Iarnród Éireann

A Strategic Review of the Cork Suburban Rail Network

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1. Introduction

1.1 Ove Arup and Partners were appointed in March 2000 by Iarnrod Eireann (IE) to undertake a review of the Cork Suburban Rail Network. Whilst this was essentially a 'desk top' study, it involved consultation with Cork Corporation and Cork County Council, and site visits to identify potential rail infrastructure improvements and new station locations. We are indebted to IE who provided valuable information, plans, data and analysis for this review.

1.2 Based on the Brief and Background Information supplied by IE, the following key tasks were agreed:

- a review of previous studies of the Cork Suburban Rail Network;
- an assessment of potential new station sites including preliminary patronage and revenue forecasts;
- a qualitative assessment of the wider benefits of the proposals;
- identification of rail infrastructure improvements and the potential for reintroducing passenger services to Midleton and Youghal;
- a review of possible park and ride facilities;
- consideration of possible service enhancements;
- a review of planning policies in the Cork region using available data;
- recommendation for land use zoning to maximise opportunities for rail;
- provision of indicative capital costs for any improvements;
- ranking of possible improvements to recommend a preliminary programme of investment;
- identification of the scale of any incremental operating costs;
- a review of the impact of the proposals on line capacity and on operations at Cork Station.

1.3 The remainder of this report is set out as follows: The next section outlines the current passenger and operating characteristics of the Cork Suburban Rail network; Section 3 covers planning and development proposals; Section 4 reviews work undertaken to date on proposed improvements to rail; Sections 5 and 6 set out and assess a number of options; finally Section 7 draws some conclusions and sets out recommendations for scheme implementation.

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2. Existing Situation and Rail Network Analysis

Introduction

2.1 The existing local rail network consists of two routes originating from Kent Station, which is located to the east of the centre of Cork. The main line to Dublin serves Mallow, 21 miles (34km) to the north of the City; there are no intermediate stations on this route. The other serves Cobh, on the coast 11 miles (18km) to the South East and has 5 intermediate stations. There are about 14 trains per day (tpd) weekday passenger service in each direction between Cork and Mallow, offering a journey time of between 24 and 27 minutes. There is a 19 tpd passenger service between Cork and Cobh, offering a journey time of 24 minutes.

2.2 The Mallow service is operated using a mixture of Inter City and local trains. Of the 14tpd, 8tpd continue to Dublin. There are some additional services on Fridays. The route has benefited from investment in recent years, in the form of track upgrading through EU Structural and Cohesion Funds.

2.3 The Cobh line is operated exclusively as a local / suburban service, using a modern diesel railcar. There has been little investment in infrastructure on the route over recent years, although stations at Little Island and Glounthaune have been upgraded.

Infrastructure

2.4 Both the Cork – Cobh and Cork to Mallow routes are double track railways. The line to Tralee, which joins the Mallow to Cork section at Killarney Junction is single track. Tralee trains use the Up Dublin mainline in both directions for several hundred metres across the Blackwater Viaduct. This is not considered to be an operating constraint at current levels of utilisation. The single track railway alignment between Glounthaune and Midleton and Youghal remains intact.

2.5 There are 3 platforms at Mallow Station. Platforms 1 and 2 are used for through trains; Platform 3 provides a loop on the up side and is used by terminating services and for some Tralee trains. Any major increase in the number of terminating trains, such as the introduction of regular hourly 'suburban' services from Cork, may cause some platform capacity problems at Mallow Station. This should be examined in more detail at a later stage.

2.6 Cobh Station has two tracks, but only a single platform. There is a headshunt facility and crossover which allows the reversal of a loco hauled train. It is not possible to reverse a loco hauled train while storing a second train at the station. However, since almost all services are now operated by DMUs, only the crossover is required to reverse trains. However, it is not possible to reverse two trains at Cobh independently.

2.7 On the Cork-Cobh route all platforms are capable of accommodating 4 piece diesel railcar trains and IE aspirations are for 4 piece railcars. No requirements are envisaged beyond this. From analysis undertaken for the Dublin Suburban Rail Strategic Review, the following platform lengths are required for different train lengths:

- 2 piece trains – 45 metres;
- 4 piece trains – 90 metres;
- 6 piece trains – 132 metres;
- 8 piece trains – 174 metres;

· 10 piece trains – 220 metres.

Table 2.1 Linespeeds between Kent and Mallow

Speed	Section
15 mph	through Kent Station and Yard
30 mph	for the following $^{7}/_{8}$ of a mile
70 mph	for 1¾ miles
90 mph	for 8¼ miles
70 mph	for 3 miles
90 mph	for 5½ miles
80 mph	through Mallow Station

2.8 The linespeeds between Kent and Mallow are shown in Table 2.1. The general linespeed on the Cobh route is 50mph between Cork and Cobh for Class 2600 / 2700 railcars; for other traffic the linespeed is 40 mph. The signalling on the Mallow line has been extensively modernised with a minimum signalled headway of 8 to 10 minutes. The signalling situation on the Cork-Cobh line is that there are colour light signals approaching Kent Station to the Signal Cabin and at Littleisland and North Esk; there are semaphore signals at Kent Station Platforms 1,2,3, and elsewhere on the line.

Existing Patronage Levels

2.9 Existing patronage levels and trends over recent years were investigated using data supplied by IE. These data included:

· rail census data from November 1999;

· Crouzet and Almex ticket machine return data;

· Annual time series analysis and data for Cork-Cobh from 1996 to date and for Dublin-Cork from 1995 to date.

2.10 The 1999 annual patronage for Cork-Cobh, Cork-Mallow and Cork-Dublin are summarised in Table 2.2.

Table 2.2 1999 Annual Patronage (trips)

	Annual trips
Cork-Cobh	493,071 [1]
Cork-Mallow	207,237 [2]
Cork-Dublin	671,377 [1]
Total	1,371,685

Notes: [1] From time series data, [2] from ticket machine returns

2.11 Consideration of historic data on each of the above lines, indicates that patronage has grown steadily on all lines in recent years. Patronage on the Cork-Cobh route increased by some 25% between 1996 and 1999 whilst patronage on the terminal points of the Cork-Dublin route (i.e. Heuston and Kent Station) increased by around 50%. Patronage on the Cork-Mallow route also increased, from 173,400 in 1997 to 207,000 in 1999, an increase of 19%.

Existing Rolling Stock

2.12 For Cork-Cobh the rolling stock is a 2-piece diesel railcar, which is deemed adequate to carry peak demand. There are about 129 seats, and standing room for about 184, giving a total capacity of 313. There is one loco hauled Cravens set on the 08.15 ex-Cobh which is made up of 3 carriages and a van; each carriage has 64 seats.

2.13 All Mallow-Cork trains are loco hauled; the rolling stock is a mixture of MkII, MkIII and Cravens. Mark III coaches are normally used Mondays to Thursdays, and for most Friday services. These are intercity services, which are supplemented by Mark II stock on Fridays. Mark III trains comprise 7 carriages, a dining car and a generating van. They can carry up to 500 passengers; Mark II trains comprise up to 10 cars, and can accommodate up to 600 passengers; Cravens are used on the Cork-Mallow route 7 days a week, and comprise 3 carriages and a generating van. Mallow Station and the through platforms at Kent Station can accommodate full length trains. IE aspirations are for Railcars on Mallow-Cork.

Timetable and Capacity Analysis

2.14 In order to assess capacity utilisation on the existing network, relevant sections of the current working timetables were analysed for passenger and freight and compared to estimates of line capacities.

2.15 There is potential for conflicting train movements at Killarney Junction where trains to / from Tralee join the mainline between Mallow and Cork. Down trains towards Tralee must use the up line from Cork. There is a similar flat junction a short distance to the south for trains using the sugar beet refinery which is located to the west of the Mallow – Cork line. While the majority of freight trains on the Mallow – Cork line are through trains serving the coast, there are up to six trains per day serving the beet factory, although it should be noted that this is for only 3 months a year (October to December).

Mallow - Cork

2.16 Passenger and freight services use the Mallow - Cork line sections are outlined in Tables 2.3 and 2.4:

Table 2.3 Passenger services using line section between Cork and Mallow

Service	**Trains per Day (Up)**	**Trains per Day (Down)**
Dublin – Cork	8 M – F, 9 Sa	8 M; 7 Tu – Th, 9 F & Sa
Mallow – Cork	2 M – Th, 4 F, 3 Sa	1 M – Th & Sa, 2 F
Tralee – Cork	2 M – Sa	2 M – Th & Sa, 3 F
Dublin – Tralee	2 M – Sa	2 M – Th & Sa, 4 F

Table 2.4 Freight services using line section between Cork and Mallow

Freight Service	**Up**	**Down**
Waterford – Mallow Refinery: beet[(1)]	5	6
North Wall – North Esk: liner	2	3
Shelton Abbey – Marino: ammonia	3	3
Heuston – Cork: fertiliser	1 (& 1 liner)	1
Heuston / North Wall – North Esk: fertiliser	1	1
North Wall / Limerick / Mallow – Cork: cement	1	2
Waterford – Mallow: timber	2	1

Note[(1)] October to December only

2.17 Several empty passenger train movements are made from Dublin, Tralee or Mallow to Cork: 1 Mondays only, 3 Fridays only, 1 Saturday only, 1 Fridays excepted (i.e. Monday-Thursday and Saturday). Empty passenger train movements made from Cork to Dublin, Tralee or Mallow are: 1 Mondays only, 1 (Mondays-Saturdays), 2 (Tuesdays-Saturdays), 2 Saturdays only. There is one light engineering train operated between Mallow and Cork, Mondays to Fridays, and one between Cork and Mallow, Tuesdays to Saturdays.

