

TRANSPORT FOR LONDON
CROYDON TRAMLINK IMPACT STUDY
SUMMARY REPORT
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1 EXECUTIVE SUMMARY



Executive Summary

Croydon Tramlink is a 28.2km light rail system, which was promoted by London Transport and the London Borough of Croydon. It became fully operational on 30 May 2000, re-introducing street running light rail to London after an absence of almost 50 years. The three lines provide a fast, frequent and reliable connection to and through Croydon on an east-west axis, using modern light rail vehicles.

This report describes the initial results from a study of the impact of the system. The overall objective of the Croydon Tramlink Impact Study (CTIS) is to understand the effect that the new system has on travel patterns in the area, to provide evidence on the performance of the models used to predict the patronage of the system, as well as looking at how perceptions towards Tramlink have altered. Such evidence, and any potential improvements in model specification, will be invaluable in the development and appraisal of further public transport systems in London.

Prior to the opening of Tramlink, Oscar Faber was commissioned to conduct a Pre-Opening study, designed to capture information on the current provision of transport (transport supply) and on travel behaviour in the catchment area for the system. Subsequently, a Post-Opening study was commissioned, to provide data for comparison. These surveys have provided a range of information from which the broad effects of Tramlink can be assessed. This document reviews the outputs and identifies key implications for future work.

CTIS comprises of the following elements:

- Household Interview Surveys (Pre- and Post- Opening);
- Stated Preference (Pre-) and Revealed Preference (Post-) Surveys;
- Agents of Change (Pre- and Post-) Surveys;
- Transport Demand and Supply Study (Pre- and Post-); and
- Users Survey (Post-).

These elements have been reported in a series of Working Papers and they comprise of a series of 'stand alone' surveys. However, they are intrinsically linked in providing an overall assessment of the impact of Tramlink on travel patterns and behaviour, and this report seeks to draw together the overall impacts of the system.

The data for the two quantitative surveys in particular, the Household Interviews and the User Surveys were reviewed to explore the degree of consistency in response between the two surveys. However, it should be noted that these two surveys adopted different sampling techniques and questions. It is not, therefore, expected that the data will correlate precisely, rather that each survey delivers a different perspective on the impacts of Tramlink.

This summary report seeks to draw together the information gained from each of the elements of the CTIS.

Effects on Travel Behaviour

More than 17 million journeys were made on Tramlink in the year from October 2000 to September 2001. The Users Survey revealed that for those trips which were undertaken previously to the introduction of Tramlink the majority had transferred from bus (69%) and car (19%).

In addition, approximately 20% of all journeys have been generated or have changed destination, as a result of the introduction of Tramlink.

Over 7,000 private vehicle journeys a day have been transferred to Tramlink. This fall in private vehicle usage is supported by a 6% reduction in car parking entries for publicly owned off street car parks in central Croydon. From West Croydon to Wimbledon, which was previously served by national rail, there has been a six fold increase in trips from those stations originally served by rail over a seven year period, a significantly higher rate of growth than across the London rail network. While the residents of New Addington have benefited the most from reductions in public transport journey times to central Croydon, Beckenham Junction and Wimbledon as a result of Tramlink.

The analysis of travel behaviour suggests an increase in usage compared with that anticipated in the Pre-Opening study. The majority of trips now made by Tramlink were previously made by car or bus and a high proportion of users sampled made the trip prior to the introduction of Tramlink.

Of those who did not make the trip before Tramlink opened (523 respondents from the total sample in the Users Survey), the reasons given were:

- the journey was too difficult (101 respondents)
- change of home address (86 respondents); and
- a change of job (158 respondents).

A high proportion of respondents in the Household Interview sample (22.7%, 710 respondents) stated that Tramlink was their main mode for the recorded trip.

Of these 710 respondents:

- 77.3% previously used bus as their main mode;
- 17.5% previously used car as their main mode.

The data for mode switch from car to Tramlink correlates closely with the output from the Users Survey. However, Tramlink has primarily attracted those journeys previously completed by bus.

underestimated by 15%, while the overall modal shift from bus and car has also been underestimated.

Attitudes and Perceptions

The most frequently cited reason for switching to Tramlink from each of the alternative modes was that the service is perceived as being faster than the mode used previously. The other primary reasons cited were that Tramlink is more reliable and more comfortable and respondents in all areas except Morden and Woodside indicated that Tramlink is not as expensive, compared to the car, as had been previously anticipated (HIS data Working Paper 2).

The surveys identified positive changes in perceptions towards Tramlink between the Pre- and Post- Opening surveys. These include the following:

- comments about 'gridlock' caused by broken down trams no longer prevalent;
- no spontaneous mention of accidents;
- press reports more positive for both Tramlink and Croydon;
- car journey times are reported to have decreased; and
- respondents commenting that 'Tramlink junctions work well' but that there is still congestion if approaching Croydon from the South.

The HIS Working Paper includes a detailed comparison of attitudes for repeat respondents across the Pre-and Post-Opening studies.

All age groups demonstrate improved perceptions of Tramlink when comparing attitude statements for the two studies (Pre-Opening and Post-Opening). Whilst perceptions have improved across all age groups and genders there are some differences in the scale of change. Respondents over the age of sixty use Tramlink more, and hold more positive views of Tramlink, than anticipated. Overall, the emergent trend is that, for the majority of statements, there has been an increase in the level of agreement.

Across all age groups, bus users award the comfort, reliability and safety of Tramlink, compared to the bus, higher scores in the Post-Opening study, suggesting Tramlink is performing better than the respondents had expected.

Personal safety and reliability remain the most important factors for respondents when traveling.

Respondents in the First Post-Opening study attached a higher level of importance to transport being fast compared to the Pre-Opening study. In contrast, there has been a decrease in the importance attached to the attribute of Tramlink as a non-polluting mode of transport.

Stated Preference and Modelling Implications

The Stated Preference analysis undertaken in the Pre- survey demonstrated the following key points with respect to modal preference for Tramlink:

- the modal constant contained in the mode choice model is strongly influenced by the specification of the model form and level of market segmentation;
- this implies that the modal constant per se cannot be taken as a proxy for modal preference unless the model is properly specified and the relevant attributes included in the model;
- explicit definition of service quality variables and mode specific parameters explain the majority of the choice process; and
- 'true' modal preference for Tramlink, beyond the definable variables, is likely to be small and relate to wider issues, such as confidence in making long term travel decisions because of the system permanence.

So if the quality type variables are explicitly taken into account, the residue modal preference is small.

A comparison of the actual choices made by respondents to the stated preference exercise indicates that the stated preference model is capable of predicting actual choices at the disaggregate level, with over 80% of choices correctly predicted.

1 INTRODUCTION



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1.1 BACKGROUND

Croydon Tramlink is a 28.2km light rail system, which was promoted by London Transport and the London Borough of Croydon. It became fully operational on 30 May 2000, re-introducing street running light rail to London after an absence of almost 50 years. The three lines provide a fast, frequent and reliable connection to and through Croydon on an east-west axis, using modern light rail vehicles.

This report describes the initial results from a study of the impact of the system. The overall objective of the Croydon Tramlink Impact Study (CTIS) is to understand the effect that the new system has on travel patterns in the area, to provide evidence on the performance of the models used to predict the patronage of the system, as well as looking at how perceptions towards Tramlink have altered. Such evidence, and any potential improvements in model specification, will be invaluable in the development and appraisal of further public transport systems in London.

1.2 THE IMPACT STUDY

Prior to the opening of Tramlink, Oscar Faber was commissioned to conduct a Pre-Opening study, designed to capture information on the current provision of transport (transport supply) and on travel behaviour, in the catchment area for the system. Subsequently, a Post-Opening study was commissioned, to provide data for comparison. These surveys have provided a range of information from which the broad effects of Tramlink can be assessed. This document reviews the outputs and identifies key implications for future work.

The Impact Study includes the following areas of research:

- Household Interview Survey and Travel Diary Analysis (Pre- and Post- Opening);
- Stated Preference Survey (Pre-Opening only);
- Revealed Preference Survey (Post-Opening only);
- Agents of Change (Pre- and Post- Opening) Surveys;
- Transport Demand and Supply Study (Pre- and Post- Opening);
- User Surveys (Post-Opening only)

Key questions from the brief were to:

- understand the effects of the scheme on travel patterns;
- gain an understanding of the relationship with wider economic, social and environmental conditions in the area;
- assist future planning for this area of London;

- provide information to assist in the planning and knowledge of such new modes in London;
- establish if there is a preference in favour of Tramlink, as against other modes and services;
- identify the components of the modal preference; and
- provide evidence to answer the question “does the stated preference technique reflect people’s actual behaviour in relation to the choice of mode available”?

1.3 LAYOUT OF THE REPORT

The detailed findings of the Croydon Tramlink Impact Study are reported in a series of Working Papers, which provide a detailed description of methodologies and outputs.

This report summarises the approach and overall findings from the Impact Study and contains the following sections:

- The System and Study Approach – Section 2;
- Overall Methodology Issues – Section 3; and
- Emerging Themes – Section 4.

2 THE SYSTEM AND STUDY APPROACH



2 THE SYSTEM AND STUDY APPROACH

2.1 THE SYSTEM

Croydon Tramlink has a total length of 28.2kms, serves 38 stops and is focused on Croydon Town Centre. The system consists of three branch lines serving Wimbledon, Beckenham Junction and New Addington. Appendix A shows the alignment of the three branches and whether they operate 'on street', replace former national rail services, travel next to existing national rail tracks or operate on new segregated private rights of way.

