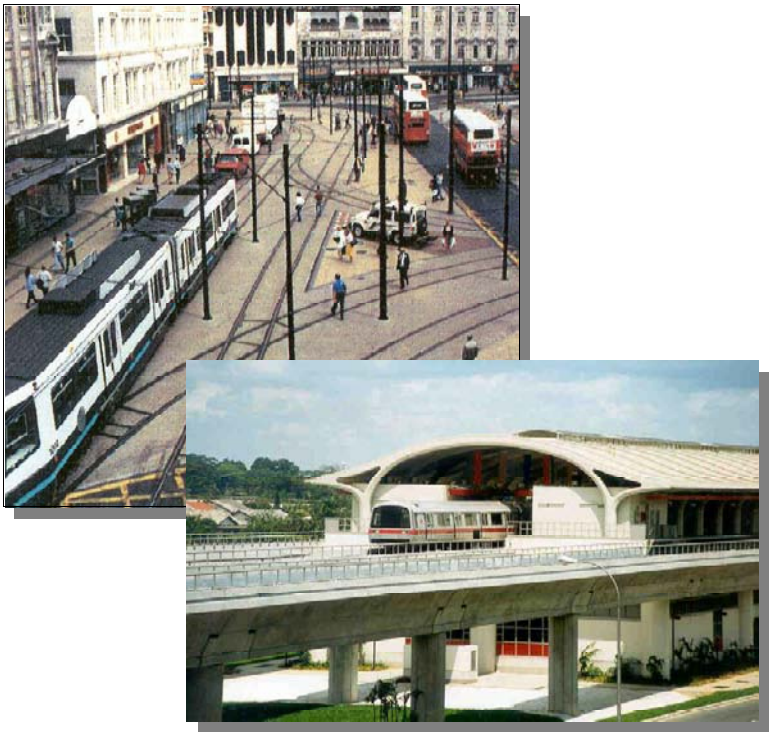
Dublin Metro
Western Route
Phase 1 Alignment Study



Light Rail Project Office

FINAL REPORT

January 2002

WS Atkins

Dublin Metro Study (Phase 1)

Final Report

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EXECUTIVE SUMMARY

The attached report sets out the conclusions of a study undertaken by Atkins McCarthy to identify potential alignments for the western orbital Metro route between Porterstown and the vicinity of the N2/M50 interchange via Blanchardstown Town Centre and the proposed Stadium Ireland Campus site at Abbotstown.

The study has been undertaken in the context of securing one or more alignments in an environment of rapid commercial development where the opportunities for achieving a good surface alignment will be closed off unless satisfactory safeguarding arrangements can be made.

The study commenced with an inception meeting with LRPO on 11 December 2000, and in earnest at the beginning of January 2001 as mapping and other background material became available. The main activities included:

- Review of background land use planning data
- Review of DTO strategic demand model
- Identification of opportunities and constraints
- Desk-top reviews of potential alignments, supplemented by site visits to check the feasibility and other potential local issues
- Liaison with a range of outside parties including the two main bus operators - Dublin Bus and Bus Éireann, Iarnród Éireann, Fingal County Council, main utilities companies, Sports Campus Ireland Limited and other key stakeholders or their consultants

The general area of study was defined by the route outlined in the DTO Strategy document “A Platform for Change”.

Nineteen potential routes were identified, including sub-options, nine of which centred on three main corridors along the Blanchardstown Road axis and ten further combinations of options through the residential areas of Castaheany and Littlepace to the west of Blanchardstown, the industrial developments around Damastown, Parlickstown

and Mitchelstown, and the Mulhuddart residential area. Of the nine Blanchardstown Road corridor routes, six would penetrate Blanchardstown Town Centre whilst the other three would serve the centre from a station on Blanchardstown Road South. Certain of the Castaheany routes could loop back to serve Blanchardstown Town centre. All routes except four (Options 10, 12 16 and 18) would serve the proposed new stadium site. The key passenger objectives served are summarised below:

Option	1	2	3	4	5	6	7	8	9
Route	1A	1B1	1B2	2A	2B1	2B2	3A	3B	3C
Blanchardstown Road South	•	•	•	•	•	•	•	•	•
Blanchardstown Town Centre				•	•	•	•	•	•
Mulhuddart	•			•					
Blanchardstown Road North		•	•		•	•			
Blanchardstown Business Park		•			•		•	•	•
Blanchardstown Business and Technology Park			•			•			
Balycoolen Industrial Park	•		•	•		•			
Snugborough Road							•	•	•
Ballycoolen Road	•		•	•		•	o	o	o
Sports Campus Ireland	•	•	•	•	•	•	•	•	•
Rosemount Business Park	•	•	•	•	•	•	•	•	•
Stadium Business Park	•	•	•	•	•	•	•	•	•
Business Parks (N2/M50)	•	•	•	•	•	•	•	•	•

o Note: Options 7, 8 and 9 (routes 3A, 3B and 3C) serve only the eastern end of Ballycoolen Road, i.e. east of Snugborough Road

The table below provides information on a range of locations/developments served by the more westerly alignments. These alignments have two different starting points either Porterstown station or Clonsilla station, but the route options for the remainder of the alignment are otherwise the same. Alignments beginning at Porterstown station serve the residential areas of Charnwood/Lohunda Park and Portersgate. Options originating at Clonsilla station access the developments in western Clonsilla including Portersgate and Windermere/Aldermere. A further option is provided in an easterly direction from Clonsilla station linking into the Blanchardstown Road routes.