2.18 The combination of long distance and local passenger trains provides 14 tpd (Mondays to Thursdays), 15 tpd (Fridays) and 16 tpd Saturdays from Cork to Mallow, although this is not a regular service. There are gaps of 2.5 hours in the service after 11.30 hr and of almost 2 hours after 17.53hrs.

2.19 Existing passenger services have slightly variable run times, although there are no stations between Cork and Mallow. Most services operated by Mk 2 and 3 stock have scheduled run times of 24 or 25 minutes, most services operated by Cravens stock have scheduled run times of 26 or 27 minutes.

2.20 Should new stations be opened between Cork and Mallow, and/or an enhanced service introduced, there will be less spare line capacity. If long distance trains continued to operate non-stop between Cork and Mallow, while a more regular stopping service was introduced, a larger differential run time between local and express trains would be introduced; this would reduce the number of available 'standard' train paths. Nevertheless, this remains unlikely to be a serious constraint since the addition of two new stations would increase the run time of local trains by only approximately 4 minutes. Also new rolling stock with improved performance could improve upon existing run times, and there may be opportunities to increase line speeds.

2.21 The section of up line between Mallow and Killarney Junction is the busiest, since this includes all up Cork trains, all Tralee trains, and beet trains to the Mallow Sugar Beet plant. On a typical weekday, eg a Tuesday, there are up to 33 train movements using this section down from Mallow (towards Cork) and up to 34 train movements up to Mallow. Fridays are the busiest days down from Mallow, with 38 train movements; Saturdays are the busiest days up to Mallow with 35 movements. The busiest times from Mallow from 1645 on Fridays, with 4 train movements within 20 minutes and after 19.00 on Fridays with 4 train movements within 31 minutes. At other times there are generally substantial intervals between trains. The busiest times up to Mallow are after 08.50 am with 4 (passenger) trains within 46 minutes; generally there are substantial intervals between trains. Platform capacity at Kent Station is the main constraint on the frequency of passenger trains on this route because Dublin trains stand at the platforms for long periods.

Cork - Cobh

2.22 On the Cork to Cobh line, there are 19 passenger trains between Cork and Cobh, which all serve the five intermediate stations of Little Island, Glounthaune, Fota, Carrigaloe and Rushbrooke. This provides a regular hourly service, with an extra morning train between 0700 and 0800. These are regular hourly services, with an extra morning peak up service between 0800 and 0900.

2.23 The busiest section of line is between Cork and the North Esk terminal (29tpd down). Consideration of the reopening of the Cork to Midleton / Youghal line for passenger services should take account of line capacity between Cork and Glounthaune (which is situated between Little Island and Fota), where the Youghal branch joins the Cobh line.

2.24 Existing passenger services have a regular headway and have a standard stopping pattern. Freight train paths are largely grouped in the early mornings and late evenings. This pattern of operations represents an efficient use of available train paths, although capacity is far from fully utilised on this route in any case.

2.25 An increase in the use of freight on the line could have some operational consequences since arrivals at the Tivoli and North Esk terminals must cross the Cobh – Cork line using a flat junction. This might become more of an issue were Midleton / Youghal services to be reintroduced, or if passenger service frequencies to / from Cobh were to be increased. Also, trains departing the fertiliser / ammonia terminal at Marino Point have to cross the Cork to Cobh line at a flat junction. This, however, lies to the south of Glounthaune, so would not directly affect the operation of any Midleton / Youghal services. A summary of existing freight/engineering trains on Cork/Cobh is given in Table 2.5.

Table 2.5 Freight and engineering trains using the Cork – Cobh line section (M-F)

Freight Service	**Up**	**Down**
North Wall – North Esk: liner	3	3
Shelton Abbey – Marino: ammonia	3	3
Heuston / North Wall – North Esk: fertiliser	-	1
Cork – Marino/North Esk: Light engineering	3	3
Total	9	10

Kent Station

2.26 The operational constraints at Kent Station merit separate analysis. There are 5 platforms; platforms 1, 2 and 3 are suburban bay platforms facing Cobh (and Youghal), whilst platforms 4 and 5 are mainline through platforms, used by trains originating and terminating at Cork, serving destinations to Mallow and beyond. There are no through passenger services.

2.27 Platforms 4 and 5 are bi–directional through platforms. These platforms provide insufficient capacity at certain times of day for these services, which necessitates the use of Platform 3. This causes operational problems since this is a bay platform facing the opposite direction. Northbound trains have to be propelled out of the platform before proceeding up the main line. IE do not consider this practice to be satisfactory and are seeking to eliminate it as part of an investment scheme at the station. The 17.10 service to Tralee and 10.35 Friday service to Mallow regularly use Platform 3 in this way, as well as a number of special services operated through the year. Furthermore, platform 3 can only accommodate a 9 piece Mark III set without a locomotive; northbound trains, however, require a locomotive at the buffer stop end, which means the south end of the train cannot be accommodated at the platform and passengers must walk along the train. This is inconvenient and prolongs the process of loading and unloading. Platform 2 is used by Cobh services, while platform 1 provides an additional facility.

2.28 IE states that there are two periods on weekdays when Kent Station faces congestion: between 14.00 and 15.00, particularly in the summer months, and between 17.00 and 18.00. In terms of passenger congestion, the evening peak is usually the more serious. Typically, 250 to 300 passengers arrive from Cobh on the 17.18 arrival at Platform 2, and a similar number are waiting to board for the return departure at 17.25. There are also large numbers of passengers waiting to board the 17.10 to Tralee from Platform 3, and the 17.30 to Dublin from Platform 5. In this period Platform 4 remains free for the 17.54 arrival from Dublin.

2.29 There are days on which a number of special trains are operated, in which case station congestion may be far more severe. We have obtained information from Tim Sheehan of IE, for the 6th June 1999 (the day of the "Munster Hurling Match"), which provides a good example of this. Over a period of 1½ hours between 1730 and 1900 all platforms were in heavy use and there was propelling from Platforms 1, 2 and 3. A gate had to be operated for some time during the period to prevent platform congestion. The concourse at Kent Station is understood to have a capacity of approximately 500 people at any time; however, over a 1½ hour period on this day, between 4000 and 5000 people passed through the station.

2.30 There is a severe curve on Platform 4 which requires heavy maintenance. It is extremely difficult to maintain slab track at this location; platform clearances are difficult to maintain, and it is understood that the IE Engineering Division would prefer ballast track on this curve with significant cant. The same problem does not exist on Platform 5. Furthermore, there is a significant gap between platform edge and train steps at Platform 4 which raises safety issues.

2.31 Anticipated and planned developments suggest that congestion at Kent Station is likely to increase. Rail patronage is expected to continue increasing with economic growth and various planning considerations suggest that rail use will increase further. There appears to be a good operational case for providing two additional through platforms and transferring the existing through platforms to a straighter track section to the east, thus providing safer and more convenient station facilities.

2.32 Several freight trains pass through Kent Station each day, including ammonia trains to and from Marino Point. A loop line just outside the south wall of the existing passenger station allows through freight trains to bypass the passenger platforms, where passenger trains are often standing for substantial periods. The loop line also provides access to a number of operational areas, which currently lie on the railway land to the south of the station area. These include a cement store and silo, which are in heavy use; fuel storage tanks, which supply local rail and bus operators; a repair shop for wagons, carriages and locomotive light maintenance; a large goods depot which is now closed, with the duties transferred to North Esk. To the north of the station area there is a carriage storage shed.

2.33 The development plans for the station involve the transfer of all the land to the south of the freight loop land to a private developer. The activities currently on this land would have to be transferred, either to the north side of the station area, or to other sites, such as North Esk. It is understood that the wagon repair shop would be transferred to the north side of the station. Currently the arrangements for delivering ammonia wagons for maintenance involve hauling the train back up the tunnel and uncoupling the locomotive in the tunnel. The procedure requires two locomotives. The transfer would allow a more straightforward process, thus providing considerable operational improvements.

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3. PLANNING AND DEVELOPMENT PROPOSALS

Introduction

3.1 The statutory basis for land use planning in the Cork area is provided by the Cork County Development Plan 1996 and the Cork Corporation Development Plan Review 1998, supplemented by a number of Urban District plans. These documents are based on the framework provided by the Cork Land Use Transportation Study LUTS Review, which was published in 1992. The LUTS Review provides population and employment projections for designated centres up until 2001.

3.2 Cork Corporation and Cork County Council have recently commissioned the Cork Strategic Plan 2000-2020, which will provide an up-dated framework for the county over the longer term. This is intended to form the basis for the full integration of land use, transportation, social and environmental polices and other relevant considerations.