2.1.1 Tramlink Route 1

This consists of 26 stops and extends from Wimbledon National Rail Station, through Croydon Town Centre to Elmers End. The branch interchanges with a total of five national rail stations, one Underground station and four major bus focal points.

The Wimbledon branch replaces the former national rail service from West Croydon to Wimbledon. After leaving the former national rail alignment at Reeves Corner, Tramlink runs 'on-street' around Croydon Town Centre. Eastbound services run on a loop in a clockwise direction linking the West Croydon stop to the Wellesley Road stop. Services then leave the loop and head towards the stop at Sandilands. It should be noted that westbound services join the loop after the East Croydon stop and then re-join the former national rail alignment before the stop at Wandle Park.

Eastbound services (after reaching Sandilands) follow the route of a disused railway line to the stop at Blackhorse Lane. The remaining section of Route 1 between Blackhorse Lane and Elmers End replaces a national rail service between Addiscombe and Elmers End.

The new maintenance depot and operations control centre for Croydon Tramlink is located off Route 1 to the north-west of the Therapia Lane stop.

2.1.2 Tramlink Route 2

This section consists of 16 stops and links Beckenham Junction to Croydon Town Centre. The branch interchanges with a total of 4 national rail stations and three major bus focal points.

All westbound services (after the stop at East Croydon Station) join the central Croydon loop. After serving George Street, Church Street, West Croydon and Wellesley Road stops, this brings them back to East Croydon station before heading towards Beckenham Junction. Services operate 'on-street' from central Croydon to the stop at Sandilands. Between the stops at Sandilands and Arena the route follows the same alignment as Route 1. A new private right of way has been constructed between the Arena and Birbeck stops to allow services to then travel alongside national rail tracks to Beckenham Junction.

2.1.3 Tramlink Route 3

This consists of 14 stops and links New Addington with Croydon Town Centre. The branch interchanges with a total of two national rail stations and four major bus focal points.

Tramlink runs 'on-street' from Croydon Town Centre to the stop at Sandilands. All westbound services (after reaching the East Croydon Stop) join the clockwise loop. After serving the George Street, Church Street, West Croydon and Wellesley Road stops, this brings them back to East Croydon station before heading towards New Addington. Between the stops at Sandilands and Lloyd Park route 3 follows the path of a disused railway line. After reaching the stop at Lloyd Park new private rights of way have been constructed to enable Tramlink to reach New Addington.

2.2 TRAMLINK SERVICE CHARACTERISTICS

Trams run at speeds of up to 80km per hour on 'off street' sections of the system, but run at much lower speeds when serving pedestrianised streets in central Croydon. Each of the 38 tram stops has a raised platform in order to provide a fully accessible public transport service.

The frequency of tram services on each of the three lines is listed in Table 2.1.

Table 2.1 Tramlink Frequencies per hour.

		Mon – Fri		Saturday		Sunday	
Route	Between	04:30 – 18:30	18:30 – 00:30	04:30 – 18:30	18:30 – 00:30	04:30 – 18:30	18:30 – 00:30
1	Wimbledon – Elmers End	6	2	6	2	2	2
2	Beckenham Junction – Croydon	6	2	6	2	2	2
3	New Addington – Croydon	9	4	9	4	4	4

Tickets are available from self-service machines located at every tram stop. In addition LT Cards and Tram/Bus Passes, which are valid on Tramlink, can be bought in advance from outlets all over London, including selected newsagents, rail stations and underground stations.

The adult single fare is 90 pence for any journey (with the exception of £1.30 from stops in zone 3, which are Wimbledon, Dundonald Road and Merton Park to stops beyond Wandle Park and vice-versa).

An adult return is £1.80 where the single fare is 90 pence and £2.60 where the single fare is £1.30. A child's single is 40 pence for any single journey and 80 pence return.

2.3 OVERVIEW OF APPROACH

As described in the previous chapter, CTIS is based on a number of separate surveys, in order to meet a wide range of objectives. The manner in which the separate surveys serve to meet the objectives is set out in the following table 2.2:

Table 2.2 Survey Summary

SURVEY ELEMENT	SURVEY LOCATION	METHODOLOGY	OUTPUTS
Household Interview Surveys	In the catchment area for Tramlink	Interviews in home with one-day travel diaries	Benchmark and comparison of travel patterns and attitude to Tramlink
Stated Preference and Revealed Preference Surveys	In the catchment area for Tramlink	Interviews in home	Establish if people choose to use Tramlink instead of other modes. Identify 'Tramlink User' characteristics.
			Understand whether there is a preference for Tramlink and if so, the components of that preference.
			Prove or disprove the hypothesis that Stated Preference can be used to predict mode choice behaviour
Agents of Change	In place of work in Croydon and surrounding boroughs.	Depth interviews	Understand how the business community and other key opinion formers view Tramlink and its effects on the area
Transport Demand and Supply Study	In the catchment area for Tramlink	Analysis of data covering the catchment area for Tramlink	Establishment of baseline transport data for demand and supply and determination of changes in travel demand
Users Survey	On Tramlink	A self-completion questionnaire	Travel characteristics including journey origin and destination, car availability and previous mode used

3 OVERALL METHODOLOGY ISSUES



3 OVERALL METHODOLOGY ISSUES

3.1 INTRODUCTION

This section reviews the following aspects of the Croydon Tramlink Impact Study:

- Methodological considerations;
- Review of methodologies;
- Response rates and accuracy of data.

3.2 METHODOLOGICAL CONSIDERATIONS

3.2.1 Temporal and Spatial Limits of Research

Previous research has indicated that the area over which new urban rail projects have a primary impact is approximately within 1 kilometre walking distance of stations. This defines the area within which people are likely to access the stations on foot, at either the home or destination end of their trips, and the maximum area over which employer activities, investment decisions and property prices are likely to be affected by the construction of a rail scheme.

For Tramlink we adopted a slightly lower threshold of 800 metres within which the Croydon Tramlink Impact Study should be carried out, on account of the different nature of light rail systems compared with heavy rail.

3.2.2 Temporal diversion

There is also a temporal sphere of influence to be considered and previous work for the Jubilee Line Extension Impact Study (amongst others) has shown this to be a complex issue. It needs to be recognised that:

- a) Some types of impact can be observed to take place within weeks, such as public transport passengers switching to take advantage of reduced travel times or the better ride quality of Tramlink.
- b) Some impacts arise in advance of the line opening such as changes in the allocation of road space to accommodate Tramlink, which begin virtually as soon as construction begins.
- c) Some impacts may occur before construction begins with developers seeking to take advantage of potential future land price increases as a result of improved accessibility; other property investment decisions may begin during construction and continue long after the system is open.

These temporal elements were incorporated into the design of each element of the study as appropriate.

3.2.3 Isolation of Impacts

Information on the impacts of the system on the travel choices made by Tramlink users can be captured from surveys of Tramlink passengers carried out after the system was opened. In addition, the impacts of the system on accessibility can be measured by considering the public transport services immediately before and after opening.

In order to identify the effects of Tramlink it is vital to exclude the impacts of other changes in the supply of transport, such as the opening of JLE. For this reason, other impacts were taken into account. The approach taken was to build up and examine the data stage by stage, thus ensuring a full understanding of the reasons for changes in behaviour.

The first Post-Opening study was designed to identify key differences in the Tramlink area, which could be caused by the impact of Tramlink.

The following sections summarise the methodology for each of the study elements under the following sub headings (where applicable):

- Objectives;
- Sampling approach;
- Questionnaire;
- Fieldwork;
- Response Rates; and
- Analysis.

3.3 HOUSEHOLD INTERVIEW SURVEY

3.3.1 Objectives

The objectives of the household interview survey (HIS) were to obtain a wide range of information about trip patterns prior to the opening of Tramlink and to collect information on the perceptions and attitudes of people making trips within the corridor ('in-scope' trips) to be served by Tramlink.

The research was designed to provide a base against which future changes can be monitored and the impact of Tramlink identified. Household interview data was collected by face-to-face interviews using pre-printed questionnaires.

3.3.2 Sampling

The HIS adopted a quota sample controlled by stratification based on employment status. In addition to the main household interview, selected individuals were asked to undertake a stated preference exercise.

Seven geographical areas were identified to ensure a wide spread of demographic and socio-economic diversity. Six (Merton, West Croydon, Woodside, Beckenham, New Addington and Lloyd Park) of the seven areas are within 800 metres of a Tramlink station, and the seventh (Morden) is outside of the 800 metre catchment area, but with access to a Tramlink station by car or bus.

The areas cover the three Tramlink branch lines and incorporate housing types and socio-economic groupings that are representative of the overall catchment area for Tramlink. These areas were revisited in the first Post-Opening study.

In order to reduce the intrinsic variability between the two surveys, it was intended to establish a panel of respondents. For this reason, the households where interviews were conducted in the Pre-Opening study were re-contacted in the First Post-Opening study. This enables a direct comparison to be made of attitudes and travel patterns before Tramlink opened with those once Tramlink became operational.

During the survey the quota sampling was controlled at two levels:

- by the individual interviewers; and
- by the fieldwork agency

The data collected included:

- residence information;
- household characteristics;
- attitudinal questions; and
- single day travel diary.

3.3.3 Questionnaire

The questionnaire for both Pre- and Post- Opening studies included screening to establish whether or not an in-scope trip had been made, and to check for eligibility in terms of quota. Further screening questions were developed for the Post-Opening study questionnaire.