Option	10	11	12	13	14	15	16	17	18	19
Route	DFAI	DFC	DGAI	DGB	DGC	DHC	EFAI	EFC	EGAI	EGC
Hartstown – Manorfields	•	•	•	•	•	•	•	•	•	•
Castaheany	•	•	•	•	•	•	•			
Littlepace	•	•	•	•	•	•				
Hunstown						•	•	•	•	•
N3 – Navan Road	•	•	•	•	•	•	•	•	•	•
Westpoint Business Park	•	•					•	•	•	
Mulhuddart Wood			•	•	•				•	•
Parlickstown	•						•			
Church Road	•		•				•		•	
Blanchardstown Road North				•						
Blanchardstown Town Centre		•			•	•		•		•
Blanchardstown Corporate Park	•		•				•		•	
North West Business Park	•		•				•		•	
Milleum Business Park	•		•				•		•	

The options were subjected to an evaluation framework where the performance of each option was considered against a range of criteria, namely:

- The ease of construction and/or time required for implementation
- Capital Cost
- Residential catchment
- Employment catchment
- Environmental Impact
- Serving New Development
- Serving Blanchardstown Town Centre
- Impact on through journey times
- Safety considerations (especially level of segregation)

- Extent to which it contributes towards the achievement of an integrated transport system

Our initial assessment of the performance of each of the routes is summarised in the following tables:

Evaluation Framework for Option Assessment – Blanchardstown Road Corridor

	Option								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Route	**1A**	**1B1**	**1B2**	**2A**	**2B1**	**2B2**	**3A**	**3B**	**3C**
Criterion									
Ease of Construction/Time to implement		Fair	Fair		Difficult	Difficult		Very difficult	Very difficult
Relative Capital Cost		Very good	Very good		Very good	Very good		Good	Fair
Residents within 800 metres		Very poor	Very poor		Very poor	Very poor		Very poor	Very poor
Employment within 800 metres		Poor	Fair		Poor	Fair		Poor	Poor
Environmental Impact		High	Low		Low	Low		High	High
Serving New Development		Poor	Fair		Poor	Fair		Fair	Fair
Serving Blanchardstown Town Centre		Very poor	Very poor		Fair	Fair		Very good	Very good
Through journey times		Very Good	Good		Good	Good		Good	Good
Safety (Level of Segregation)		Moderate	Moderate		Moderate	Moderate		Good	Good
Transport Integration		Fair	Fair		Very good	Very good		Good	Good

Evaluation Framework for Option Assessment – Castaheany Corridor

	Option									
	10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Route	**DFAI**	**DFC**	**DGAI**	**DGB**	**DGC**	**DHC**	**EFAI**	**EFC**	**EGAI**	**EGC**
Criterion										
Ease of Construction/Time to implement	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Poor	Fair	Poor
Relative Capital Cost	Good	Very Poor	Fair	Fair	Poor	Poor	Good	Poor	Good	Very Poor
Residents within 800 metres	Good	Good	Good	Good	Very Good	Very Good	Good	Good	Very Good	Very Good
Employment within 800 metres	Very Good	Fair	Very Good	Fair	Poor	Poor	Very Good	Poor	Good	Very Poor
Environmental Impact	High	Moderate	Moderate	Low	Low	Moderate	High	Moderate	Moderate	Moderate
Serving New Development	Very Good	Good	Good	Fair	Good	Good	Good	Good	Good	Good
Serving Blanchardstown Town Centre	Very Poor	Very Good	Very Poor	Very Poor	Very Good	Very Good	Very Poor	Very Good	Very Poor	Very Good
Through journey times	Very Poor	Very Poor	Very Poor	Poor	Poor	Very Poor	Very Poor	Very Poor	Very Poor	Poor
Safety (Level of Segregation)	Good	Good	Good	Fair	Good	Good	Good	Good	Good	Good
Transport Integration	Poor	Very Good	Poor	Poor	Very Good	Very Good	Poor	Very Good	Poor	Very Good

LRPO commissioned the consultants in September 2001 to undertake some modifications to the DTO model to compare demand forecasts associated with alternative alignments and to assist the process of option evaluation. The results of this work have been incorporated into this report.

The alignments were the subject of discussion at a ½-day workshop held with key stakeholders on 25 July, attended by developers, BTC, Fingal CC, Bus Eireann, Iarnród Éireann, BAC, Stadium Ireland, DTO and the main local residents group. Fingal County Council responded formally to the initial proposals in a letter dated 21 September 2001 to LRPO in which the Council expressed a strong preference for the metro to be aligned via the Blanchardstown Road corridor. Within this set of options, the Council expressed a preference for Option 5 (Route 2B1) or alternatively one of the alignments along the Snugborough Road corridor – Options 8 or 9 (Routes 3B or 3C). The Council made a number of other comments, including a suggestion that the metro be routed underground in the vicinity of Blanchardstown Town Centre, and that the interchange with the Maynooth railway line be located at Porterstown.

In addition to identifying potential alignments, the brief required the study team to identify a suitable depot site within the study area, together with one or more potential Park and Ride sites.

Conclusions

The principal conclusions of the study can be summarised as follows:

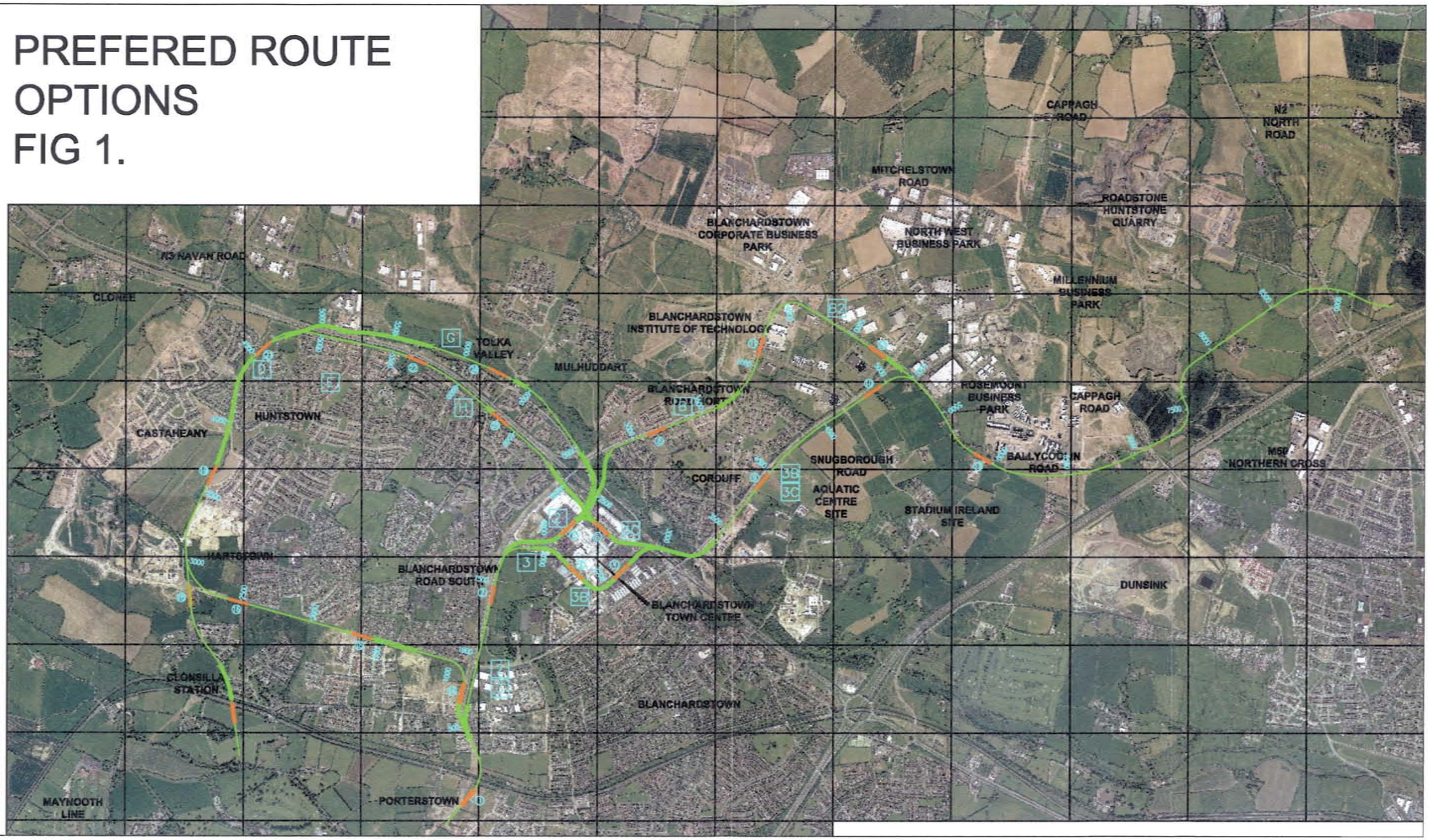
- More travel demand is generated by study area residents than by study area businesses and employers, with a net outflow from the study area in the morning peak

- Although the dominant study area movement is to and from the City Centre, there is a significant demand for peripheral movement;

- The dominant peripheral movements are to areas to the south, particularly Tallaght, though there is a significant travel demand to and from the Airport

N

PREFERED ROUTE OPTIONS FIG 1.



KEY

ROUTE OPTION
PROPOSED SITE OF STATION

Oifig Chonsaltóireacht Iarnród Sráide
Light Rail Project Office

Atkins McCarthy

DUBLIN METRO WESTERN ORBITAL ALIGNMENT STUDY

PREFERRED ROUTE OPTION

Drawn: PH | Status: PRELIMINARY
Designed:
Checked:
Approved:
Date: 14.11.01
Scale: 1:10000
Cad file: 1840RL015REV1
Org. No.: 1840 RL 015
Rev: 1

- Demand for trips entirely within the study area is significant but of a lesser magnitude than the movements highlighted above. Most of these trips are to the new development areas in the north-east of the study area adjacent to the N2

- Porterstown or Clonsilla would appear to be a suitable location for an interchange between the Metro and the Maynooth Line of the suburban railway, although careful consideration will need to be given to the ultimate likely capacity of the interchange

- All alignments serve the proposed Stadium Ireland site with the exception of Options 10, 12 16 and 18

- Based on the catchment analysis, the more westerly alignments via Castaheany appear to have greater scope for attracting patronage from within the catchment area of stations than routes via Blanchardstown Road South, although this has not been confirmed by the results of the DTO modelling work

- The catchment/patronage potential of the Porterstown area is likely to be significantly higher than the potential catchment around Clonsilla station

- Taken together the previous two conclusions suggest that, in terms of resident and employment populations within the catchment area of the alternative alignments considered, and excluding visitors to Blanchardstown town centre and the Stadium, a route starting at Porterstown and then running via Castaheany has the greatest patronage potential whilst routes starting at Clonsilla and running via Blanchardstown Road have rather lower patronage potential.

- The more circuitous routeings are however likely to render Castaheany alignments less attractive for trips to, from or through the study area, especially with a Porterstown 'entry point' at the southern end of the study area. These factors raise issues as to the role of the Metro vis a vis other public transport modes, and in particular suburban rail for journeys to and from the city centre

- The disaggregation work carried out on the DTO model suggested that levels of patronage on the Western Orbital route were broadly similar regardless of alignment within the Phase 1 study area

- Blanchardstown town centre would appear to be a suitable location for a major multi-modal interchange and, although there is as yet no firm consensus as to its precise location or configuration, a number of possibilities exist both within the Shopping Centre site and along Blanchardstown Road South. A general preference at the stakeholder routings workshop for the interchange to be located at Blanchardstown town centre

- There would appear to be scope for provision of a major park and ride facility at a station at the eastern end of the study area in the vicinity of the N2/M50 interchange. Consideration might also be given to an additional facility for more local users in the Stadium area

- A depot capable of accommodating up to 100 four-car trains could be provided in the vicinity of the N2/M50 interchange

- Whilst any adverse environmental impacts of the Metro within the study area should be capable of alleviation through appropriate mitigation measures, there is likely to be strong resistance to the Metro proposals from those people directly affected by the Metro route(s) on the grounds of noise and visual intrusion, severance and loss of amenity. There will be offsetting environmental benefits associated with the reduction in traffic levels resulting from mode shift from private cars – noise, exhaust emissions etc. Environmental impacts are likely to constitute major issues to be addressed in scheme development and may potentially be significant obstacles to successful implementation

- Assuming Porterstown forms the 'entry point' for the Metro at the southern end of the study area, total construction costs are likely to be in the broad range [text deleted] for the Blanchardstown Road routes, or higher at around [text deleted] for the Castaheany routes, excluding rolling stock and depot

- Options involving the Metro entering the study area at Clonsilla would increase construction costs for Blanchardstown Road routes by roundly [text deleted] and reduce the cost of Castaheany routes by approximately [text deleted] compared with above

- The additional cost of routing Blanchardstown Road alignments (Options 2, 3, 5, 6 and 13) via Mitchelstown and Huntstown (the 'Industrial Loop') instead of Ballycoolen Road and Cappoge is in the order of [text deleted]