3.3 The principal characteristics of development in the Cork area in recent years includes:

· overall growth of the Cork City and environs from 150,000 in 1981 to 180,000 in 1996;

· major residential development has occurred to the south of the city, with relatively limited development to the north and east, though these areas are now coming under increased development pressure;

· major development of industry around the harbour, at locations such as Ringaskiddy and Little Island, and in the southern suburbs.

3.4 Cork County Council has sought to balance the growth of the City and environs with the development of a set of Satellite Towns, including Ballincollig, Blarney-Tower, Glanmire-Riverstown, Carrigaline, Midleton and Carrigtwohill, together with a number of Ring Towns, located further out and with a high level of self sufficiency. The Ring Towns include Kinsale, Bandon, Macroom, Youghal and Mallow.

3.5 Former rail alignments still exist from the Cobh line to Midleton and Youghal. However, the alignments of the former rail lines to the south and west of the city have been compromised by development and, in any event, these lines were linked to the existing lines only by street track. The review of current and future development in the Cork area, given below, is thus largely concerned with the existing rail corridors and the Midleton -Youghal line. The settlement hierarchy is summarised in Table 3.1. The principal Development Plan policies are summarised in Table 3.2.

Table 3.1 Hierarchy of Settlements in County Cork

Town	Population 2001 (Est.)	Station Status
Cork City and Suburbs (Excl.Ballincollig and Glanmire)	160,000	Existing station: Major development planned with re-orientation of station to Horgan's Quay. Accessibility to and from Kent Station is a crucial component in the attraction of passengers to the expanded service.
Ballincollig	16,300	Not located on rail network
Cobh	10,000	Existing stations at Cobh and Rushbrook with more rudimentary stop at Carrigaloe; additional station planned for Ballynoe.
Carrigaline	10,000	Not located on rail network.
Mallow	9,500	Station on main line rail. Up to 20 trains per day serving town. Rationalisation of traffic flows and car parking planned.
Glanmire/Riverstown	8,500	Not directly located on rail line. Potential for a park and ride site associated with new station.
Midleton	7,500	Former station located 500 metres from main street. An alternative site also under consideration.
Youghal	7,000	Former station available for re-use.

Table 3.2 Development Plan Review

Centre	Authority	Status	Extracts from the development plan and variations
Cork City	Corporation.	City	In the LUTS Review the location of rail stations was seen as crucial. At the City end it was acknowledged that measures to bring commuters closer to the city centre would be important. (Suggestions included extension of the rail service to Brian Boru St. and the provision of a shuttle bus service). The re-orientation of Kent Station to Horgans Quay should help to facilitate more efficient access to and from the City Centre and thus attract additional rail users.
Mallow Line			
Mallow Urban	UDC	Ring town	Developers currently control the development of approximately 1200 housing units in Mallow. Works to resolve the road access difficulties at the City end and a more efficient and reliable transport system would act as a catalyst to accelerated house building in the town. Iarnrod Eireann plan to improve circulation and car parking at the existing station by providing additional parking for 300 cars on station lands to the north of the platform. A covered walkway linking the car park and the station is proposed. The Urban District Council is awaiting submission of a planning application.
Mallow Environs	CCC	Ring town	Substantial land holdings adjacent to the existing Urban District were included in the 1999 Material Variations document. Approximately, 150 acres of land were brought within the Development Boundary at Ballyviniter a large

Centre	Authority	Status	Extracts from the development plan and variations
			proportion of which may be suitable for residential or light industrial development.
Blarney/Tower	CCC	Satellite town	Blarney is considered as a highly scenic area with good potential to further expand its tourism base. The town has had difficulty in attracting additional industry and residential development due to access constraints. Tower has increased due to the expansion of residential zoned lands. In the 1999 variations a block of land was rezoned for industrial use on the eastern side of the town. An additional 37 acres was zoned for industrial use in the recent variations. Permission was recently granted on 70 acres of industrially zoned land (including the entire rezoned area) for site development works for a light industrial and warehouse park. Access to Council owned land will also be facilitated by the proposed development. Both industrial land holdings plus an adjacent site all have frontage onto the Mallow-Cork line.
Kilbarry		City suburbs	The IDA industrial estate (200acre) remains underused. Creating favourable conditions for this is seen as the overriding planning consideration in this area. On the North Side, the LUTS Review identified Kilbarry for some peripheral expansion. This with the further development of Blarney and Glanmire (satellites) was to assist in controlling pressure for one-off and inappropriate development. By 1998, over 300 units had been built just outside the Corporation area with additional land earmarked for residential development. It was proposed in the LUTS Review that the existing station be re-opened so as to give access to employment in East and North Cork. New commuters to this area could also be attracted in response to the additional industrial units recently provided at the North Point Business Centre and the West Link Business Park off the Mallow Road.
Cobh Line			
Glanmire / Riverstown	CCC	Satellite town	Forms part of the East Harbour Area and its main role is residential. There is a strong stimulus as Glanmire has good infrastructure and ample zoned development land. Rezoning at Dunkathel House has resulted in a current application for 345 houses, which should proceed as soon as planning permission is granted (S.00/0802). The town itself has developed very rapidly in the last four years with the vast majority of zoned residential land being either built or under construction. Based on current rates of development the town will be the fifth largest settlement in County Cork (excluding Cork City) by 2001with an estimated population of 8,500.
Cobh Urban	UDC	Satellite town	At least 600 residential units have been constructed in Cobh since 1996. Since 1998 the focus of development has been at the lands identified in the Action Area Plan for Rushbrook/Ballynoe. Provision of pedestrian linkages from new housing estates to a future station at Ballynoe forms an important component in pre-planning discussions for all residential developments in

Centre	Authority	Status	Extracts from the development plan and variations
			this area. Combined with other residential areas there are current commitments for 1700 additional housing units in Cobh. This constitutes a very substantial additional population further enlarging the potential commuter catchment.
Cobh Environs	CCC	Satellite town	Cobh's role within the East Harbour area is increasingly becoming a residential one. Land is available for small industries.
Rushbrooke/ Ballynoe		None	As a large block of residential zoned land in Cobh environs, an action area plan has been drafted by CCC with housing densities ranging from 1-11 units per acre.
Carrigaloe		None	
Glounthaune		None	Role is seen as one of limited low density residential growth. Substantial block were zoned in the 1996 plan for residential development. The village has some employment but nothing of great scale. Its main centres for employment are Little Island and the city.
Little Island	CCC	Satellite town	Has developed into a major industrial and commercial area. There are large land banks available to afford opportunities to develop a whole range of industrial/commercial activities from warehousing to heavy processing. Identified as one of the two major strategic employment areas in the Cork City Region, Little Island has recently been the subject of strong industrial and commercial development pressure. This has focussed on Eastgate a mixed development of starter units, business park, industrial and warehouse units (800,000 sq. ft approx. In addition, the Fosburn development, comprises a 49-acre site with a governing permission for a light industrial park. Both of these sites provide vast potential for increased rail related commuting.
Tivoli		City suburbs	Principal land uses are related to the Port of Cork, with low density employment activities. There is some residential and institutional land inland, but limited scope for rail based commuting.
Midleton / Youghal Line			
Youghal Town	UDC	Ring town	There are existing IDA estates at Springfield and Foxhole. There is a large IDA advance factory at Springfield in the town (50000sqft) . The town is to be bypassed. This town has undergone substantial change in the last 3-5 years with hundreds of additional residential units (particularly apartments) being provided along the waterfront. The town's development boundary was extended on the Cork side in the 1999 variations primarily to facilitate additional residential expansion.
Carrigtwohill	CCC	Satellite town	This is the most promising of the smaller settlements having ample land close to the city. In the 1999 variation additional lands were proposed for industrial use on the north west edge of the town. Additional lands were also rezoned for residential use. Although originally envisaged as more of an employment centre than a population growth point, Carrigtwohill was the subject of major industrial and residential rezoning in the 1999

Centre	Authority	Status	Extracts from the development plan and variations
			Material Variation Document. This can largely be attributed to the town's proximity to the rail network. An additional c. 110 acres of industrially zoned land was provided at Carhoo and Anngrove to the north of the rail line. These are IDA lands designed to cater for the high level of demand for industrial sites from incoming, particularly foreign investment. There is a prospect of an additional c.35 acres, which forms a natural link between these areas, being rezoned at some stage in the future. In addition, 450,000 square feet of office/industrial floorspace is proposed on lands zoned as Business/Technology based industry in the 1996 County Development Plan. There are current applications and permissions for 700 residential units in Carrigtwohill. Should a commuter rail service be provided there is scope for a further residential expansion to the north of the rail line at a future date.
Midleton Urban	UDC	Satellite town	The original LUTS, during the 1970s, identified the reopening of the Midleton line. However, reopening was not considered viable. Midleton is rapidly expanding with a number of developments to be completed in the short term. The town is largely self sufficient but contributes to the volume of commuter traffic entering the Little island area and the city. Like Carrigtwohill, Midleton was the focus of major rezoning in the Material Variation document. An area of c.17 acres at Broomfield East was supplemented by the provision of an additional 51 acres of residential land directly to the east. Combined, these lands are the subject of a current application for 610 residential units. Directly adjacent to the newly zoned area at Broomfield East the town development boundary was extended to make provision for rail related uses. At Broomfield West the Council has recently purchased land for the construction of social/affordable housing. The nearby Universal Foods site, which is located on the rail line, has been the subject of pre-planning discussions for a 120 residential unit and commercial development. Meanwhile, to the south of Midleton a further 56 acres of land with a potential yield of 400 residential units was zoned near Ballynacorra. These units are additional to the recent strong development activity in this area which is likely to yield up to 700 additional residential units within the next 5-10 years.
Midleton Environs	CCC	Satellite town	Additional land has been identified in the settlements close to Midleton. The area has some industrial land at Broomfield.
Castlemartyr Town	CCC	Village	Proposed to be bypassed. Designated "a village of historic interest". This town declined in population from 587 to 484 between 1991 and 1996. Castlemartyr is located approximately one mile to the south of the rail line that runs through Mogeely a smaller settlement to the north. Both settlements were the subject of land rezoning in the 1999 Variations and there are current applications and submissions for an aggregate 410 residential units between both settlements. In addition, at least one submission for a substantial residential land rezoning has

Centre	Authority	Status	Extracts from the development plan and variations
			been lodged with the Council for consideration in the Plan Review. It is inevitable that the population decline in this area will be turned into a substantial population gain within the next few years.