If the respondent was not making an in-scope trip, only the attitudinal and travel diary sections of the questionnaire were completed. If they were making an in scope trip they were asked either the Stated Preference questions (Pre-Opening Study) or the Revealed Preference questions (Post-Opening study).

The remaining sections of the questionnaire were identical for both stages, so that direct comparisons could be made between Pre- and Post-Opening attitudes and trip characteristics.

Various attitudinal questions comparing Tramlink to another mode were asked of all respondents. Finally, a Travel Diary was completed for all the trips that all members of the household made the previous day.

The impact of asking the Stated Preference questions increased the interview length from 35 minutes on average to approximately 90 minutes. The Revealed Preference questions (Post Opening) had less of an impact on overall time of interview, increasing it to 50 minutes on average.

3.3.4 Fieldwork

The fieldwork was carried out by experienced interviewers. A personal briefing was carried out and interviewers had the opportunity to pilot the questionnaires and review the methodology, before going into the field.

Fieldwork for both the Pre- and Post- Opening studies was carried out in two stages, due to the large sample size required. Interviews were carried out in the late Autumn, with a break for Christmas, and then again early in the New Year. (Some additional Stated Preference interviews were carried out as part of the Pre-Opening study, to correct a slight imbalance in the sample).

A detailed record of interviewer strike rates were maintained, providing reasons for non-contact or non-interview. This was used to monitor the progress of the survey fieldwork and to provide data on re-contact rates in the Post-Opening study.

A total of 3082 interviews were successfully completed in the Pre-Opening study and 3124 in the subsequent First Post-Opening study.

There were 759 repeat respondents, i.e. they were interviewed in both surveys, representing a control group for which comparative analysis could be completed.

3.3.5 Response Rates

Response rates for the Post Opening study were analysed to provide an understanding of the fieldwork task.

A total number of 3124 respondents contributed to the First Post-Opening study. This represents an overall response rate of 23% from the 13,775 households visited. The sample size of c3000 gives an accuracy of +/- 1.9% for the total sample. The sample of 3124 respondents consists of the following:

- Same respondent, same household -759 people (24%);
- New respondent, same household – 169 people (6%); and
- New respondent, new household -2196 (70%).

This means that 30% of the sample for the First Post-Opening study consisted of the households which took part in the Pre-Opening study. This provides an excellent control sub-sample of households which were familiar with the questionnaire and the issues relating to Tramlink.

Out of the 13,775 households visited, 9508 people declined to be interviewed, giving an overall refusal rate of 69%. The refusal rate amongst

the 3082 respondents who had previously taken part in the Pre-Opening study was 38% (1182 people) and that of the 10,691 new households was 78% (8326 people).

The response rate analysis identified that three hundred and eighty-nine people from the Pre-Opening study sample of 3082 have moved house (13%) and 454 (15%) were unobtainable after three attempts.

The 'new' sample of households generated a response rate of 22% effective, which compared well with the 31% response rate from the existing Pre-Opening sample. Indeed, a response rate of over 20% from an in-home survey is considered to be good.

Surveys based upon a pre-selected sample, typically achieve a re-contact rate of approximately 80%. The Post Opening Study HIS fieldwork achieved a re-contact rate of 79.8% (2461 of 3084). It should be noted that other surveys which respondents stated related to Tramlink, were being conducted at the same time as this study. We believe this has led to a certain degree of respondent fatigue and contributed to the overall refusal rate.

3.3.6 Analysis

Analysis of the attitudinal statements demonstrated that overall there was a positive increase in the level of agreement with the statements presented to the respondents. This indicated that Tramlink was viewed in a more positive light than had been anticipated and that Tramlink was being used to undertake more travel to the areas identified than had been previously envisaged.

The number of trips for which details were obtained in the travel diaries was 6807 in the Pre-Opening survey and 5588 in the Post-Opening survey.

Detailed analysis was carried out and mode definitions were reviewed to provide a comparison of trips completed between the two survey periods.

3.4 STATED PREFERENCE SURVEY

3.4.1 Objectives

This survey was designed to answer the following questions:

- is there a preference in favour of Tramlink, as against other modes and services?
- what are the components of the modal preference?; and
- does the stated preference technique reflect peoples' actual behaviour in relation to the choice of mode available?

- trips in scope (i.e. within the Tramlink area);
- mode used, (either car or bus); and
- work/non work trips.

3.4.3 Questionnaire

3.4.4 Fieldwork

The stated preference questionnaires were administered via laptop computer.

3.4.5 Response Rates

- to obtain 125 interviews in each of the five separate interview areas of New Addington, Merton, Morden, Woodside and Beckenham;
- to obtain SP surveys from 300 existing bus users and 300 existing car users; and
- to obtain SP surveys with 300 commuters and 300 non-commuters (combined by car and bus).

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car and bus users, and containing 254 commuters and 570 non-commuters. The respondents by area all exceeded the 125 target with the exception of New Addington, where significant difficulties in obtaining respondents were encountered, and only 105 interviews were completed.

The final sample provided an excellent base for the model calibration with the interviews by market segment far exceeding the minimum number of 75 interviews.

In the Post-Opening survey, respondents to the (Pre-Opening) Stated Preference (SP) experiment were asked to provide Revealed Preference (RP) data relating to the same trip. The targets for the RP were the same as the Pre-Opening survey. Of the Post-Opening surveys 159 were undertaken with the same individual as in the Pre-Opening survey.

The RP survey was carried out with household survey respondents making trips of interest, that is trips for which Tramlink would be a reasonable alternative mode of transport. The target for RP returns was set at 1000 to allow for a number of surveys being unusable due to incomplete data. The number of RP returns actually reached 1762 trips of interest but only 737 of the respondents had completed all elements of the questionnaire. However the number of completed respondents comprised a robust dataset that could be segmented to the required level of detail and still provide robust estimates of the modal shares.

3.4.6 Analysis

Two basic SP experiments were undertaken within each market segment. The first examined the quantitative journey attributes of in vehicle time, wait time, access/egress time, fare, and bus type. To examine the relative importance of different service quality attributes of different modes, a second SP experiment was carried out, covering service quality attributes such as comfort, ride quality, security, safety, ease of boarding and seat availability. The second SP experiment was carried out because the main mode choice experiment was already complex and by including the quality attributes in the mode choice experiment there is a danger that the qualitative quality variables would be 'swamped' by the other mode choice variables such as time and cost.

The baseline analysis of the stated preference data concentrated on answering the two key questions of whether a modal preference exists for Tramlink (light rail per se) over bus and, if so, what are the components of that modal preference. In the Post-Opening analysis the SP was combined with the RP data to examine the relative capabilities of SP, RP and hybrid SP/RP models in predicting Tramlink patronage.

3.5 AGENTS OF CHANGE

3.5.1 Objectives

The purpose of this survey was to understand the impacts of Tramlink and establish perceptions amongst the business community and those with an interest in the commercial viability of the area.

3.5.2 Sampling approach

A methodology of 'face to face' qualitative in depth interviews was chosen to explore the expected impacts of Croydon Tramlink on the administrative and business community. Respondents were selected from the following key organisations:

- Local Authorities (Bromley, Croydon, Merton and Sutton);
- Developers;
- Retailers;
- Non retail - business;
- Leisure; and
- Estate Agents.

Quota sampling, which is a non-random method of sampling, was used to select respondents. Quotas were established for each type of respondent, to make sure that the views of each were reflected in the results.

Targeted organisations were contacted by telephone to identify the person most likely to be able to provide the information required. A senior member of staff such as the Managing Director /CEO, a Director, or Manager was chosen where possible, so that they would have sufficient insight into the business and the power to request specific items of information that might be useful.

Most of the respondents agreed to take part in both the Pre-Opening and the Post-Opening research activity.

3.5.3 Questionnaire

A series of open questions were asked to establish perceptions of Tramlink in both the Pre- and Post- Opening situation. Questions were kept broadly the same for both stages of the research, to provide a means of comparing the information.

The techniques adopted were qualitative, hence this area of the CTIS concentrates upon perceptions and attitudes.

Respondents were asked to provide data on financial or staff turnover, but this information is in most cases highly commercial and difficult to obtain.

3.5.4 Fieldwork

The data was collected via depth interviews carried out by a trained qualitative researcher. The process included telephone screening, arranging appointments and a face to face interview.

3.5.5 Response Rates

Where possible, the same respondents were sampled in the First Post-Opening study as in the Pre-Opening study. Table 3.1 shows the sample achieved.

Table 3.1 – The Sample Achieved for the Pre- and Post- Opening Stages of the Agents Of Change Study

	Local Authorities		Developers		Retailers		Business – Non retail		Leisure		Estate Agents		TOTAL	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
Quota	4	4	2	1	5	5	4	5	2	2	2	3	19	20
Number of interviews	4	4	1	1	5	4	5	5	2	2	3	4	20	20
Number of Respondents	10	10	3	2	5	4	5	5	3	2	3	4	29	27

Some respondents were not available for repeat interviews. This was because either the original respondent had left the company or the respondent/organisation declined the interview. In these cases a similar respondent was chosen from within the company or from a similar organisation where appropriate.

The response rate was high, as is normal with surveys of this nature. Furthermore, the analysis, being qualitative in nature, is less susceptible to slight changes in sample so long as the key sampling criteria are adhered to.

3.5.6 Analysis

This element of the study seeks to provide an in depth understanding of the impact of Tramlink on Croydon and the surrounding areas in terms of travel, economic performance, and the cultural situation. Two stages of interviewing have been carried out, one before Tramlink opened to explore the expected impacts, and the second after Tramlink opened to understand the actual impacts. A comparison of the findings between the before and after stages of interviews, provides an insight into the impacts that a light rail system brings.