- The additional cost of extending the industrial loop routes (Options 10, 12, 16 and 18) via Mitchelstown and Huntstown to serve the stadium as well (the 'Stadium Loop') is in the order of [text deleted]

- Approximately 6-7 trains costing some [text deleted] (including allowance for spare vehicles) would be required to operate a five-minute headway service over the study area section of route for the Blanchardstown options (1 – 9). 9-10 trains (cost roundly [text deleted] would be required to operate the Castaheany routes (options 10 – 19)

- The total cost of the alternatives considered, including allowances for rolling stock, contingency, client costs, VAT and property acquisition, lies in the following range:

	BT Road Corridor		**Castaheany Corridor**	
	From Porterstown	From Clonsilla	From Porterstown	From Clonsilla
	€ million	€ million	€ million	€ million
Base Cost	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Rolling stock cost	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Contingenc	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Client Costs	15-19	16-20	19-28	18-26
VAT	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Grand Total (rounded) +	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Cost Range (-10%/+40%)	[text deleted]	[text deleted]	[text deleted]	[text deleted]

* Assumes no change in rolling stock requirement when starting at Clonsilla. At the margin, starting at Clonsilla may require an additional train for the Blanchardstown Road corridor compared with running from Porterstown. Conversely it may be possible to save a train when starting from Clonsilla and running via Castaheany

\+ The cost ranges of the individual elements are not additive, hence there may be apparently small discrepancies in the total range

- There appear to be no insurmountable problems with utilities although a major gas main along Blanchardstown Road North will need to be diverted (Options 2, 3, 5, 6), the cost of which is likely to be in the broad order of [text deleted]. Further work is required to assess the works involved, and to determine the most cost effective practicable solution

Taking account of the above factors, coupled with feedback from the stakeholder consultation meeting held on 25 July, it is considered the following alignments should be carried forward for wider public consultation:

- Option 6 (Route 2B2) serving the Blanchardstown Road corridor via:
  - Blanchardstown Road South
  - BTC
  - Blanchardstown Road North
  - Ballycoolen Road
  - Stadium

- Either Option 8 or 9 (Route 3B or 3C) serving:
  - Blanchardstown Road South
  - BTC (Route 3B runs via the south west and south east faces of the centre, route 3C runs via the north west and north east faces)
  - Snugborough Road
  - Ballycoolen Road
  - Stadium
- Either Option 14 or 15 (Route 4DGC or 4DHC) serving:
  - Central Castaheany (Littlepace)
  - Mulhuddart
  - Blanchardstown Town Centre, thence via Route 3C along the Snugborough Road corridor

The routes are illustrated in Fig. 1.

In this context, it should be noted that Fingal County Council is likely to resist strongly options via Castaheany or the northern industrial areas, having expressed a strong preference for an alignment along the Blanchardstown Road corridor. The Council's preferred alignment (Option 5, Route 2B1) is a variant of Option 6 above, or alternatively Options 8 or 9 (Routes 3B or 3C), and these alignment options could therefore reasonably be expected to receive the Council's support in principle. Conversely, Options 14/15 would be very unlikely to be supported by FCC.

Although not directly relevant to the conclusions on route choice, there are a number of policy issues which need to be borne in mind in the process of refining options, including:

- The need for land use plans to be developed in a manner which provides high levels of public transport accessibility and inter-modal integration. This may require additional pressure on the relevant local authorities and developers

- The nature of the proposed deregulation of bus services which may affect Metro revenue and hence the ability to secure capital funding from potential PPP bidders

1. INTRODUCTION

Context

1.1 The Dublin Transportation Office's (DTO) September 2000 strategy document, "A Platform for Change" sets out a vision of an integrated multi-modal transportation strategy for the Dublin area, to be delivered over the next 15 years. The strategy identifies a Metro system as a key element of the vision for the strategic transport network.

1.2 The conceptual Metro network outlined in "A Platform for Change" comprises:

- A "spine" from Swords in the north, via Dublin Airport, Finglas, Broadstone, City Centre, Ranelagh, Sandyford, terminating at Shanganagh in the south. It is envisaged that this route will incorporate LUAS Line B, suitably upgraded to Metro standards between Sandyford and Ranelagh
- Tallaght West to City Centre via Tallaght and Kimmage
- A western orbital route between Finglas and Tallaght via Blanchardstown and Clondalkin

1.3 The western orbital route, as envisaged in the DTO's plan, is to serve Tallaght, Clondalkin, Liffey Valley Shopping Centre, Porterstown, Blanchardstown, Ballycoolen and Cappagh, and linking with the Swords route in the vicinity of the N2-M50 Interchange. This orbital route traverses an area of ongoing rapid development in Greater Blanchardstown, and the development pressures are such that preferred alignments need to be safeguarded at an early stage. This will ensure that the Metro can be routed to serve major existing and proposed developments in the corridor optimally and maximise its contribution to meeting wider economic and transportation planning objectives. It is also important in planning terms to identify the preferred alignment(s) at the earliest possible stage in order that detailed planning of developments reflects the existence of a high quality public transport system, and for that transport system to be properly integrated into the urban infrastructure and built fabric.

1.4 The Dublin Light Rail Project Office (LRPO) is developing alignment proposals for the western orbital route of the Metro in two stages:

- Porterstown to N2/M50 Interchange area where it would link to the north-south spine route (Phase 1), and
- Porterstown – Tallaght (Phase 2)

1.5 Following discussion with Aer Rianta and a competitive tendering exercise, LRPO is appointing consultants to undertake a larger scale and more detailed feasibility study for potential alignments linking Dublin Airport with the City Centre and on to Tallaght.

Background to Commission

1.6 Atkins McCarthy was appointed by the Dublin Light Rail Project Office to undertake a feasibility study of alternative alignments for Phase 1 of the Western Orbital Route. The limits of the study area were defined as Porterstown in the south/west to the junction with the Swords route in the north/east, with pre-requisites to serve Blanchardstown and Mulhuddart. Suitable locations for inter-modal interchanges (including Park and Ride) were to be identified, and the study was required to consider the impact of the proposed new Stadium. The brief also required the study team to identify a suitable depot location.

1.7 A study inception meeting took place on 11 December 2000 to clarify and confirm the study scope, receive relevant background documentation and to identify requirements for mapping and other essential study materials.