CCC = Cork County Council

3.6 The station at Fota serves the wildlife park, which is one of the main tourist attractions in the south of the country. Little residential or industrial development is located here and it is envisaged that Fota will retain its leisure activity status.

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4. Review of Studies

MVA LUTS Review

4.1 Proposals for the development of the local rail network were produced from a review of the Cork Land Use / Transportation Plan undertaken in 1991/2. A number of these proposals were assessed by The MVA Consultancy in 1993. This MVA study identified five key issues facing the local rail network against which the rail proposals were assessed, namely:

· locomotive hauled stock on the Cobh line which is expensive to operate and creating a poor image for the service;

· a lack of timetable integration between the two lines;

· relatively poor access from Cork City Centre to Kent Station, and poor integration with bus services;

· poor access from the areas of high unemployment in the North of the City to the job opportunities served by the Cobh Line;

· a lack of space for park and ride or car passenger boarding / alighting at the intermediate stations on the Cork – Cobh Line.

4.2 The MVA proposals for the two lines were as follows:

Cork - Cobh Line (Scheme 1):

· extension of the Cobh – Cork Line on a spur to a new terminus at Brian Boru Street, to give improved access to the City Centre;

· new stations at Tivoli and Ballynoe (shown in Figure 4.1);

· refurbishment of existing stations;

· provision of additional car parking at some stations;

· upgrade of signalling;

· dedication of a modern diesel multiple unit (DMU) to provide a regular 1 tph service.

Cork - Mallow Line (Scheme 2):

· re-open stations at Blarney and Blackpool / Kilbarry (shown in Figures 4.2 and 4.3);

· provision of car parking at Blarney;

· dedication of modern DMU to provide a two hourly service interval between Mallow, Brian Boru Street and Cobh.

4.3 In order to evaluate the above schemes, MVA developed a methodology with two distinct elements: firstly, a formal cost benefit analysis (CBA) followed by a set of "additional considerations". The CBA included estimated capital and operating costs and journey time improvements accruing to rail users. Base employment and population projections were incorporated together with estimates of the effects of particular employment and housing developments. These are reviewed more fully in the planning section. The set of 'additional considerations' included generated rail travel, park and ride provision, cycle access, alternative car ownership assumptions and tourism. Of these, only generated travel and tourism were concluded to be relevant.

4.4 The forecasts used in the assessment of the proposals and the results of the cost benefit analysis are outlined below:

· 1991 patronage on the Cobh Line was forecast to increase from 510 000 to 680 000 by 2001 as a result of planned land use changes and general movements of population and employment;

· it was forecast that implementation of the rail proposals would increase patronage on the Cobh Line by a further 30% by 2001, and an additional 10% due to tourism, and 4% resulting form generated traffic, ie a total of 1.016m trips in 2001. Most of this growth was attributed to the increased catchment area which would exist around a Brian Boru Street terminus, which was estimated to contain approximately three times as many jobs within 1 km than Kent Station;

· IE estimated the capital costs of the Cobh Line proposals at £7.2m. Operating costs would decline by £0.24m. Passenger benefits of £0.29m were forecast to accrue in the first year of operations, comprised mainly of time savings. A Net Present Value (NPV) of £3.1m and benefit/cost rates of 1.44 were predicted;

· on the Mallow Line, the 1991 patronage of 234 000 was forecast to increase by 5% p.a. as a result of population and employment changes in the corridor;

· it was forecast that implementation of the proposals would increase patronage by a further third on the Mallow Line;

· IE estimated the capital costs of the Mallow Line improvements at £2.4m and they were forecast to produce a marginally positive NPV.

4.5 The Present Value of Costs of the two schemes taken together was estimated to be £9.3m, and operating cost savings of £0.9m were estimated.

4.6 The MVA report concluded that the Cork to Cobh Line was in decline and would deteriorate further without capital investment. The assessment of the proposals showed significant benefits and 'satisfactory economic performance'. It was stated that the provision of a new terminus closer to the City Centre with the consequential increase in the number of workplaces within one kilometre walking distance was an important element of the scheme.

4.7 The level of benefits in the CBA is highly dependant on the forecast scale of rail demand. The MVA predictions for passengers on both Cork-Cobh and Cork-Mallow greatly exceed the actual growth on these lines. Their predictions for 2001 for Cork-Cobh were 680,000 p.a. and for Cork-Mallow were 381,000. Actual annual flows for 1999 were 493,071 and 207,237 for each line respectively. This is partly because the MVA study over estimated the 1991 base year traffic on the routes. For example, the IE records show 360,000 passengers on the Cork to Cobh route in 1991, which compares to 510,000 used by MVA. There were also a number of omissions in the costing, relating to infrastructure on the Cork to Cobh Line, which would adversely effect the CBA.

4.8 The LUTS Review included proposals for the reopening of the Midleton / Yougal route; this was not evaluated in the MVA study.

4.9 Since the MVA Study, some schemes have been implemented. A dedicated two car diesel railcar set for the Cork to Cobh Route was acquired, which allows the operation of a more regular and reliable service at lower operating costs; the upgrading of stations at Little Island and Glounthaune has also been achieved. Station upgrades at Rushbrooke and Carrigaloe are to be undertaken shortly.

4.10 The Cork to Mallow route has not been significantly improved over the period, although there has been some cascading of rolling stock from the Dublin / Belfast service. In addition, EU Structural and Cohesion funds have been invested in the Dublin – Cork route which forms part of the Trans European Network. This has allowed the entire Cork to Mallow section to be upgraded with continuous welded track.

Further Reviews

4.11 Since the MVA LUTS review, a number of further studies and reviews on particular projects has been undertaken. These are outlined below.

IE Development Plan

4.12 IE have identified a number of schemes of relevance to the Cork area as part of their Development Plan for the country's mainline passenger services. The value of these schemes is estimated to be £18.1m. These are outlined below, together with a breakdown of the estimated costs:

· upgrading of the Cork to Cobh line to continuous welded rail with ancillary works (£10.6m);

· upgrading of the signalling system to a modern mini CTC system on the Cork to Cobh route (£2.6m);

· provision of an additional two car diesel train set for the Cork to Mallow route (£2m);

· replacement of trackwork and signalling at east end of Kent Station, including the provision of CAWS in conjunction with the resignalling of the line to Cobh.

Kent Station

4.13 Cork Station currently handles between 1.6m and 1.8m passengers p.a. There are alternative proposals for the reorganisation and redevelopment of Kent Station as part of a major development of the lands which adjoin the station.

4.14 The proposals include the provision of a new passenger concourse on the south side of the station with access oriented to the quays. The walking distance from the station to the CBD would be reduced by up to 400m. There would also be improved access for feeder modes, including bus, taxi, car and cycles. This proposal is an objective within the City Development Plan. The cost of the new station concourse is estimated to be approximately £7.0m, which excludes the costs of servicing the wider site, the relocation of the rail freight businesses, additional car parking provision, and some approach road works connecting Alfred Street and Horgan's Quay.

4.15 Further to the relocation of the concourse, there are alternative proposals for major works to improve the safety, efficiency and capacity of railway operations at the station. The works would address broad areas of concern, as follows:

· the safety of current signalling suburban platforms and "snaked" trackwork;

· shunting facilities for Ammonia wagon maintenance;

· the safety and maintenance of the curve on Platform 4.

4.16 Two alternative schemes have been developed by IE to address these problems – a Do Minimum and a 'Preferred Scheme'. The Do Minimum scheme has an estimated capital cost of about £16.1m, and includes various minor improvements and some heavy maintenance.

4.17 The Do Minimum would achieve the following:

· provide for safer arrivals and departures on the Cobh platforms;

· allow for parallel movements in and out of the Cobh platforms;

· provide a safer yard and running lines as a result of resignalling;

· reduce net holding capacity of the sidings by approximately 50%;

· continued current capacity provision of through running platforms and terminal platforms;

· continued use of existing curved mainline platforms;

· provide access ramps to platforms from new concourse.