3.6 TRANSPORT DEMAND AND SUPPLY STUDY

3.6.1 Objectives

The objective of the Transport Demand and Supply Study is to outline the components of the transport system in place before the introduction of Tramlink and the changes made to these components in order to accommodate Tramlink. Demand data for National Rail, Bus and Private Vehicle Usage, is examined in relation to Tramlink to determine the impacts of the system.

3.6.2 Methodology and Analysis

The demand for transport provides an overview of the travel situation prior to the construction of Tramlink. It is a statement of the travel demand and patterns in the absence of Tramlink. There are two issues associated with transport demand with which the study is concerned. The first is to determine whether there is a real increase in the demand for travel, which can be attributed to the implementation of Tramlink. This needs to consider both private and public modes of transport because of the issue of transfer between modes.

The supply side of the transport study looked at the impact of Tramlink on the transport infrastructures and on travel time accessibility in the Tramlink corridor. The impact of Tramlink on travel time accessibility using public transport was measured using TfL's PDGIS-EMME/2 calculator known as CAPITAL.

Patronage counts and passenger surveys were carried out by consultants on behalf of TCL and TfL's Revenue Agreements Section. Surveys were divided into three categories, Monday to Friday, Saturday and Sunday. Over a period of three months (July-September 2001) each scheduled tram for one typical weekday was surveyed, while for Saturday and Sunday a sample of scheduled trams were surveyed. Data were factored to provide information on the annual number of boarders and alighters for every stop. In addition, data was manipulated to provide average daily boarders and alighters for each of the three categories by time of day. Demand was then put into context by examining the service frequency of Tramlink.

3.6.4 National Rail

Tramlink Route 1 replaced former national rail services run by Connex South Central from Wimbledon to West Croydon. Data were analysed to provide a comparison of national rail services and Tramlink between Wimbledon and West Croydon. Survey data collected for a 3hr weekday peak period (07:00-10:00) in 1994 was compared to data collected by TfL and TCL.

National Rail services between Elmers End and Addiscombe stations were removed to allow Tramlink's Route 1 to serve Elmers End. However, no national rail data is available to allow a comparison with patronage levels on Tramlink.

The bus network was examined to identify changes in bus usage into and out of central Croydon and New Addington before and after the implementation of Tramlink. As the three branches of Tramlink converge on central Croydon it was anticipated that the greatest change in travel patterns would occur within this area. New Addington was selected to examine how Tramlink would affect a residential area that was only served by bus. Changes in patronage were also placed into context with alterations to the bus network for both areas.

Bus patronage data was collected from London Buses' Bus Origin Destination Surveys (BODS). BODS, is conducted on a rolling programme with every bus route being surveyed every 5 years on average.

Summarised data was produced to show inbound and outbound loadings for each of the two study areas for a weekday 24hr total and a 3hr am peak period for both 1995 and 2001.

The impact of Tramlink on private vehicle usage is examined by analysing data on off-street car park activity in central Croydon and traffic flows within a 1.5km radius of Tramlink. A description of alterations made to the highway network as a result of Tramlink was also produced.

Data on monthly usage of the council's non-pay and display car parks were obtained for January 1997 to September 2001. Total income for pay and display car parks was used in the absence of entry data from January 1999 to September 2001.

The impact of Tramlink on travel time and accessibility using public transport was measured by using TfL's model CAPITAL.

To measure the impact of Tramlink on public transport journey times and accessibility, three situations were modelled as follows:

- CAPITAL was used to calculate public transport accessibility, with travel times based on the assignment of a pre-Tramlink 2000 matrix of public transport demand to the pre and post Tramlink networks. The resulting differences in journey times and accessibility therefore represent the changes attributable to reassignment of traffic (re-routing by users), which would be a direct impact of Tramlink.

3.7 USER SURVEYS

To determine the travel habits of users of Tramlink using self-completion questionnaires. Within this remit, it was important to determine the change in mode for trips within the catchment area for Tramlink.

3.7.2 Sampling approach

Following analysis of the predicted patronage data, it was clear that handing out questionnaires at each station for an average day would provide between 10,000 and 15,000 potential respondents.

The choice of a self-completion methodology was influenced by the length of the questionnaire and the high frequency of Tramlink services in peak periods. It was thought that face-to-face interviews with boarding passengers would lead to a large number of interviews being aborted. On board surveying was considered but dismissed in view of the volume of passengers in the peak and the difficulties this would present in undertaking the interviews and achieving acceptable sample levels.

The User Survey was designed on the assumption that count data would be available, as specified, for the expansion of demand data. This information was made available in November 2001 and the Working Paper has been updated accordingly.

3.7.3 Questionnaire

The questionnaire for the User Survey covered the following topics:

- trip characteristics;
- frequency of travel;
- previous modes of travel;
- reasons for mode choice; and
- demographic information, including car ownership.

The questionnaire was designed to encourage a good response rate and the majority of questions contained pre-coded responses, making data entry more efficient. In addition, the provision of a prize draw was used to improve the level of response.

3.7.4 Fieldwork

A total of 12,154 questionnaires were distributed, with 2534 responses received, giving a response rate of 21%. This represents a good response from a self-completion questionnaire exercise and it exceeded the anticipated response rate. Of these 2534, 1835 had made trips with a single boarding and alighting station and reported they were heading in a direction that was in accordance with the survey design.

3.7.5 Response Rates

The User survey sample of 2534 is considered to be robust, providing a base from which analysis and conclusions can be drawn, and demand issues considered.

3.7.6 Analysis

A quantitative analysis was carried out, to provide data on travel characteristics and attitudes. All the results were entered into an excel spreadsheet for initial analysis. Subsequently, the data was tabulated using SPSS software.

Boarding and alighting data were provided by TfL for the purpose of weighting the origin and destination data. The output describes the attitudinal findings in terms of the sample data set, and the travel characteristics based upon data weighted to current boarding figures, thus representing the total universe of passengers on the system.

3.8 ENHANCEMENTS TO SURVEY DESIGN

3.8.1 Household Interview Surveys

The study has generated a sample base which can be used for further research and comparison. A reduced sample size conducted on a regular basis would provide the opportunity to monitor impacts over a longer period of time, thus picking up some of the temporal diversion effects. If this were to be considered, the sample design should assume that replacement interviews would be required at a similar rate to that experienced in the First Post Opening study.

It is felt that the fieldwork was well executed and the data set is a valuable source of information. However, it is clear that the strike rate for successful interviews could be increased by some or all of the following:

- Reducing the interview length;
- Simplifying the questions;
- Offering an incentive;
- Allocating more fieldwork resource to 'call backs'; or
- Adopting a 'Citizens Panel' approach (with all the associated costs of recruitment, regular contacts and ongoing replacement).

The cost implications of such a study cannot be ignored, particularly since the fieldwork element of the study has absorbed a high proportion of the total fee. It would be possible to reduce this considerably by a reduction in either sample size or interview length, which could be contemplated now that the baseline data have been collected.

It should be noted that survey costs are increasing in London with respondents showing more 'fatigue' perhaps due to an increased emphasis on consultation.

3.8.2 Stated Preference and Revealed Preference Surveys

The SP and RP surveys used in the study were of necessity quite long as the issues to be addressed were complex. In view of this, significant attempts were made to ensure that the SP was completed as efficiently as possible through the use of lap top computers which does speed up the interview process, particularly for SP. The surveys as designed addressed the issue of interview fatigue by keeping the number of scenarios presented to nine, which we believe to be the minimum required to produce acceptable results.

It is possible to further reduce 'respondent fatigue' by developing a number of shorter questionnaires, each of which would be administered with a smaller sample, but with an overall increased sample size to ensure that the same confidence can be attached to the results for specific attributes of the system. However, there are increased cost implications of adopting this approach.

3.8.3 Agents of Change

In general the approach to the qualitative research was successful. A high proportion of respondents took part in a repeat interview (First Post Opening Study).

The research failed to elicit consistent benchmarking data on revenues and staff turnover, and may be subject to some variation since the qualitative methodology reduces the rigour of questioning in favour of a more open and creative approach. However, it is felt that this element of the study was highly relevant in terms of the overall image of Tramlink in the local area.

A more structured approach to the request for appropriate benchmarking data may enhance the quality of the output.

3.8.4 Transport Demand and Supply Study

In order to strengthen the conclusions of this report, data which were not available within the study's timescales could be analysed for the following sections:

Tramlink

TfL has commissioned consultants to monitor interchange activity at Wimbledon, West Croydon and East Croydon rail stations as part of an interchange improvement initiative. It would be of interest to report the level of interchange occurring between national rail and Tramlink and compare these figures with those produced by TCL's and Revenue Agreements' surveys.

National Rail

TfL is currently negotiating with the various Train Operating Companies (TOC's) to gain access to previous travel surveys/passenger counts. It would be of interest to determine how Tramlink has affected the demand for rail travel within Croydon.

3.8.5 Users Survey

Whilst the approach adopted was successful and has provided a valuable data set, it is felt that more effective use could be made of on system interview techniques to support self-completion questionnaire surveys, and to provide an additional level of detail. The combination of more in-depth on-board interviews permitting prompting by interviewers, with self-completion questionnaires and detailed in-home surveys, would provide a comprehensive range of techniques and data sets. This has been successfully used in other public transport related studies, including the London Bus Initiative. However, the issue of peak hour crowding remains.