1.8 During the course of the study, and in discussion with LRPO, it became clear that alternative routeings to the north and west of the study area, for instance through the rapidly developing areas of Castaheany, Littlepace, Clonsilla and Castleknock residential areas and the zoned industrial area to the north, would merit consideration alongside alignments in the defined study corridor. Accordingly, it was agreed with LRPO that the study area should be widened to encompass these areas. More recently, Atkins McCarthy was commissioned to undertake the Phase

2 study (Porterstown/Clonsilla – Tallaght) and this is currently nearing completion.

1.9 This report sets out the conclusions of Phase 1 of the study. It identifies a number of alignment options and sub-options along the corridor centred on Blanchardstown Road North and South (Options 1-9) and via Castaheany (Options 10-19). Initial conclusions from Phase 2 will be submitted in a separate report.

Structure of Report

1.10 Following this introductory section, Chapter 2 summarises the planning and environmental issues needing to be considered in comparing and evaluating options, followed in Chapter 3 by a review of transport planning and policy considerations. Chapter 4 provides an overview of demand related issues, based on the results of the zonal disaggregation work carried out using the DTO model.

1.11 Chapter 5 summarises the key design parameters adopted against which proposals were developed, and outlines the alignment options considered together with preliminary suggestions for the location of stations. It also provides an initial assessment of the size of footprint required for a depot, and conceptual outlines for the size of footprint required for major and minor stations.

1.12 Chapter 6 sets out comparative construction costs for each of the shortlisted options, followed in Chapter 7 by an outline evaluation. This is followed in Chapter 8 by our conclusions and recommendations.

2. PLANNING AND ENVIRONMENTAL ISSUES

2.1 This section aims to review the relevant sections of strategic and local planning documents and to consider the overall environmental issues that can arise. It is important to recognise that it is largely the scale and pace of development within the Greater Blanchardstown area that has led to the consideration of Metro alignments in this area ahead of potential alignments in other parts of the Greater Dublin area.

Strategic Planning Issues

2.2 Nationally, the Government has recognised that recent economic success has brought considerable benefits to Ireland, but has also brought a set of problems that need to be addressed if the economy is to continue to grow. These concerns are addressed in the National Development Plan (NDP) 2000-2006. The NDP illustrates the details and costs of the infrastructure that will be required to facilitate continued economic growth. It is recognised that road and rail links need significant improvement as well as improved links to export markets via seaports and airports.

2.3 There is an acknowledgement that recent economic success has brought a specific set of problems particularly in the Dublin region, due to the over-concentration of growth in this area. The need for a better spread of investment throughout the country is the main principle behind the emerging National Spatial Strategy (NSS).

2.4 The Strategic Planning Guidelines for the Greater Dublin Area (published in March 1999 and subsequently updated in April 2000 and 2001) provide an assessment of strategic options for the future growth of the Dublin region based on promoting sustainable patterns of development. The preferred Strategy is based on the consolidation of growth in the Dublin city area, with containment of growth within the Dublin Metropolitan area, the establishment of Strategic Green Belt areas in the hinterland, and a number of primary and secondary development centres based on existing towns in the hinterland. In terms of transportation there is emphasis on public transport improvements.

Fingal County Development Plan 1999

2.5 The Development Plan for the study area is the Fingal County Council Development Plan 1999. In the Phase 1 area the main focus of the Development Plan is the retention of Blanchardstown's status and development of the town as the largest urban settlement

within Fingal County. This aim is accompanied by objectives to provide for social, cultural and local tourism facilities, and the continued development of Blanchardstown as a residential, commercial and industrial centre. Blanchardstown is seen in planning terms as a stand-alone town on the edge of Dublin City, with a significant population, centred on a town centre with a range of uses. At present the development of the town as a relatively self sufficient community has not yet been achieved and anecdotal evidence would suggest that there are large volumes of commuters living in the area, and that the town centre actually functions for the moment as an edge of centre/out of town regional shopping centre for the Greater Dublin area.

2.6 The main areas zoned for development as residential and employment are to the north and north west of the existing town centre. The Plan forecasts a population of 100,000 for Blanchardstown in the longer term. (More recently consideration has been given to a population in the longer term reaching 170,000). There is a general aim of providing residential development in a form that will encourage the use of public transport by promoting higher densities in proximity to railway stations and principal bus routes. A greater mix of dwelling types will also be encouraged. This aim is largely in response to the current dominant form of residential development that has taken place in the last few years in the Blanchardstown area. At present, the area is typically characterised by residential estates of suburban character, dominated by semi-detached three-four bedroom dwellings, in traditional cul-de-sac layouts, with boundaries of continuous solid wall or railings. This form of development is not conducive to high levels of accessibility by public transport. Notwithstanding the statements in the Plan, we note that the layout of new developments in Castaheany, Littlepace etc are still proceeding along these more traditional lines and we consider this is going to make it difficult to achieve the ambitious mode split targets to which the DTO aspires in its Strategic Plan (see Chapter 3).

2.7 The adoption and publication of the Development Plan actually predates the announcement of the Metro. However the Plan states that the Council will continue to work closely with the Light Rail Project Team with the aim of selecting a light rail route that meets the needs of the citizens of Fingal. A range of potential alignment options are envisaged.

2.8 The zoning maps accompanying the Development Plan document show potential alignment options for both heavy rail and light rail. The proposed alignment for the heavy rail links Porterstown to Blanchardstown with an alignment adjacent to Blanchardstown Road South. There are no light rail or metro alignments shown for the study area on these maps.

2.9 Work is currently being carried out on the preparation of the Blanchardstown Area Integrated Development Framework Study on behalf of Fingal County Council and the Dublin Transportation Office. The latest progress report on the study notes that some 650 hectares have been zoned for industrial development of which only 205 has been developed to date. It is envisaged that some 10,000 additional housing units will have been developed by 2005.