4.18 The 'Preferred Scheme' has estimated capital costs of £25.1m and includes:

· provision of 4 through running platforms and 1 terminal platform capable of accommodating a 9 piece train;

· provision of a 6th platform for special trains, capable of accommodating a 9 piece train;

· provision of wash facilities for 9 piece trains;

· provision of sidings with an operational holding capacity of 39 x 23m carriages;

· provision of sidings with a crush holding capacity of 65 x 23m carriages;

· relocation of the locomotive shed, with the provision of 4 roads and pits;

· the provision of a 400 space multi-storey car park;

· The track and platform layout would provide capacity for services on a reopened Midleton/Youghal route and allow the through running of regular services between Cobh/Midleton and Mallow.

Brian Boru Street Spur

4.19 The Kent Station proposals prompted a review of the scheme for a rail spur to Brian Boru Street. The 1998 City Development Plan suggests that the 'spur could be reviewed as part of the development of proposals for the entire Kent Station area.' Further work was carried out by IE to take account of updated safety standards for the design of railway facilities, the growth in commuter traffic on

the Cobh line since the LUTS Review, and the proposals at Kent Station for property development, including a new south facing entrance.

4.20 The original proposal envisaged a short terminal platform contained within the existing traffic lanes connecting Alfred Street and Brian Boru Street. The introduction of stricter safety guidelines meant that additional property would have to be acquired to provide minimum platform width at the station; a 15m long friction buffer would be required; the platform at this location would need to be severely curved, which is against IE policy. Furthermore, it is now considered likely that, if four car trains have to be operated to cater for forecast demand, this would involve extending the platform across Ship Street. The complete segregation of the railway in Alfred Street would be needed, and statutory undertakings services would have to be moved from under the railway alignment. These considerations make the rail spur impractical, since the benefits would be outweighed by costs and disbenefits to road users.

4.21 An alternative scheme to extend a spur as far as Alfred Street was also examined by IE. While this would address some of the engineering problems associated with the Brian Boru Street scheme, it was found to have the following disadvantages: the terminal point would be 150m further from the city centre; the necessary segregation from road traffic would cause a major intrusion and would have a major impact on existing businesses in Alfred Street; road traffic on Alfred Street would be restricted; and all services would have to be relocated from Alfred Street. In social cost-benefit terms, this scheme was judged to provide insufficient benefits compared to the station re-orientation scheme.

New Stations

4.22 We understand that the case for the four additional stations on the two routes was reviewed in strategic terms, and that there was considered to be a good case for these as part of an integrated land – use transport strategy, on the basis that they link areas of high unemployment within the north eastern corridor with job opportunities in development areas. The local authorities view these station proposals as possible stimuli for local developments. IE envisaged that the estimated costs could not be justified on commercial grounds, since there would be insufficient additional patronage generated. The reasons for this are their proximity to the city centre, their locations relative to their local catchment areas and the continued relatively poor penetration of the city centre by rail services, even if the Kent Station re-orientation scheme were implemented.

4.23 It was considered likely that the case for the new stations would be improved through the introduction of the through Mallow to Cobh service, which would allow rail to become an attractive option for more commuter flows. The scope for trips from Blarney, and Blackpool / Kilbarry to Cork was considered to be limited by MVA, based on an assessment of relative populations, journey length, accessibility and bus competition. However, there were considered to be more substantial benefits arising from improved access to employment sites at Tivoli and Little Island, as well as improved provision for leisure travel to Fota and Cobh. The possibilities of benefits in terms of reverse commuting associated with industrial development within the rail catchment remains to be fully examined. The low density of development around stations suggests that improvements to station access to widen their catchment areas would be beneficial and, to this end, rail based park and ride should be considered further.

Cork-Midleton-Youghal

4.24 A major proposal which was not considered in the MVA study was the reopening of the Midleton / Youghal route. An evaluation by IE identified preliminary costs. Calculations were made of both the necessary traffic volumes and fares required to produce a positive financial return together with the necessary journey time savings to produce a positive NPV in social cost benefit terms.

Assessment of Costs

4.25 We have undertaken independent cost estimates for the schemes described above. These are reported in the following section. A summary of costs is provided at the end of the section.

4.26 The assessment was based on 1:50000 scale plans and limited site visits. Further, large scale details of particularly station sites will be required to verify levels, road accesses, etc.

4.27 The following cost elements are too detailed for this review and are, therefore, excluded from our cost assessment.

- ground conditions, included potentially contaminated land;
- buried services;
- land acquisition;
- legal fees;
- abnormals due to poor ground or other design input;
- disruption/compensation;
- tax.

4.28 The indicative costs thus produced should be regarded as very preliminary and should have a contingency or risk allowance added to them which is commensurate with the early stage in the development of the scheme.

New Stations

4.29 The standard to which the station cost were developed includes:

- twin platforms, 90m long and either 2.5 or 3.5 m wide - the wider are used where high speed trains pass through the station without stopping, which is applied on the Mallow line. Construction is assumed to be of concrete block wall and precast concrete slab;
- a basic footbridge - this does not include ramps to satisfy disabled access (DDA) requirements, and could be revised to tie in to existing adjacent bridges if available. DDA can have a significant effect on cost and layout. Of particular relevance to this study is ramped access to platforms; for the stations in this study access has assumed to be either direct to the adjacent highway (where level crossings exist) or via a footbridge/subway. The latter has to accommodate shallow gradients (1:20), and changes of direction, which results in a significantly enlarged structure and increased construction cost;
- an allowance for access to an adjacent highway. This assumes such access is readily available;
- a 20 space car park;
- an allowance for a small station building;
- associated civils works such as drainage, walkways etc.

Route Upgrades

4.30 The cost estimate for the upgrade of the route from Cork to Cobh uses actual track renewal figures from IE. Our estimate of the reinstatement of single track route from Glounthaune to Youghal includes:

· new CWR track on concrete sleepers throughout;

· an allowance for passing loops at stations and new turnouts required along the route for crossovers;

· an allowance for new or refurbished bridges;

· refurbishment of level crossings along the route - a nominal sum is included as an average for each location, it does not include for a major upgrade from the existing standard;

· a nominal allowance for refurbishment of telecommunications facilities.

Cost Summary

4.31 The summary of cost estimates is given in Table 4.1.

Table 4.1 Current Rail Investment Schemes (1999 £)

Scheme no.	**Scheme Description**	**Assessment of Capital Cost**
1	Kent Station – Concourse Remodelling	£7m
2(a)	Kent Station – East end trackwork / CAWS [1]	£2.7m
2(b)	Kent Station – Resignalling / Platforms: Existing platform layouts retained	£16m
3	Kent Station – Resignalling / Platforms: Major platform realignment [2]	£25m
4	New Stations at: Tivoli, Ballynoe Kilbarry / Blackpool & Blarney	1.02m each 1.08m each
5(a)	Reopening Cork-Midleton line, including reopening stations at Carrigtwohill & Midleton	13.9m [3]
5(b)	Reopening Cork-Youghal line, including reopening stations at Carrigtwohill, Midleton Mogeely, Killeagh & Youghal	27.49m [4]
6	New rolling stock (2 car DMU)	£2m per set
7	Cork / Cobh track renewal	£10.6m [5]
8	Cork / Cobh resignalling	£2.8m [5]

Notes:
[1] Scheme 2(a) would be included in 2(b)
[2] Scheme 3 is an alternative to Scheme 2. It facilitates the development of through regular services between Mallow and Cobh.
[3] Civils/Stations £10.68m; Signalling/Telecoms £3.22m
[4] Civils/Stations £20.78m; Signalling/Telecoms £6.71m Rail
[5] Actual IE Renewal Figures assumed.

5. Investment and Service Enhancement Options

Do Minimum

5.1 The Do 'Minimum' option includes committed and other schemes required for safety reasons etc. This option does not involve the upgrading of passenger services on the Cork suburban rail system. It does include concourse works to Kent station, which are part of a wider redevelopment scheme at the site. The 'Do Minimum' package provides the base against which the other options should be compared. The Do-Minimum service pattern is shown in Figure 5.1, and for each of the options discussed below in Figures 5.2 and 5.5. The do minimum includes the following schemes:

· the remodelling of Kent Station – this is part of the property development scheme on the railway lands at Kent Station;

· Kent Station – East end trackwork / CAWS [1]

· Kent Station – Resignalling / Platform works with existing platform layouts retained

· Cork – Cobh track renewal and resignalling.

5.2 There would be no change in the rolling stock requirement.

Option Development

Option A

5.3 This includes the Do Minimum schemes and also the provision of four new stations: Tivoli and Ballynoe on the Cobh line; and Kilbarry and Blarney on the Mallow line. The new stations on the Mallow line would be served by some or all of the existing services, which are a mixture of local and long distance trains, not at regular intervals. It is not considered practical to implement a dedicated regular service on the Mallow line with the present configuration of Kent Station, in which there are only two through platforms. Although it might be possible to operate such a service from the bay platforms, this would require an extension of the practice of 'propelling' trains, which is not considered acceptable in safety terms. A regular hourly service would be operated on the Cobh line as now.

5.4 Since the two new stations on the Mallow line are assumed to be served by the existing local and long distance services, which do not face short turnarounds, there is no impact on rolling stock requirements. However, there would be operational problems associated with stopping 9 piece trains at 90m platforms. (It is unlikely that 220m platforms could be justified. Passengers for these stations would have to be confined to particular sections of these trains.