- Follow up interviews with HIS panel to monitor travel habits and attitudes (we would recommend reducing the interview length to something more cost effective, which would also increase the response rate). This data set could be treated as a 'panel' providing steps were taken to maintain the interest of respondents and to 'refresh' the panel. It would afford the opportunity to monitor Tramlink usage against other modes such as rail and to measure the effectiveness of Tramlink as a feeder service to National Rail;
- Qualitative work in New Addington, to explore original perceptions against current usage and to establish the extent to which Tramlink has impacted on lifestyle and work or training opportunities;
- Follow up with appropriate quantitative surveys if the qualitative work identifies key issues which require additional evidence;
- Additional Travel Diary analysis (perhaps using GIS) which calculates trip lengths and compares this for Pre and Post Opening data.

4 EMERGING THEMES



4 EMERGING THEMES

4.1 PATRONAGE LEVELS BY MODE

4.1.01 Tramlink Usage

Based on the survey data collected by TfL and TCL between July to September 2001 a total of 17,568,239 people boarded and 17,051,870 alighted from Tramlink between October 2000 and September 2001.

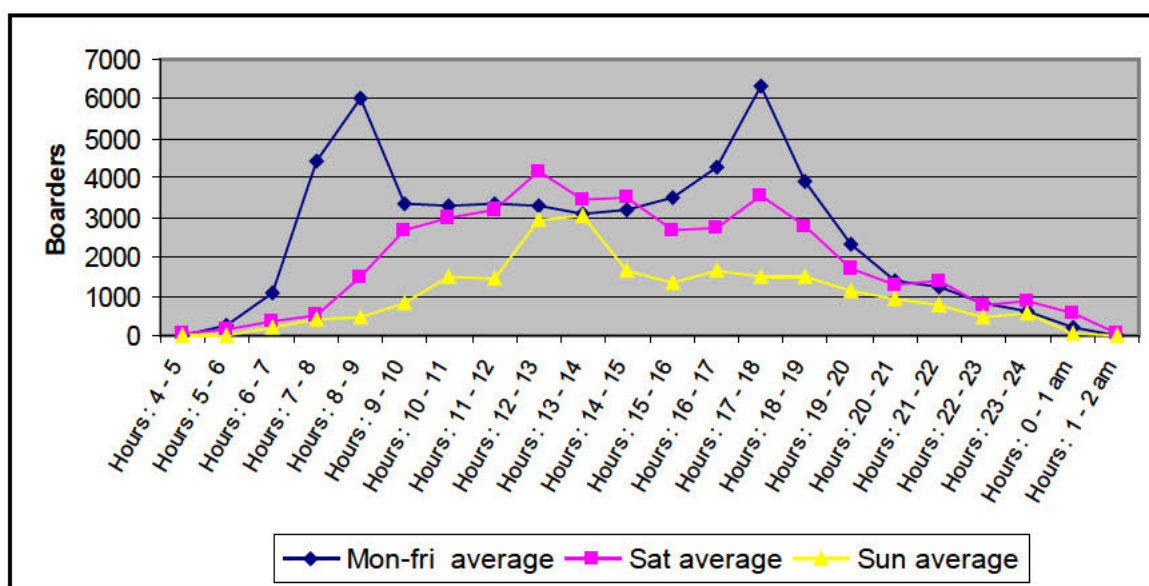
Board and alight figures do not match due to difficulties in accurately counting the number of people boarding and alighting during busy periods. For the purposes of the summary report an average of the two figures has been taken to provide an estimated annual patronage figure of 17,310,054. It should be noted that the factors used to growth the data did not take into account any seasonal variations.

In descending order stops at East Croydon, George Street, West Croydon, Wimbledon, Church Street, New Addington and Sandilands were the busiest during the week and on Saturday and Sunday. The majority of the busiest stops serve major centres of shopping/ business activity. The high usage of Sandilands is due to the stop being the main interchange point between lines serving New Addington and Beckenham Junction/ Elmers End.

Figure 4.1 shows boarding activity by time of day. Boarding (and alighting) activity peaks between 08:00-09:00 and 17:00-18:00 on weekdays. In contrast on Saturday the number of people boarding the system is higher at mid-day than on an average weekday, although the number of people boarding the system before 10:00 is considerably lower. This reflects a change in the nature of trips from work to shopping/ leisure trips.

The data for boarding passengers (figure 4.1) is mirrored by that of alighting passengers.

Figure 4.1 Average boarding activity by time of day.



Interchange between national rail stations and Tramlink stops, was also high at East Croydon (26%) and Wimbledon (19%). However, this figure fell to 6% at West Croydon.

For the Wimbledon to West Croydon corridor there has been an approximate 8 fold increase in the number of boarders and alighters at stops between 1994 and 2001. The number of boarders and alighters at those stations served formerly by Connex, have increased by 5 and 6 fold respectively.

Despite a background of increased rail travel it is clear that Tramlink has attained a higher level of patronage on the Wimbledon to West Croydon corridor than if national rail still served the corridor.

- enhanced operating frequency of 6 trams during the peak compared to one train every 45 minutes under national rail;
- increased range of possible destinations (West Croydon to Elmers End) which are accessible from Tramlink Route 1 without the need to interchange; and
- increased range of possible destinations by interchanging with Tramlink Routes 2&3 and national rail stations and major bus focal points.

4.1.03 Bus

The bus network was re-structured so that in general it complements the Tramlink network. Table 4.2 shows total bus patronage inbound and outbound for central Croydon and New Addington for 1995 and 2001.

Table 4.2 Total bus patronage for central Croydon and New Addington in 1995 and 2001.

	Central Croydon				New Addington			
	1995		2001		1995		2001	
	In	Out	In	Out	In	Out	In	Out
3 hr am peak	20,207	8,819	18,019	8,638	2129	504	449	174
24 hours	58,964	58,740	54,738	58,227	4826	4290	1250	1164
3 hr am peak 95-01 % change			-11%	-2%			-79%	-65%
24hr am peak 95-01 % change			-7%	-1%			-74%	-73%

Bus route corridors for central Croydon, which serve Tramlink destinations, have experienced large falls in patronage, while other routes which have not been affected by Tramlink have seen positive growth. It should be noted that despite a fall in bus patronage the number of buses entering central Croydon in the am peak period only fell from 213 to 210 vehicles between 1995 and 2001. However, while loadings may have fallen at the cordon boundary for some routes it has to be remembered that loadings elsewhere on these routes may still require the level of service to remain unchanged or even increased.

As a result of the introduction of Tramlink the bus network was altered to generally complement the system, rather than act as a competing mode. However, a number of routes do abstract patronage from Tramlink, as a result there is provision for London Buses to compensate TCL for a limited period for revenue lost as a result of pre-defined services. It should be noted that it is necessary to retain these services for London Buses to meet its overall service commitments. The greatest impact on the bus network is in central Croydon, which is served by the three branches of Tramlink. A number of changes have been made to the local bus network to provide an integrated bus and tram network.

The biggest fall in bus patronage occurs on services running on Addiscombe Road (corridor no.5). Patronage on inbound services fell in the am peak period from 4470 in 1995 to 2030 in 2001, a fall of 55%. Patronage over a 24hr period on services on Addiscombe Road fell from 11291 in 1995 to 6338 in 2001, a fall of 44%. A large fall in patronage is expected on routes using Addiscombe Road as they also serve areas served by the New Addington and Elmers End Tramlink branches.

As previously noted bus services are run to generally compliment the Tramlink network. As a result, the number of buses serving Addiscombe Road between 1995 and 2001 fell from a total of 42 to 26 during the am peak period.

Similar large falls in patronage occurred on Lower Addiscombe Road (corridor 6) and Morland Road (corridor 7). Inbound patronage on Lower Addiscombe Road experienced a fall of 31% from 1995 to 2001 in the am peak period and a fall of 18% over a 24 hour period. For inbound services on Morland Road patronage fell by 38% in the am peak period, while a fall of 29% was recorded over a 24 hour period. In contrast to the large falls in the number of services using Addiscombe Road, bus frequencies increased from 11 to 13 and fell from 6 to 5 for Lower Addiscombe Road and Morland Road respectively.

As bus services on the aforementioned roads serve areas which are also served by the Elmers End/Beckenham Junction Tramlink branch, large falls in patronage were anticipated.

Large increases in patronage were experienced on Warham Road (corridor 13). Inbound patronage in the am peak period increased by 78% and 51% over a 24 hour period. On Whitehorse Road (corridor 8) patronage increased by 29% in the am peak period and 6% over a 24 hour period. Bus frequencies increased from 7 to 8 and 27 to 29 on Warham Road and Whitehorse Road respectively.

Although bus routes which serve Tramlink destinations have experienced large falls in patronage other routes which have not been affected by Tramlink have seen positive growth. Overall bus usage has fallen by 11% for inbound routes during the am peak, while usage has just dropped by 1% for outbound routes over a 24hr period.

However, between 1995 and 2001 (using an estimation of ridership) total network patronage across London has increased by nearly 20%. As a result, the impact of Tramlink on lowering bus patronage is greater than the figures suggest.

BODS data were collected to determine bus loadings on those routes which link central Croydon and New Addington using Lodge Lane or Kent Gate Way.

The largest fall in patronage can be seen on route 130, which links New Addington to central Croydon, with the number of people travelling to New Addington over a 24hr period falling from 2837 in 1995 to 292 in 2001. As expected a large number of passengers have switched modes to take advantage of Tramlink's frequent and quick service from New Addington.