Local Planning Issues

2.10 In developing Metro alignments, it should be recognised that there will be a corresponding need for a more sustainable settlement pattern. Integration is achievable in new developments and this opportunity should be available in the Blanchardstown area with a suitably robust planning regime. The scale of growth in the study area is unprecedented, and presents significant opportunities for innovation. However the scale of growth also represents a significant challenge for planners, given the location on the north west edge of Dublin city. The scale and pace of development also creates difficulties in developing alignment options for the Metro, as constraints arising from construction and completion of development may reduce the options available. Although much of the most recently developed and emerging urban form in the Greater Blanchardstown area could be classed as relatively low density for both residential and employment, this pattern of development actually leads to a substantial volume of land utilised for development. This results in a large surface area being densely covered with development, particularly in the form of housing.

2.11 The development of the Stadium Ireland Campus within the study area also represents a significant challenge and opportunity in developing Metro alignment options. The conceptual masterplan for this development shows a development on an international scale, with a mix of uses. It is noted that the location of the more dense uses to the north

of the site provides an opportunity to serve significant numbers of employees and visitors by Metro.

2.12 The Blanchardstown Town Centre is another major factor. There are aspirations to develop a more cohesive town in Blanchardstown incorporating a greater range of uses in the town centre, reducing severance from the surrounding residential areas, and creating higher densities of development. The Metro would assist in reducing the impact of the car, improving accessibility, reducing the need for car parking, and facilitate higher density development.

2.13 The significant areas of land zoned for a range of industrial uses in the study area is an important consideration. Recent developments in this area include some of the major inward investors for the Irish economy, with American firms such as IBM having significant facilities. There is therefore a substantial potential catchment of employees making trips to/from these industrial areas. However it should be noted that these developments are typically "campus style" and not necessarily conducive to access by public transport, particularly given the amount of free car parking at these sites. In the longer term future, provision of a Metro system in this area could act to increase the density of developments in the study area, by increasing levels of accessibility for public transport and reducing the need for the provision of large-scale car parking. Although development in these industrial areas has occurred at a pace in recent years there remain substantial areas of undeveloped zoned land, particularly in the Damastown and Mitchelstown areas. It is likely that the future development of these lands will be closely linked to the performance of the national economy.

2.14 In general, transport (particularly rail) infrastructure required to achieve the objectives should be provided at an early stage in order that:

- New development can be focused on, and properly integrated with, public transport nodes rather than transport infrastructure having to be 'shoe-horned' into existing developments; and
- People have access to public transport, cycleways, attractive and safe walkways and other essential infrastructure from the outset, and hence less likely to get into the 'car habit'.

Environmental Issues

2.15 In considering the environmental issues that could arise from the Metro system a review was carried out of Environmental Impact Statements from major transportation projects. The LUAS Dublin LRT Environmental Impact Statement of March 1997 supplied information on impacts arising from a new railway development. These include:

- Human Beings - inconvenience in terms of parking and access during the construction period, potential demolition of property, increased employment opportunities, modal shift away from private car use;
- Fauna and Flora - the EIS predicted disruption to fauna and flora at one important site i.e. the Grand Canal where two protected species occurred. Impacts were also expected during construction resulting in the loss of hedgerows, grassland and marshy grassland. However after mitigation measures were applied no significant impacts were expected.
- Noise/Vibration - adverse impact during construction and operation on sensitive receivers particularly residential properties, schools and hospitals;
- Lighting - adverse impact on sensitive receivers particularly during construction from night time working;
- Landscape and Visual - adverse impact during construction from removal of planting, excavation and installation works. However, positive impacts on the environment were predicted from the design of street furniture and trackside elements associated with the railway;
- Material Assets – adverse impacts during construction from diversion of public utilities out of proposed track bed; and
- For the LUAS no significant impacts were predicted on the soil, water, air, property and archaeology or arising from electromagnetic fields or 'stray' electrical currents.

2.16 A comparative review of Environmental work for a selection of major road schemes revealed the following general impacts:

- Humans Beings – of greatest importance to sensitive receivers living near to the route is minimising impacts on property, both residential and heritage, particularly arising from the compulsory purchase, visual, noise and disturbance to land designated for recreation and amenity;

- Fauna and Flora - adverse impacts on conservation sites and national designated sites e.g. Natural Heritage Areas. These sites are most vulnerable during the construction period as damage can result from excavation and storage of materials near to these areas.

- Noise/Vibration - impacts on residential properties arising from the construction and operational periods. Where proposed road noise levels are above 68dB(A) (18hour) noise abatement measures are put into place including: acoustic barriers or earth mounding, double glazing or the use of low noise road surface material;

- Geology/Soil - The nature of the underlying geology and soil will influence the construction method and hence the cost for the motorway, particularly for any associated structures such as bridges and culverts;

- Water - motorway development spanning or passing close to existing water courses can have detrimental effects, particularly during the construction period. Typical effects during construction are depositing dust, temporary spillage of oil from plant and equipment, and from the disposal of foul drainage. During the operational period common impacts arise from surplus surface run-off from earth works and pollutants from the highway pavement;

- Air - impacts arising during construction from dust. Due to an ever increasing proportion of old cars being replaced by new cars fitted with catalytic converters, predicted pollutant concentrations during the operational period for new roads rarely compromise any statutory guideline air quality criteria;

- Climate – climatic features affecting motorway design include wind speeds and the direction of the predominant wind and any cross-winds, average rainfall, rainfall intensities (affecting construction period) and return periods which may

influence the drainage design of bridges and the incidence of fog and snow. The presence of cross-winds may require special designed wind barriers;

- Landscape - impacts are likely to be significant if the landscape has been designated as being of local, regional or countrywide importance, if the development will substantially alter the existing character of the area or if visual intrusion or visual obstruction has occurred. Other issues affecting visual quality are lighting, signage and wind/noise barriers, the location of which must be assessed from visually sensitive receivers;

- Material Assets - impacts may arise from the sterilisation of development land as identified in local Development Plans which could compromise adjacent land uses. There should be no significant generation of waste materials or disposal issues which may affect local property or land. Other effects on material assets arise from unnecessary land take or demolition/removal of existing structures, removal or serious degradation of significant land designation; and

- Cultural Heritage - earth moving operations, spoil excavation and site re-contouring as part of motorway construction all have the potential to disturb or even destroy features of historical or archaeological interest.

- For major motorway schemes, the route selection process will influence the proximity of the development to sensitive receivers. The closer the development is to sensitive receivers, the greater the mitigation required to reduce both construction and operational impacts. Elements of motorway design, which are of greatest concern to the public, appear to be impact on property, noise/vibration and visual. Careful and detailed mitigation measures for these elements will influence the overall perceived environmental impact.