5.5 On the Cobh line, two new stations will increase the journey time on the route beyond the point at which a regular hourly service can be reliably operated with one train. We have estimated a Kent / Cobh journey time of 29 minutes and reversing time of 5 to 6 minutes is considered the minimum necessary to provide a reliable service. A solution might be to provide compensating improvements in journey times through increases in line speeds etc. In the absence of these, it appears that an additional 2 car train would be needed to operate (2tph) Cobh services but would be idle much of the time unless the service were extended, otherwise less attractive timetabling might be necessary e.g. a 40 minute headway.

Option B

5.6 This involves schemes in Option A together with the reopening of the line to Midleton, with possible extension to Youghal. There would be an intermediate station between Glounthaune and Midleton at Carrigtwohill, and stations between Midleton and Youghal at Mogeely and Killeagh. An hourly service would be operated, using the existing bay platform facilities at Kent Station.

5.7 Rolling stock requirements would be as for Option A for Mallow and Cobh services. We have undertaken a preliminary estimate of rolling stock requirements on the Midleton / Youghal route. A line speed of 50 mph is assumed on the reopened section of line between Glounthaune and Midleton / Youghal. Journey times are assessed for stopping trains as :

· Cork – Midleton: 22 minutes;

· Cork – Youghal: 44 minutes.

5.8 These journey times imply that it is possible to operate an hourly service between Cork and Midleton with one train, or a two hourly service between Cork and Youghal with one train. Alternatively an hourly service to Youghal could be operated with two trains which would need to pass at Midleton. For costing purposes we have assumed the one additional train under Option A plus either one additional train for Cork – Midleton or two additional trains for Cork – Youghal.

Option C

5.9 This involves the implementation of the Do Minimum Schemes but with IE's preferred Kent Station remodelling scheme [Scheme B(i)]. It also includes the opening of new stations at Kilbarry, Blarney, Tivoli and Ballynoe. This would allow the twin benefits of a dedicated regular hourly service on the Mallow route, and the introduction of through trains between Mallow and Cobh, opening up new direct journey opportunities by rail for users of intermediate stations. These through trains would serve the new intermediate stations on the Mallow route, allowing existing long distance trains to continue a non-stopping service between Cork and Mallow.

5.10 A through service between Cobh and Mallow, including a total of 4 new stations is estimated to have a total journey time of 57 minutes with the current line speeds, if operated by two trains. This allows for only a 3 minute turnaround, which is insufficient, and indicates that a reliable hourly service would require 3 trains. Should speeds be increased so that a journey time of 54-5 minutes or better was achieved, it would be possible to operate an hourly service between Cobh and Mallow with 2 trains. Therefore two additional trains have been assumed for costing purposes.

Option D

5.11 Option D involves implementation of schemes in Option C and the reopening of the line to Midleton, with a possible extension to Youghal. There would be alternate two hourly through running services between Mallow and Midleton / Youghal, and Mallow and Cobh. These would provide a regular hourly service between Mallow / Blarney / Kilbarry and Cork / Tivoli / Little Island / Glounthaune. There would also be two hourly services between Cork and Midleton / Youghal and between Cork and Cobh.

5.12 For services between Midleton / Youghal and Mallow, the following journey times were estimated: Midleton – Mallow: 51 minutes; Youghal – Mallow: 1 hour 13 minutes.

5.13 It appears possible to operate alternate two hourly services between Cork and Midleton and Cork and Cobh with one train. This would allow five minute turnaround times which should be just sufficient to operate reliable services. In this case, the total rolling stock requirement for the services in Option D would be 4 trains (3 of which would be additional), as follows:

· 2 hourly services - Cork / Cobh and Cork / Midleton – 1 train

· 2 hourly services – Midleton / Mallow – 1 train

· 2 hourly services – Cobh / Mallow – 2 trains

5.14 Should linespeeds be improved such that the Kent to Mallow and Kent to Cobh services could operate to a reduced run time of approximately 25 minutes, including stops at all intermediate stations, it would be possible to operate the above service pattern with only 3 trains. Alternatively, there may be ways of reducing run times by operating some services with reduced stops. An example of how part of such a timetable might work is shown in Table 5.1. The three 2 hourly services interact to provide an hourly frequency on all three 'branches' of the network, and utilise the 3 trains effectively.

Table 5.1: Possible outline timetable pattern for 2 hourly services: Cobh – Cork – Midleton; Mallow – Cork – Midleton; Mallow – Cork – Cobh.

Cobh dep	7.00	9.00	11.00
Cork arr	7.25	9.25	11.25
Cork dep	7.30	9.30	11.30
Midleton arr	7.52	9.52	11.52
Midleton dep	8.00	10.00	12.00
Cork arr	8.22	10.22	12.22
Cork dep	8.30	10.30	12.30
Cobh arr	8.55	10.55	12.55

Mallow dep	6.00	8.00	10.00
Cork arr	6.25	8.25	10.25
Cork dep	6.30	8.30	10.30
Midleton arr	6.52	8.52	10.52
Midleton dep	7.00	9.00	11.00
Cork arr	7.22	9.22	11.22
Cork dep	7.30	9.30	11.30
Mallow arr	7.55	9.55	11.55

Mallow dep	7.00	9.00	11.00
Cork arr	7.25	9.25	11.25
Cork dep	7.30	9.30	11.30
Cobh arr	7.55	9.55	11.55
Cobh dep	8.00	10.00	12.00
Cork arr	8.25	10.25	12.25
Cork dep	8.30	10.30	12.30
Mallow arr	8.55	10.55	12.55

5.15 If the extension to Youghal is opened, the requirement is for 6 trains (5 additional) as follows:

· 2 hourly service – Cork / Cobh – 1 train

· 2 hourly service – Cork / Youghal – 1 train

· 2 hourly service – Mallow / Youghal – 2 trains

· 2 hourly service – Mallow / Cobh – 2 trains

5.16 Again, run time improvements on the Cork to Mallow and Cork to Cobh sections would allow the requirement to be reduced by 1 train. However, extension of the line beyond Midleton, to Youghal implies the need for a further 2 trains to operate the service pattern described above. For costing purposes we have assumed an additional three trains for Option D with Cork – Midleton reopened and an additional five trains with Cork – Youghal reopened.

Table 5.2 Summary of Cork Suburban Rail Investment Package Options

Option	**Description**	**Schemes**	**Objectives**	**Indicative capital costs (1999 £) * over Do Min**
Do Min.	Do Minimum Committed schemes. Basic track layout / signalling scheme at Kent station [Kent Do Min]. Minimum expenditure to maintain current service patterns – safety expenditure; Cork Station concourse works.	Kent Station: - Access from South - Concourse remodelling - East End Trackwork - Designalling/Trackwork Cork-Cobh track renewal and resignalling. Schemes 1, 2a + b, 7, 8.	Maintain status quo in terms of services. Improve safety and customer facilities at Kent.	-
A	Basic track layout / signalling scheme at Kent station [Kent Do Min]; maintain basic current service pattern; provide two new stations on Cork – Cobh line and two new stations on Cork – Mallow line served by existing irregular service	Do Min plus new stations on - Cork-Cobh line - Cork Mallow line Schemes 1, 2a +b, 4, 6, 7, 8,	Enchanced catchment for rail. **5.17**	£6.2m
B	As for A; re-establish Cork to Midleton / Youghal services, with new intermediate stations	As (A) plus new service Cork-Midleton. (B1) Schemes 1, 2a +b, 4, 5(a), 6, 7, 8. Includes 5(b) for Cork-Youghal.(B2)	As for A and Re-instatement of passenger services in Midleton / Youghal corridor to the east of Cork.	£22.1m (B1) (Midleton) £37.7m(B2) (Youghal)
C	Extensive realignment of track and platform layout at Kent Station, additional through platforms at Kent Station. [Kent Option B(i)] 2 new stations on Cork-Cobh line and 2 new stations on Cork-Mallow.	Kent platform realignment. Mallow-Cobh through running, giving Mallow a regular hourly service. 4 New stations. Schemes 1, 2a, 3, 4, 6, 7, 8	Through running Cobh-Mallow to open up new employment and travel opportunities. Improve safety, platform capacity and customer facilities.	£17.2m
D	Extensive realignment of track and platform layout at Kent Station [Kent Option B(i)]; re-establish Cork to Midleton / Youghal services, with new intermediate	Kent platform realignment. Mallow-Cobh through services. Mallow-Midleton (Youghal in D2) through services. 9 new stations. Schemes 1, 2a, 3, 4, 5a, 6, 7,	**5.18**	£33.1m (D1) (Midleton) £50.7m(D2) (Youghal)

Option	Description	Schemes	Objectives	Indicative capital costs (1999 £) * over Do Min
	stations.	8. . Includes 5(b) for Cork-Youghal.(D2)		

Existing Basic Service Pattern (Trains per Hour)

Option A - Basic Service Pattern (Trains Per Hour)

Option B - Basic Service Pattern (Trains per Hour)

Option C Basic Service Pattern (Trains per Hour)

Option D Basic Service Pattern (Trains per Hour)

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6. Operating and Maintenance Costs

6.1 The annual operating costs associated with the options include the following: staffing, station / office costs, traction costs, rolling stock maintenance costs, ticketing costs. Unit costs for these items were derived from previous Arup work, including the Dublin Suburban Rail Strategic Review. Staffing costs of train crew were assumed to be £30,000 p.a. per driver, with an allowance of three drivers per train to cover shifts, leave, sickness etc. One person operation of suburban trains was assumed.