It should be noted that the bus network to central Croydon from New Addington was restructured to complement the Tramlink network. With services being withdrawn shortly after the opening of Tramlink by London Buses due to a lack of demand. As a result the number of buses which linked central Croydon to New Addington fell from 27 to 19 over a one hr am peak period between 1995 and 2001.

4.1.04 Private Usage - Off Street Car Parks

Table 4.3 shows car park entries into Croydon Council's non Pay & Display car parks which account for 4561 spaces out of a total of 6751 public and

private car park spaces. In the 12 months before and after the opening of Tramlink entries fell from:

- 2,648,066 in 1999/00; to
- 2,489,484 in 2000/01.

While car park activity fell by 6% in the 12-month period after the opening of Tramlink, it also fell by 2.5% in the 12 months prior to that period. From the data it is unclear as to whether the reduction in car park activity from June 1999 to May 2000 was a 'one off event' or whether demand would have continued to fall in the period after the opening of Tramlink. It is possible that the 2.5% reduction was due to disruption to the town centre caused by the construction and testing of Tramlink.

During the period of May-September 2001 demand for parking rose to above pre-Tramlink opening levels. This may be explained by the closure of the privately owned 800 space Drummond car park in May 2001 for redevelopment. The closure of this car park would have placed additional demand on Croydon Council's car parks.

Table 4.3 Car Park Entries June 1997 to May 2001

	Car Park Entries	Change on previous year	% Change on previous year
June 1997 to May 1998	2,675,066		
June 1998 to May 1999	2,715,344	40,278	1.5%
June 1999 to May 2000	2,648,066	-67,278	-2.5%
June 2000 to May 2001	2,489,484	-158,582	-6.0%

In contrast to the above, income revenue data from Croydon Council's pay and display car parks (303 spaces) proved inconclusive as to whether demand had changed as a result of Tramlink.

4.1.05 Cost of Parking

The cost of parking in each of Croydon's Council's off street Pay & Display and non-Pay & Display car parks has not been altered as a result of the introduction of Tramlink. In general, parking charges have been changed broadly in line with inflation.

4.1.06 Highway flows

Table 4.4 shows AADF data for the central Croydon cordon. Total AADF flows slightly fluctuated year on year between -3% to +2% from 1994 to 1999. However, with the opening of Tramlink in 2000 traffic levels fell from 137,318 to 117,651 a fall of 14%. In contrast, traffic levels in Kingston only fluctuated year on year between -2% to +2% from 1994 to 2000. Croydon Council officers have also been unable to identify any other routes into central Croydon that have become more congested as a result of traffic re-assignment.

Table 4.4 AADF's for central Croydon cordon (1994-2000).

Site No.	Road	1994	1995	1996	1997	1998	1999	2000
108	A232	24,976	24,885	24,707	25,495	25,293	24,896	24,065
53	A212	19,881	19,824	19,537	19,565	19,429	17,982	17,340
10	A235	25,446	24,482	24,318	24,282	27,836	26,854	23,718
60	A232	61,200	61,019	58,821	58,902	58,491	57,417	40,778
77	A213	11,401	11,358	10,408	10,413	10,359	10,169	11,750
Total		142,904	141,568	137,791	138,657	141,408	137,318	117,651
Croydon % change on previous year			-1	-3	1	2	-3	-14
Kingston % change on previous year			-2	-1	-2	0	-1	2

Note 1. Figures in red are AADF's based on actual surveys

Table 4.5 shows AADF data for sites on roads parallel to Tramlink. Total AADF flows have fallen by 32,193 vehicles (21%) from 150,631 in 1997 to 118,438 in 2000. In comparison total AADF flows for the central cordon have fallen by 15% from 138,657 in 1997 to 117,651 in 2000. As expected, parallel roads to Tramlink have experienced a fall in traffic levels.

Table 4.5 AADF's for sites on parallel roads to Tramlink (1994-2000).

Site No.	Road	1994	1995	1996	1997	1998	1999	2000
53	A212	19,881	19,824	19,537	19,565	19,429	17,982	17,340
60	A232	61,200	61,019	58,821	58,902	58,491	57,417	40,778
72	A212	47,392	47,180	48,975	48,913	48,610	47,718	36,535
148	A236	23,037	22,929	22,790	23,251	23,118	22,700	23,785
Total		151,510	150,952	150,123	150,631	101,038	98,099	118,438
Croydon % change on previous year			0	-1	0			
Kingston % change on previous year			-2	-1	-2	0	-1	2

Note

- Figures in red are AADF's based on actual surveys.
- Figures in grey have not been included in the total as AADF adjustment factors would have not taken into account the effect of road space reallocation.

From the data available it is not possible to determine what percentage of traffic reduction was due to 'road space reallocation'. Only count site 72 is positioned at a location where road space was reallocated. Unfortunately, as surveys were only conducted in 1996 and 2000, the AADF figures for 1998 and 1999 will not reflect 'actual' traffic flows as the factors used to growth up earlier counts would not have been adjusted to take into account the effect of 'road space reallocation'.

Counter site 72 shows a 25% reduction in traffic levels between 1996 and 2000. However, southbound traffic (except buses) can no longer turn off Wellesley Road into the eastern section of George Street to access East Croydon Station and beyond. Instead vehicles travelling to the east of Croydon Town Centre are likely to use St James's Road and bypass Wellesley

Road or continue southbound along Wellesley Road until reaching Barclay Road.

To establish the maximum number of private vehicles that have been removed from the road network it is assumed that those car drivers who accompanied the 3% of car passengers that transferred to Tramlink no longer make the trip. The impact of the 3% of car passengers and 16% of car drivers that transferred to Tramlink, indicates a maximum of 7,028 vehicles a day or 2,565,350 vehicles a year have been removed from the road network.

It has been assumed that the majority of these trips would have had central Croydon as their origin or destination since Tramlink is focused on central Croydon. However, traffic into central Croydon has fallen by 19,667 vehicles per day from 1999 to 2000, compared to the maximum estimated drop of 7,028 vehicles per day, which would have been attributed to former car users switching to Tramlink. The majority of the recorded fall in traffic levels is due to site 60. No alternative reason can be established for such a significant drop in traffic at this location, as traffic management alterations have not reduced the range of destinations available from this road.

If site 60 is removed from the analysis the number of vehicles falls by 4% (3,028) from 79,901 in 1999 to 76,873 in 2000. The overall fall in private vehicle usage is supported by a fall in car park entries.

Further information on mode shift and forecast mode shift is set out in the following section.

4.1.07 Accessibility

Between 1995 and after the opening of Tramlink in 2000, New Addington to Canary Wharf experienced the greatest single reduction in journey time at 28 minutes. In general trips whose destination was Beckenham Station or Canary Wharf benefited the greatest from a reduction in general travel time. However, the data includes travel time savings that were generated not just by Tramlink but by other major transport infrastructure projects such as the Jubilee Line Extension.

Table 4.6 shows how travel times have changed 'before' and 'after' the opening of Tramlink in 2000. These represent changes in travel time that are solely due to the impact of Tramlink. The greatest single travel time reduction is 25 minutes between Forest Dale and Beckenham Junction. In general all trips ending at Beckenham Junction and all trips originating from New Addington benefited from the greatest travel time reductions.

Table 4.6 Difference in accessibility (mins) in 2000 between 'before' and 'after' Tramlink.

Sector	Bank	Beckenham Station	Canary Wharf	East Croydon	Piccadilly Circus	Purley Way	Wm'don Station
Addington Hill	-8	-19	-8	-8	-8	-4	-8
Addiscombe	0	-19	0	0	0	-1	0
Beckenham	0	-2	0	-11	0	-10	-3
Central Croydon	0	-20	0	0	0	-1	-1
Elmers End	0	-5	0	-7	0	-7	-5
Forest Dale	-12	-25	-12	-12	-13	-10	-12
Merton	0	-4	0	-7	-1	-7	-5
Mitcham	0	-6	0	0	0	0	0
Morden	0	-10	0	0	0	-1	-5
New Addington	-16	-13	-15	-22	-16	-23	-23
Shirley	0	-6	0	-1	0	-3	-1
South Northwood	-1	-18	0	-1	-1	-2	-1
Thornton Heath	0	-8	0	0	0	0	-1
Waddon	0	-13	0	-1	-1	0	-11
Wimbledon Town Centre	0	-5	0	-2	-1	-23	0

4.1.1 Comparison of Mode Shift

The original Transport and Economic Case forecast that users would be generated from the following sources;

- Former bus users;
- Former rail users;
- Former car users;
- Trips created by new developments;
- Trips generated by Tramlink.

The Transport Study Working Paper includes a detailed comparison of forecast trips against actual trips for the above segments. This analysis is based upon:

- Patronage counts conducted after an operational period of 16mths
- The original estimate that Tramlink would have attracted 56% of its total predicted patronage at the period when the patronage counts were conducted.