2.17 In order to build up a picture of the environmental constraints which would influence the alignment options for the Metro, a desk top study was carried out using Ordnance Survey mapping and the Fingal County Council Development Plan 1999. A series of site visits was carried out to note general vegetation types and to assess landscape character, visual amenity and principal views. Environmental constraints for the study area are shown on Drawing No.1840-RS004 as Fig. 2.1

2.18 Key emerging environmental issues affecting the alignment options for the Metro are: the preservation of zoned land, impacts on Cultural Heritage sites, noise impact on residential properties, visual impact from elevated structures and diversions of public utilities.

2.19 Preserved zoned land relates particularly to that zoned G on the Fingal County Council Development Plan 1999, which includes Tolka Valley Park, Dunsink and land to the north of the Royal Canal between the M50 and Ratoath Road. The objective for zone G is to protect and improve high amenity areas. The Metro will pass through this area (possibly elevated) and careful attention will be required to avoid severance of land, to maintain public access and minimise disruption to existing planting. Additionally aesthetic treatment to elements of the superstructure such as piers, abutment and noise barriers to reduce their perceived size will help to assimilate the Metro into the landscape.

2.20 The Royal Canal is an important Cultural Heritage site located along the southern boundary of the study area. The Metro will cross the Royal Canal in the locality of Porterstown or Clonsilla to enter into the study area. The Fingal CC Development Plan states that there is a commitment to protect and develop the canal for amenity and recreation having due regard to the need for nature conservation. Minimising disruption to protected species living within the Grand Canal corridor at the southern boundary of the study area will be a key environmental issue as noted in the LUAS EIS. The design of new bridges crossing over the Canal should consider the traditional style of bridges within the canal corridor and the use of materials sympathetic to the surroundings.

2.21 The Metro is likely to pass close to residential properties, particularly along Blanchardstown Road South and Hartstown Road. Agricultural land between existing residential development off Hartstown Road and the proposed Ongar Road Link has been zoned for further residential development by Fingal County Council. Environmental constraints within these proposed residential areas and their immediate surrounds include four stud farms, namely Littlepace Stud, Williamstown Stud, Ongar Stud, and Clonsilla Stud and two public amenities - St. Joseph's Hospital and Hartstown Park.

2.22 Impacts arising from noise and vibration from the Metro will be a key issue in the project Environmental Impact Statement (EIS). Sensitive receivers will be people in residential properties, patients and staff of hospitals and animals in the stud farms. Mitigation measures which could be applied fall into three categories

(i) At source - this method includes electric traction (as opposed to diesel), wheel skirting, floating track construction and quiet wheel/rail interaction

(ii) Between source and receiver - this includes distance, intervening barriers (absorbent versus reflective)

(iii) At-receiver - this includes noise insulation packages such as double or triple glazing.

2.23 Noise impacts of the Metro will be a function of baseline noise levels in individual areas. Mitigation measures will be required where noise levels exceed standard levels. This cannot be assessed without information on existing baseline noise levels, but will need to be considered at the detailed design stage.

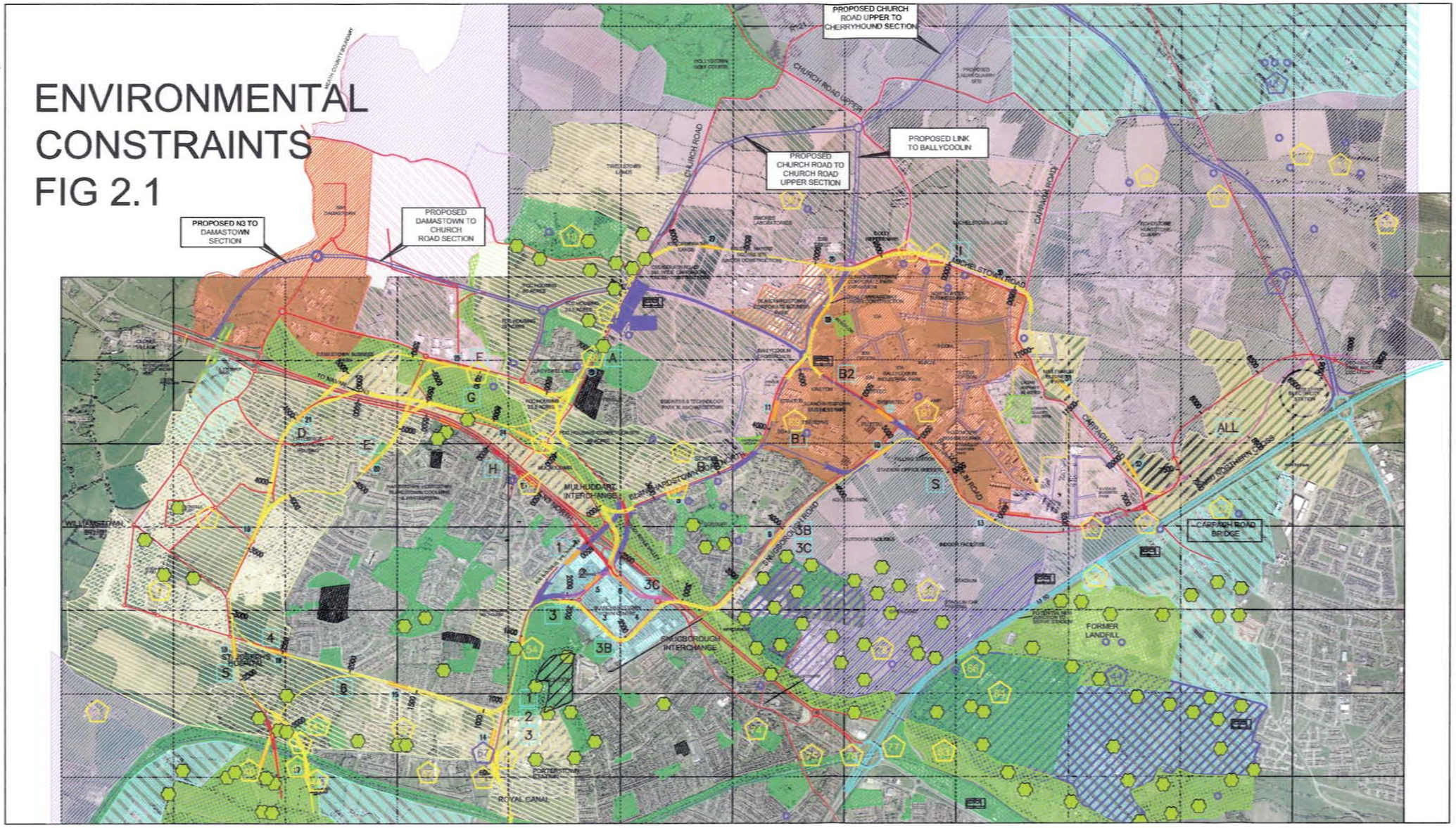
2.24 In order to protect views of special amenity value or of special interest, the Development Plan lists views worthy of protection. Development which would block such a view would be prevented. There are no protected views within the study area. However, it is predicted the Metro will be elevated in sections to pass over major roads and junctions and may cause a degree of visual obstruction and / or intrusion e.g. the M50 at Blanchardstown. The visual assessment for the project EIS should describe mitigation measures to reduce the impacts arising. These may include: aesthetic treatment to the railway superstructure, screen planting or screen walls/fences, earth mounding and tree planting to channel views towards interesting features along the road.