6.2 Operating costs for new stations were based on Dublin Suburban Rail. For a new staffed station operating costs were assumed to be £75,000 p.a., comprising £60,000 for staffing, £5,000 for cleaning and £10,000 for maintenance. Operating costs at an unstaffed station were therefore assumed to be £15,000 p.a.

6.3 Rolling stock costs were assumed at £2.2m for a 2 car DMU railcar. For appraisal purposes, mid life refurbishment of rolling stock should be considered, and it is recommended that this is based on the assumption of 20% of new train costs in the 20th year after delivery.

6.4 Traction costs were derived by the application of a unit rate to the additional train kilometres for each option. Average fuel and maintenance costs per train was £0.249 per km for a 2 car DMU (1997 prices). The maintenance cost was £0.81 per kilometre for a 2 car DMU. Track maintenance for new track was assumed to be £20,000 per track km. Ticketing and fare collection costs were assumed to be 10% of total O & M costs, excluding fuel costs. This allows for the costs of maintaining ticket machines and providing revenue protection. In addition, an administrative overhead was applied to all O & M costs with the exception of fuel costs and ticketing costs.

6.5 Annual traction and maintenance costs for trains were assessed for each option by annualising the train kilometres operated on the following basis:

- 17 hours per weekday (including Saturdays) x 301;
- 14 hours per Sunday and Bank Holiday x 63.

6.6 Based on these unit rates, the annual operating and maintenance costs for each option are set out in Table 6.1.

Table 6.1: Operating and Maintenance Costs by Option (000's p.a)

Train Crew Costs £	Traction Costs £	Maintenance Costs £			Other Costs £[3]		Annual Total Costs (£)
		Station[1]	Train[2]	Track	Ticketing	Overhead	
90	0	60	0	0	15	15	180
180	55	150	179	200	71	71	906
270	120	255	390	466	138	138	1,777
180	95	60	308	0	55	55	753
270	55	150	179	200	80	80	1,014
450	120	255	390	466	156	156	1,993

(1) Assumes £15,000 per station p.a. (except Midleton & Youghal @ £75,000 per Station p.a.).
(2) Assumes 2 car Railcars.
(3) Ticketing and administrative overhead are BOTH 10% of O&M costs, excluding traction costs.

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7. Patronage and Revenue Forecasts

Do Minimum Patronage

7.1 The analysis of the likely scale of passenger demand for each of the options set out in the preceding chapter was undertaken in a number of stages. Patronage for a do minimum forecast, assumed to be 2005, was obtained by applying growth factors derived from the IE time series analysis of Cork-Cobh services assuming that these were transferable to Cork-Mallow patronage. The incremental effect of new stations, service enhancements and the re-introduction of Cork-Midleton (and Youghal) services were then projected using a trip rate model, application of standard elasticity values and use of data from the Cork Corporation SATURN model/trip rate model respectively.

7.2 The resulting do minimum rail flows for 2005 are given in Table 7.1. This assumes retail sales increase by 5% p.a. and that real fares remain constant, which are a conservative set of assumptions. The overall increase in patronage between 1999 and 2005 is around 25%.

Table 7.1 Do Minimum Rail Patronage 2005 (trips p.a.)

	1999	**2005**
Cork-Cobh	493,071	612,644
Cork-Mallow	207,237	257,493
Mallow-Cobh Line	21,343	26,519
Total	721,651	896,656

Potential New Station Sites on Existing Lines

7.3 A regression model was developed for the Dublin Suburban Rail Study, based on data on four key variables at 16 existing stations. The derived trip rate was 36 boardings per thousand population per day. Comparisons with UK trip rates are difficult because normal UK practice is to calculate trip rates by distance bands from stations rather than using Census enumeration district totals (which were used for Cork).The trip end model estimated from the variables listed above was as follows:

$$\text{Daily boardings} = 301.6 + 0.027 \times \text{Population} - 3.143 \times \text{journey time}.$$

7.4 Application of the trip end model to the proposed new stations in Cork resulted in excessive forecasts of boarders, probably due to a combination of particular conditions peculiar to Dublin and the proximity of Tivoli and Kilbarry to the city centre. Boarders were therefore derived by applying the trip rate of 36 boarders/day per thousand population. This recommended given the strong "out of Cork" movement to centres such as Little Island.

Estimation of Effects of Service Pattern Changes on Patronage and Revenue

7.5 For changes in existing services an elasticity-based approach was adopted using established elasticity values gained from UK experience. These elasticities were applied to estimates of generalised time for the particular service options under consideration. This approach does not provide forecasts of mode switching or of the effects of transport polices such as parking restrictions in Cork. These would require an area-wide multi-modal forecasting model.

7.6 When new stations open, there is a benefit to passengers using them; new passengers were forecast using the regression model estimated for Dublin using journey time and population projections. However, there is also some offsetting dis-benefit to existing users due to longer journey times. A journey time elasticity of –0.9 was used to estimate this effect.

7.7 Operating Mallow - Cobh through trains will benefit existing travellers interchanging at Cork and will attract new passengers. The effect is estimated through generalised time, which includes an interchange penalty. The degree of inconvenience arising from interchange can depend on a wide range of factors including waiting time, walking time, frequency and reliability of service, ease of interchange, facilities, familiarity journey purpose, etc. This implies a wide range in applicable interchange penalties between individuals. Penalties are usually lower for short distance trips since they are likely to involve shorter wait times and be more familiar. Nevertheless, as a proportion of generalised journey time, the interchange penalty falls as distance increases. UK evidence from Revealed and Stated Preference studies provides the following guide to interchange penalties.

Table 7.2 Interchange Penalties

Distance	Interchange penalty (minutes) – full /reduced tickets	Interchange penalty (minutes) – season tickets
0	15	10
10	21	14
25	30	20
50	45	30
75	53	35
100	60	40
150	68	45

7.8 The effect of introducing a regular hourly service on the Mallow-Cork service and of enhancing the service to existing stations on the Cobh line through the introduction of Midleton/Youghal services, was estimated through the effect on generalised time. The impact of increased frequency was calculated by converting the service interval into an equivalent journey time value based on Stated Preference research in the UK.

Table 7.3 Conversion of service intervals to wait penalties (mins)

Service interval	Equivalent waiting time penalty
5	5
10	10
15	15
20	19
30	26
40	31
60	39
90	51
120	63
180	87

New Lines

7.9 A preliminary patronage and revenue assessment for the reintroduction of services on the Midleton-Youghal line was undertaken using a combination of the trip rate model discussed above with data from the Cork Corporation SATURN model. Whilst the SATURN model only gives data by car, it provides an indication of total corridor demand for the line.

7.10 A series of select link analyses were undertaken using the SATURN Cork model in order to ascertain the likely scale of car trips between the eastern side of Cork and the city centre. This indicated that during the morning peak hour there were around 200 trips from the corridor which had a destination in

the city centre; this equates to a daily two way flow of around 2500. Approximately 1200 of these trips were between Midleton and the city centre.

7.11 Given the 1999 population of Midleton, the trip rate model suggests around 400 rail trips per day between Midleton and the city centre. Assuming that the current bus mode share is relatively low, rail mode share would be in the order of 25 - 30%. This appears plausible given what would be competitive car: rail journey times in the corridor. This gives general support to the trip rate model predictions of daily boarders at Carrigtwohill, Mogeely, Killeagh and Youghal.

Revenue

7.12 Analysis of Cork-Cobh data for 1998 indicates a daily to annual factor of around 266. In order to forecast revenue it is necessary to apply projected fares to a forecast distribution of trips. Fares were estimated by assuming a fixed element and a variable element based on an interpolation of existing fares according to distance. For the purpose of the new station analysis it was assumed that the destination of all trips was Cork city centre; However, trips from Blarney and Kilbarry with a destination on the Cobh line, such as Little Island, would pay a higher fare. The new station revenue forecasts can therefore be considered conservative.

Patronage and Revenue Forecasts

7.13 Table 7.4 shows the results of the 2005 patronage and revenue forecasts for each of the four options, A to D. These results reflect the forecast effects of service changes on patronage and revenue at existing stations and the forecast patronage and revenue of the new stations on both existing lines and on the reopened line to Midleton / Youghal.

Table 7.4 2005 Patronage, Revenue and Operating Cost Forecasts

Option	2005 Patronage(m) (% Change over Do Min)	2005 Revenue (£million) (% Change over Do Min)	2005 Revenue over Do Minimum (£million)	2005 Operating Costs (£million)
Do Minimum	0.894	1.253		
Option A	1.123 (26%)	1.477 (18%)	0.224	0.180
Option B [1]	1.356 (51%)	1.771 (41%)	0.518	0.906
Option B [2]	1.499 (67%)	2.038 (63%)	0.785	1.777
Option C	1.205 (35%)	1.623 (29%)	0.370	0.753
Option D [1]	1.431 (60%)	1.901 (52%)	0.648	1.014
Option D [2]	1.574 (76%)	2.168 (73%)	0.915	1.993

[1] Includes extension of services to Midleton.