The findings can be summarised as:

- an estimated 17.3m trips took place on Tramlink compared to a predicted ridership of 15.6m trips in the base case ;

- for the am peak period (07:00 to 10:00) 12000 trips were forecast compared with an estimated 13,806 trips from the patronage surveys;
- the percentage of car trips predicted to transfer to Tramlink was half of that measured by the Users Survey; in contrast the number of former rail users was over estimated by nearly three times, while the number of former bus users was higher than predicted, 73% compared to 60%. The over estimation of rail users can be explained as all journeys which involve a rail journey and a bus journey (as a feeder mode) were classified as 'rail' in the model;
- the base case predicted that 15.3% (2,384,413) of Tramlink's patronage would be generated by new developments and the system itself, whereas the Users Survey estimated a higher proportion of trips on Tramlink were 'new' at 22% (3,808,049 trips);
- the base case predicted boardings to be split relatively evenly between the New Addington (35%), Beckenham Junction (33%) and Wimbledon branches (32%); the patronage surveys show that the Wimbledon branch accounts for 40% of all trips, with roughly equal amounts on the other two branches;
- the number of passenger kilometres on the system (85.5m) was 6.9m higher than originally predicted in the base case (78.6m). Journeys totalling 27.2m, 21.2m and 19.6m passenger kilometres started on the Wimbledon, Beckenham and New Addington branch respectively;

In summary, the base case appears to have been a reasonable prediction in aggregate, provided that the 56% figure for build-up is accepted. However, peak period patronage is underestimated by 15%, and the transfers from previous modes indicate that bus and car transfers were underestimated, whereas transfers from rail were overestimated. The Wimbledon branch carries significantly more passengers than forecast, and a much greater proportion than forecast are former bus users.

TCL considered that 73% of the total number of users would have been attracted to Tramlink by the end of its first year of operation. This figure is significantly higher than that predicted by London Transport in the original case prepared for the Department of Transport. It was also later considered that London Transport's build-up rates were too low based on experience gained from other light rail systems. If this opinion is correct then it is likely that Tramlink will not achieve its target of 28 million passengers per year.

However, if the build up rate used by London Transport in the base case to the Department of Transport is correct then the predicted 'end state' of 28 million trips per year on Tramlink may also be correct.

It must be concluded that it is too early in Tramlink's operational life to determine which build up rate is correct and hence what the 'end state' patronage figure will be. It is recommended that a comparison of patronage build-up rates is performed once data from TCL and TfL's

Revenue Agreements' surveys is available for the period two years after the opening of Tramlink.

4.1.2 Travel Behaviour

There appears to be an increase in usage compared with that anticipated in the Pre-Opening study. The majority of trips now made by Tramlink were previously made by car or bus.

Of the 2534 respondents who were captured on the system, a high proportion of users sampled 1868 (74%), made the journey specified prior to the introduction of Tramlink, indicating a modal shift on the introduction of Tramlink. A total of 523 (21%) respondents did not make this journey previously, 101 of whom giving the reason that the journey was too difficult without Tramlink or that they could not have easily got to their destination previously (5% non response).

This illustrates that the introduction of Tramlink has attracted both trips that were previously made (modal shift), and those that were not undertaken without Tramlink in operation (trip generation or re-distribution). As indicated, a total of 523 were trips not made previously providing an insight into the level of trip generation. To provide a context to this it is important to note that for 86 of these trips, the reason given for the previous non-completion of this journey was that they have since moved house. In addition, a further 158 respondents indicated that their journey was not made before the opening of Tramlink due to a change of job.

Table 4.7 illustrates the main modes previously used (% of respondents drawn from the User Survey Data – Working Paper 6, trips transferred calculated in Transport Study Working Paper).

Table 4.7: Modes previously used by current Tramlink passengers		
Mode	% of respondents	Trips transferred
Bus	69	9,316,271
Car as driver	16	2,160,295
Car as passenger	3	405,055
National Rail	7	945,129
Walk	4	540,074
Other	1	135,018
Taxi	100%	13,501,842

Of the 3124 respondents in the 2000 sample (Household Interview Survey – Working Paper 2), 22.7% indicated Tramlink as their main mode. This is a total of 710 respondents whose main mode is now Tramlink.

Of these 710:

- 77.3% previously used bus as their main mode;
- 17.5% previously used car as their main mode.

Data for mode switch from car to Tramlink correlates closely with output from the Users Survey. However, Tramlink has primarily attracted those journeys previously completed by bus.

A review of the User Survey was undertaken to establish the previous mode used according to those access and egress stops for which respondents indicated their origin or destination as home. The analysis is separated into those who indicated their origin as home and those that indicated their destination as home.

A total of 679 respondents indicated their origin as home and indicated their previous mode used for their Tramlink trip. As previously indicated Tramlink has primarily attracted trips previously completed by bus (average 67%). However, the proportions switching from bus vary by Tramlink stop as shown below:

- Birbeck Road (78%);
- Therapia Lane (78%);
- Waddon Marsh (85%);
- Wandle Park (84%);
- Wellesley Road (88%); and
- West Croydon (87%).

A total of 197 respondents indicated their destination as home and indicated their previous mode used for their Tramlink trip. When examined according to stop, the numbers were too low to provide a meaningful analysis. However, a review of the data would indicate that if examined in conjunction with the above data where home was the origin, there would be no overall change to the trends that the above analysis suggests.

A comparison of new and repeat respondents shows similar trends, giving consistent evidence of modal switch occurring from both the car and the bus to Tramlink.

Respondents were asked whether they were using Tramlink more than they had previously expected. These responses were then analysed according to reasons for use of Tramlink. A total of 964 respondents indicated that they were using Tramlink more than they had expected:-

- 756 – 'more than expected'; and
- 208 – 'much more than expected'.

For these respondents the main reasons for their level of use of Tramlink were as follows:

- Comfortable (39.2%);
- Frequent (28.4%); and
- Reliable (10.1%).

An examination of those who indicated that they were using Tramlink 'much less' or 'less' than they had expected revealed the following main reasons:

- Stops too far from origin/destination; and
- I prefer the mode I use.

A review of respondents according to use made of Tramlink compared to expected levels demonstrated that those indicating a higher than expected level of usage contained a higher proportion of elderly people. Of those indicating that they were using Tramlink more than expected, 21% were in the 65+ age category, representing the single highest group of respondents in terms of age category.

A review of the age distribution according to current main mode used by respondents illustrated that the 65+ age group was the main age category for both bus and Tramlink users. However, this did not extend to the car, where the age group of 35-44 was the main age group. Furthermore, there were a higher proportion of Tramlink users in the 16-19 category compared to the proportion of car users, reflective of the driving licence regulations.

The distribution of the Tramlink user population by age group was broadly similar to that of the overall population. However, there was a slightly lower proportion of Tramlink Users in the 16-19 and 20-24 age groups in comparison to the overall population. Furthermore, there are a higher proportion of 45-59 year olds in the Tramlink User population compared to the overall population. These trends were apparent across both genders.

4.1.3 Access Mode and Catchment Area

Fifty-seven percent of respondents accessed Tramlink on foot.

The catchment area of Tramlink is based upon walking distance from stops. However, at East Croydon and Wimbledon the presence of National Rail termini mean that a high proportion of respondents access Tramlink by train. At Addington Village, 78% access the stop by bus suggesting a good bus feeder link to Tramlink.

The three stops which show the highest proportion of passengers accessing Tramlink via bus are all situated on the eastern end of Tramlink Route 3, between Croydon and New Addington. This suggests that there is an effective interchange in operation between Tramlink and feeder bus services at these stops.

4.1.4 Travel Patterns

Table 4.8 illustrates some of the origin areas specified by users of Tramlink. This was on the basis of self-completion questionnaires, hence the responses given included 'Croydon', 'New Addington', 'Mitcham' etc.

Table 4.8: Origin locations of Tramlink Passengers

Origin	Number of respondents	% of respondents
Croydon	263	19.4
New Addington	162	12.0
Mitcham	64	4.7
Beckenham	59	4.4
East Croydon	58	4.3
Wimbledon	56	4.1
West Croydon	52	3.8
Total Responses	1354	

The origin areas indicated by respondents can be categorised as follows:

- areas near the route termini of the three radiating arms of Tramlink network;
- areas close to the central nodes of East and West Croydon; and
- areas near those stops that have a national rail or underground terminus attached.

The key trip purposes identified were commuter-based and shopping trips.

4.1.5 Demographic Differences

Data for the 35-44 age group, indicates that the use of Tramlink in comparison to the car was not as high as had been outlined in the Pre-Opening study.

Across all ages, bus users indicate that the comfort, reliability and safety of Tramlink, compared to the bus, is greater than that indicated in the Pre-Opening study, suggesting Tramlink is performing better than expected.

Analysis of the change in attitude of bus users according to gender revealed that the direction of change in attitude was largely independent of gender. However, female respondents awarded lower scores on the Post-Opening study for personal space than what had been anticipated in comparison to the bus.

4.1.6 Car Availability

Data from the Users Survey shows that, of the 1868 Tramlink passengers who did make the surveyed trip before Tramlink by an alternative mode, 55% had a car available to them for the trip recorded in this survey and 86% could have used an alternative mode for the trip.

4.1.7 Trip Purposes

Of the single leg journeys that were completed in the am peak (138), 67% were commuter-based trips. The other main purposes were 'going to school/college' and 'shopping'. Similarly, of the 72 trips completed in the pm peak, 29% were passengers returning home from work. The majority of single trips were completed in the 'inter-peak' period and most of these were shopping related, with 29% of the 185 'inter-peak' period journeys originating or terminating at the shops. A further 39 trips were work related single trips. (Users Survey - Working Paper 6).

Of those two leg trips in the am peak, 401 respondents (83%) indicated that this was a work-related trip. Furthermore, 81% of these respondents (326) indicated that they would make the return journey in the pm peak.

Of those 326 work related return trips, 241 represented a journey that was made by an alternative mode prior to the opening of Tramlink, illustrating how its introduction has captured a number of dedicated commuter based trips.

There were 270 'outward' trips completed in the 'inter-peak' period. Over half of these (137) were shopping related, illustrating a change in trip purpose dependent on time of day. Seventy-four percent of these (of the 137) respondents indicated that they would make the return trip within the inter-peak time period. Of these 137 respondents, 73% made this journey previously by an alternative mode. As with the commuter trips identified above, the key reasons for the switch in mode were the reliability of the service and the speed of the journey (Users Survey - Working Paper 6).

4.1.8 Group Sizes

A review was undertaken of the modes people used and the associated number of accompanying passengers. This enabled analysis to be completed to ascertain if Tramlink, in comparison to other modes, attracted more 'group' or 'individual' travel.

Table 4.9 overleaf provides a summary of the results. For the purposes of this analysis the number of accompanying passengers were categorised into the following sets:

- Zero accompanying passengers;
- 1-3 accompanying passengers;

- 4-6 accompanying passengers; and
- 6+ accompanying passengers.

Table 4.9: Summary of Accompanying Passengers according to Mode

Numbers Accompanying	0		1-3		4-6		6+		Total
Mode	Count	%	Count	%	Count	%	Count	%	
Car	1323	67.7	596	30.5	31	1.6	3	0.2	1953
Car as Passenger	57	16.1	264	74.8	29	8.2	3	0.8	353
Walk	548	75.0	167	22.8	12	1.6	4	0.5	731
Bus	614	82.7	109	14.7	16	2.2	3	0.4	742
Train	278	89.4	22	7.1	11	3.5	0	0	311
Combined	521	79.3	119	18.1	15	2.3	2	0.5	657
Tramlink	593	70.5	206	24.5	38	4.5	4	0.5	841

As expected the majority of travel undertaken was that completed by single occupancy. Over 80% of trips undertaken by bus and train were completed by those travelling alone. The majority of trips (70.5%) completed on Tramlink were undertaken by those travelling alone.

However, there were a higher proportion of trips, compared to those undertaken by bus and train, completed by people travelling together. Furthermore, the table illustrates that Tramlink attracts a higher level of group travel than all modes except car and 'car as a passenger'. Approximately 25% of trips completed by Tramlink were undertaken by groups of 1-3 people travelling together.

4.2 PERCEPTIONS

4.2.1 Increase in positive perceptions

The HIS Working Paper includes a detailed comparison of attitudes for repeat respondents across the Pre and Post-Opening studies.

All age groups demonstrate improved perceptions of Tramlink when comparing attitude statements for the two studies (Pre-Opening and Post-Opening). Whilst perceptions have improved across all age groups and genders there are some differences in the scale of change. Respondents over the age of sixty use Tramlink more, and hold more positive views of Tramlink, than anticipated.

The most frequently cited reason for switching to Tramlink from each of the alternative modes was that the service is perceived as being faster than the mode used previously. The other primary reasons cited were that Tramlink is more reliable and more comfortable and, in the case of those who previously made the trip by car, respondents in all areas except Morden and Woodside indicated that Tramlink is not as expensive, compared to the car, as had been previously anticipated (HIS data - Working Paper 2).

A marketing and promotional campaign based on these key attributes (faster, more reliable, cheaper than expected) would perhaps prove to further enhance Tramlink's patronage.

There is evidence that some initial 'poor' perceptions of Tramlink were due to a lack of understanding or awareness. Verbatim evidence for this is to be found in the Agents of Change interviews (Working Paper 4). The surveys identified positive changes in perceptions towards Tramlink between the Pre- and Post- Opening surveys. These include the following:

- comments about 'gridlock' caused by broken down trams no longer prevalent;
- no spontaneous mention of accidents;
- press reports more positive for both Tramlink and Croydon;
- car journey times are reported to have decreased; and
- respondents commenting that 'Tramlink junctions work well' but that there is still congestion if approaching Croydon from the South.

For the following statements there has been a movement from marginal disagreement to a degree of agreement:

- Croydon Tramlink will/has reduced local traffic congestion;
- Croydon Tramlink has/will make travelling locally easier for me personally;
- Croydon Tramlink will/has encouraged me to travel to Croydon more often; and
- I plan to/use Croydon Tramlink more than the bus.

In almost all other regards, whilst there was not a shift from one viewpoint to another, there was overall, a move to a more positive view of Tramlink.

A review of the change in attitudes according to age category and gender was completed and these results are described in detail in the HIS Working Paper. The level of agreement for respondents over the age of sixty has improved for all statements, suggesting that they use Tramlink more, and hold more positive views of Tramlink than anticipated.

A review was undertaken of those Tramlink users who previously used the car. A series of attitude statements were used to enable comparisons to be made between Tramlink and other modes. In comparison with car, perceptions are that Tramlink performs better by being (in order of level of agreement for the statement in quotes):

- "is more environmentally friendly than" the car;
- "is faster than" the car;
- "is easier to get in and out of than" the car; and

Of these, 75% (535) had switched from the bus and 121 had switched from the car.

The attitudes of respondents who have switched to Tramlink are, as expected, more favourable towards Tramlink than those continuing as bus and car users. Those respondents who previously used the car indicated a high level of agreement with the statement that Tramlink is faster than the car. Compared to those who have switched from the bus to Tramlink, existing bus users have a higher level of agreement with the statement that Tramlink is more expensive than the bus. This suggests that non-Tramlink users perceive Tramlink to be more expensive than it is.

In terms of the importance attached to different service attributes, the attributes of 'Personal Safety' and 'Reliability' were viewed as the most important and this was reflected across both surveys.

Further details of respondent attitudes and a review of the importance attached to different service attributes are contained within the Household Interview Survey Report.

4.3 IMPORTANCE OF TRAMLINK ATTRIBUTES

Table 4.10 illustrates that the reasons for switching modes to Tramlink are primarily that it is perceived to be faster, more reliable and more comfortable than modes previously used.

Table 4.10: Reasons for switching to Tramlink

Reason	Number of Respondents
Faster	1382
More reliable	984
More comfortable	789
Needs less walking	415
Other	404
Cheaper	265
Fewer changes	217

Totals are more than sample due to multiple response format.

The proportional split between the reasons given was similar regardless of previous mode used except for those who had previously used the car. They indicated in a greater number that using Tramlink made their journey cheaper than before.

Table 4.11 shows that all the attributes have a high level of importance, all scoring over seven. Personal safety remains the most important factor for respondents when travelling, the score for which has slightly increased. This is followed by reliability, also showing an increase in importance between the two periods. Respondents in the First Post-Opening study attached a higher level of importance to transport being fast compared to the Pre-Opening study.

Contrastingly, there has been a decrease in importance attached to the attribute of non-polluting transport (Table 4.11).

Table 4.11: Importance of Service Attributes – all respondents

Statements: How important is it that transport is...	Mean Score – Pre-Opening study	Ranking – Pre-Opening study	Mean Score – First Post-Opening study	Ranking – First Post-Opening study
Comfortable	7.55	6	7.49	6
Reliable	8.23	2	8.27	2
Fast	7.32	9	7.36	7
Cheap	7.47	7	7.33	8
Personally safe	8.38	1	8.43	1
Non polluting	8.00	3	7.58	5
Clean	7.89	4	7.69	3
Easy to get on and off	7.64	5	7.68	4
Not crowded	7.39	8	7.29	9
Base	3082		3124	

Analysis was completed to ascertain the extent to which differences between the 759 repeat respondents, between the two stages, were significant. This analysis was undertaken by comparing the mean scores using a one-way ANOVA.

This analysis revealed that the differences between the means for the majority of attitudinal statements were significant. The results are summarized below:

99.9% Confidence Interval

- (j) Use more than bus ($F=42.46$, $P<0.001$)
- (b) Eased local travel for me ($F=90.54$, $P<0.001$)
- (g) Encouraged travel to Beckenham ($F=19.36$, $P<0.001$)
- (f) Encouraged travel to New Addington ($F=48.60$, $P<0.001$)

99% Confidence Interval

- (a) Congestion reduction ($F=8.25$, $P<0.01$)

95% Confidence Interval

- (e) Encouraged travel to Wimbledon ($F=6.34$, $P<0.05$)

This demonstrates that the changes in attitude towards the above statements are significant to at least the 95% confidence interval. For four of the statements the differences between the two periods are significant to the 99.9% confidence interval.

4.4 PERCEIVED BUSINESS EFFECTS

The effects reported on the business community are at a qualitative level as much of the information is anecdotal. Respondents report the following:

- some town centre retailers report increase in trade
- one supermarket reports increase in:
 - numbers of shoppers;
 - number of purchases; and

-more upmarket purchases.

This was described as:-

'...a shift from a basket full of economy products, to a trolley full of branded ranges'

Overall the perceptions of Tramlink in general have improved and there is evidence of benefits experienced by some in the retail sector.

4.5 STATED PREFERENCE AND MODELLING IMPLICATIONS

The SP analysis undertaken in the Pre-Opening survey demonstrated the following key points with respect to modal preference for Tramlink:

- the modal constant contained in the mode choice model is strongly influenced by the specification of the model form and level of market segmentation;
- this implies that the modal constant per se cannot be taken as a proxy for modal preference unless the model is properly specified and the relevant attributes included in the model;
- explicit definition of service quality variables and mode specific parameters explains the majority of the choice process; and
- 'true' modal preference for Tramlink, beyond the definable variables, is likely to be small and relate to wider issues, such as confidence in making long term travel decisions because of the system permanence.

So if the quality type variables are explicitly taken into account, the residue modal preference is small.

A comparison of the actual choices made by respondents to the stated preference exercise indicates that the stated preference model is capable of predicting actual choices at the disaggregate level, with over 80% of choices correctly predicted.

APPENDIX A - TRAMLINK MAP

Croydon Tramlink route