[2] Includes extension of services to Youghal.

7.14 The results indicate that both patronage and revenue can be increased substantially through investment in the system. They imply that substantial numbers of car trips can be switched to rail. A comparison of the likely annual revenue of each option with the annual operating costs indicates that, from a purely financial point of view, only Option A covers its annual operating costs.

7.15 Sensitivity tests were undertaken with an alternative generalised journey time elasticity of - 0.451 tested. The results were robust to this alternative assumption, with both patronage and revenue results varying by less than 5% in all options.

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8. Assessment of Wider Benefits

Introduction

8.1 A full appraisal of the options would include assessment of a wide range of impacts, some of which are quantifiable and others not. A qualitative assessment was undertaken which aims to capture the broad range of the wider impacts of the options. In, addition, we have ranked the options to help develop an investment programme. The categories follow the five objectives of Economy, Environment, Safety, Integration and Accessibility which are set out in the UK Department of The Environment Transport and the Regions (DETR) New Approach to Appraisal (NATA). These are the objectives against which a full assessment might be made. We have provided two sets of rankings – a financial ranking and an indicative overall ranking. The latter is not based on any extensive modelling or research, which would be required in a full assessment, but mainly on professional judgement, based on consideration of the likely implications of each option. The aim is to give an indication of the likely outcome of a fuller assessment of the wider impacts of each of the options and should not be treated as definitive. An explanation of the range of impacts is set out below and our assessment is provided in Table 7.5. A full appraisal is recommended when the necessary forecasting tools and data are available.

8.2 The five NATA objectives contain a wide range of sub-objectives. The **Environment** objective includes *inter alia* impacts in terms of noise, local air quality, greenhouse gas emissions, landscape and biodiversity. The methods for measuring these impacts vary, and in some cases a quantitative method is not available. As part of a full assessment, an environmental impact assessment would normally be carried out. The strategic effects of rail investment are highly likely to be directly related to the scale of switching from car to rail and, other things being equal, this will be related to the scale of rail investment. Hence the environmental benefits of rail options are assessed as highest D and lowest for A.

8.3 The **Safety** objective includes the impacts in terms of accidents across all modes, and security. The impact of increased use of rail on rail safety is not normally calculated because the risks of rail accidents are considered to be very low. However, there are significant benefits associated with switching away from road use, which can be quantified using a mode share forecasting model and standard accident rates and values. In general, the scale of benefit will be directly related to the scale of mode shift.

8.4 The **Economy** objective includes transport economic efficiency, reliability, and wider economic impacts. The first would be assessed using traditional cost benefit analysis, including user and non-user benefits as well as financial impacts, by impact group. Reliability is difficult to measure, and it is recommended by the DETR that quantitative techniques are used only where a scheme is likely to have a significant reliability effect, eg the relief of severe congestion. Wider economic effects are very difficult to measure, are normally only relevant in designated regeneration areas, and are often represented by employment effects using simple rules of thumb given local economic conditions.

8.5 The **Accessibility** objective includes the option values of a service, ie the value to people of the option of using a transport service – they may be willing to pay to maintain a service which they do not normally use. A qualitative method is normally considered adequate for assessing this. Severance is an important issue with some schemes and there are guidelines to help treat it consistently. The scale of benefits depends on the flows affected. Access to the transport system is an issue which is related to the concept of social exclusion, and may be important in the objectives for rail in the Cork area. The methodology for assessing accessibility includes calculation of the proportion of population without access to a car, and not living within 250m of a public transport service. In addition, there may be accessibility benefits to the mobility impaired associated with modernised public transport fleets. A preliminary

assessment relates the accessibility benefits of Cork Suburban rail to the size of rail network and the number of stations.

8.6 The **Integration** objective refers to three distinct issues: the impact on the quality of physical transport interchange; the integration of transport with land use policy, since there are important longer term relationships here; and integration with other government policies. The first and second of these are considered more important in terms of rail strategy development in Cork. A preliminary assessment can be made on the basis of the improvement of local rail services to minimise rail/rail interchange, the provision of P&R and the extent to which the rail network would serve and facilitate new development reviewed earlier in this report.

Table 7.5: Qualitative Ranking of Options A - D

Objective	Sub - Objective	Option					
		A	B[1]	B[2]	C	D[1]	D[2]
Economy	Financial	***	**	*	***	**	*
	User Benefits	*	***	***	**	***	***
	Decongestion	*	*	*	**	**	**
	Regeneration	*	*	*	***	***	***
Environment		*	**	**	**	***	***
Safety		*	**	**	**	***	***
Integration		*	*	*	***	***	***
Accessibility		*	**	***	*	**	***
Ranking on Five Criteria		6	=4	=4	3	=1	=1
Financial rank		1	3	5	2	4	6
Overall rank		6	4	5	3	1	2

8.7 The simple ranking given in Table 7.5 is based on equal weights for each objective. It indicates that, although the financial assessment gives a clear ranking with Option A as best, the overall ranking reflects the important potential benefits that rail investment can provide particularly on safety, environment and economic benefits. On this basis, Option D[1] is ranked as the best option.

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9. Conclusions

9.1 From our preliminary financial evaluation, it is clear that only Option A (new stations) appears to cover its operating costs; none of the other options do. However, it is also clear that the net revenue position is not the only issue and there are a number of important factors that need to be recognised:

· the user and non-user benefits of the options have only been assessed in qualitative terms. These would be assessed more formally as part of a full social cost benefit analysis. The qualitative assessment suggests that the initial patronage and revenue results do not preclude a positive economic NPV for the options, and that the financial ranking is not likely to be a good indicator of overall ranking;

· the rail options are not optimised; for example, Option D may perform better with an enhanced frequency of service between Cork and Cobh.

· our review of land use and zoning indicates that the case for rail investment may be improved by new development (bringing economic and accessibility benefits):

- *Ballynoe*: full exploitation of land zoned for residential use but no forecasts available;
- *Killbarry*: 200 acre IDA industrial estate underused. New commuters to this area could be attracted in response to the additional industrial units recently provided at the North Point Business Centre and the West Link Business Park;
- *Little Island*: one of two major strategic employment areas in Cork. There are large land banks available to afford opportunities to develop a whole range of industrial /commercial activities from warehousing to heavy processing. Through rail service to Mallow serving new stations would maximise this opportunity;
- *Youghal*: substantial residential redevelopment in last 3-5 years not reflected in the 1996 data available for this study;
- *Carrigtwohill*: regarded as the most promising of the smaller settlements. The 1999 Material Variation Order proposed additional lands for residential and industrial use. Current application/permissions for 700 residential units and there is scope for further growth;
- *Midleton*: is rapidly expanding with a number of developments to be completed in the short term. The town is largely self sufficient but contributes to the volume of commuter traffic entering the Little Island area and the city. Midleton was the focus of major rezoning in the Material Variation document and there is the prospect of more development which would be attractive if the rail route were reopened.

9.2 The Cork rail network has enjoyed significant patronage growth despite the awkward location of Cork station and the unsatisfactory connections between services. There are good opportunities for network development alongside a carefully orchestrated land use development policy. If this can be achieved the role of rail in the Cork region can be significantly enhanced. The emphasis needs to be on development in station catchments and on bus and car access to stations, particularly in Cork, Kent where the redevelopment of the station is the key to a range of other possibilities.

9.3 There is little doubt that the above land-use developments will improve the case for investment in the Cork rail network. However, an opportunity now exists, through the Cork Strategic Plan

2000-2020, to build further on the existing rail network and to develop the case for significant suburban rail investment. In the past, residential development in Cork has favoured the south, and to a lesser extent the west, of the urban area, whilst considerable levels of employment are located in the southern suburbs. Demand for housing and the opening of the Lee Tunnel, which facilitates easy access from the east and north of the city to facilities and attractions to the south, is increasing pressure on both the Cobh/Midleton and Mallow rail corridors. The development of employment in the Little Island area is also of great significance.

9.4 Therefore, the potential exists for the allocation of a significant portion of the overall growth of the Cork region to the Cobh/Midleton/Youghal and Mallow rail corridors. These corridors are the only parts of the wider Cork area that can be served by rail in the shorter-term and the Cork Strategic Plan 2000-2020 should fully recognise and exploit this opportunity for sustainable development. The development of the rail corridors will balance the spatial development of Cork by redressing the excessive historic growth to the south, will provide a choice of residential locations with good access to an expanding city centre and to Little Island and maximise use of the existing rail resource in a sustainable manner.

9.5 The allocation of significant levels of growth to the rail corridors in the Cork Strategic Plan 2000-2020 will need to be followed up with a review of the corridor patronage forecasts based on the detailed population projections given in the strategy.

9.6 On the basis of the qualitative appraisal set out in Section 8, Option D[1], which comprises 4 new stations, Cobh-Mallow through services and the reopening of the line to Midleton, is the preferred option. However, a fuller quantitative economic analysis is required before any definitive recommendation can be made regarding the preferred option.