2.25 Public utilities are shown on Drawing No. 1840-RS004 and discussed in detail within Chapter 5, section *Implications for Utilities*. Several significant utilities, e.g. ESB 110kV (overhead) located north west of north of Blanchardstown Road North, proposed 914 mm diameter gas main (underground) also adjacent to Blanchardstown Road North, are located close to (or cross over) the proposed Metro route. Detailed consideration needs to be given to the clearances required for each utility so that an assessment can be made of the feasibility of diversion to allow a complete comparison of proposed routes.

2.26 To summarise, the principal effects of the Metro on the environment of the study area are likely to arise from the compulsory purchase and demolition of residential and heritage property, the alignment crossing preserved zoned land, the proximity to cultural heritage sites, visual impact from elevated structures and local noise impacts.

DO NOT SCALE

ENVIRONMENTAL CONSTRAINTS FIG 2.1



KEY

- TO PRESERVE AND PROVIDE FOR OPEN SPACE AND RECREATIONAL AMENITIES.
- TO PROTECT AND IMPROVE HIGH AMENITY AREAS.
- SENSITIVE LANDSCAPES.
- TO PROTECT AND PROVIDE FOR THE DEVELOPMENT OF AGRICULTURE AND RURAL AMENITY.
- TO PROVIDE FOR GREEN BELTS AND TO PROVIDE FOR URBAN AND RURAL AMENITIES AND AGRICULTURE.
- RESIDENTIAL COMMUNITIES
- NEW RESIDENTIAL COMMUNITIES
- INDUSTRIAL AREAS.
- TO PRESERVE AND PROVIDE FOR SCIENCE AND TECHNOLOGY BASED CAMPUS
- TO PROTECT AND PROVIDE FOR SCIENCE AND TECHNOLOGY PARKS IN A HIGHLY LANDSCAPED AREA
- MAJOR TOWN CENTRE ACTIVITIES
- LIGHT INDUSTRIAL EMPLOYMENT IN HIGH QUALITY LANDSCAPED ENVIRONMENT
- RECORDED MONUMENTS PROTECTED UNDER SECTION 12 OF THE NATIONAL MONUMENTS (AMENDMENT) ACT 1994
- TO PROTECT AND PRESERVE TREES AND WOODLANDS
- PRESERVATION LISTING, LIST 1, STRUCTURES TO BE PRESERVED
- PRESERVATION LISTING, LIST 2, STRUCTURES TO BE CONSIDERED FOR PRESERVATION
- TO PROTECT AND/OR PROVIDE FOR A BURIAL GROUND
- TO PROVIDE FOR TRAVELLERS HALTING SITE/GROUP HOUSING
- PROTECT, PROVIDE AND IMPROVE LOCAL NEIGHBOURHOOD FACILITIES
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED SITE OF STATION

Oifig Chaonscaitol an Iarnród Sráide
Light Rail Project Office

Atkins McCarthy

DUBLIN METRO WESTERN ORBITAL ALIGNMENT STUDY

ENVIRONMENTAL AND PLANNING CONSTRAINTS

PRELIMINARY

23.05.01

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2.27 Conversely, there will be environmental benefits associated with the reduction in traffic levels resulting from mode shift from private cars – lower levels of noise, exhaust emissions etc. – and potentially economic gains from land which might otherwise be used for highway construction being available for alternative productive uses.

2.28 Despite the range of potential mitigation measures which can be applied to the various perceived impacts, and notwithstanding the wider environmental benefits the Metro can achieve through transferring trips which would otherwise be made by car to public transport, the likely scale of adverse reaction to construction of the Metro should not be under-estimated. It is likely that strong objections will be raised by people who are likely to be affected by the Metro, both during the construction period and in the longer term. Objections are likely to be centred particularly on noise and vibration generated by trains, construction impacts and local severance created by the railway. Some alignment options involve disturbance to, or acquisition of, privately owned land or houses.

3. TRANSPORT PLANNING ISSUES

3.1 The Strategic Planning Guidelines for the Greater Dublin Area provide the vision for a better balance between public and private transport based on the principles of sustainable development. This vision includes the need to achieve a reduction in the growth in demand for transport through improved land-use planning and increasing emphasis on transportation alternatives to the private car, in particular the rail network. The guidelines emphasise that future development must be based around public transport and, as a consequence, significant investment in public transport infrastructure will be required. It is acknowledged that private sector involvement is important and the Strategic Planning Guidelines suggest that commercial organisations can become involved in funding public transport operations where these are directly related to their particular facility.

3.2 The Planning Guidelines have been further reinforced by the Strategy for 2000-2016 set out in 'A Platform for Change' published by the DTO in September 2000. The document highlights the massive increase in population and travel demand for the Greater Dublin Area, which have grown much faster in recent years than had been predicted. The population of the Greater Dublin area is expected to rise from 1.46 million to 1.75 million between 1999 and 2016, an increase of 20%. (The latest Regional Population Forecasts, published by the central Statistics Office in June 2001, envisage the level of growth being even higher to 1.91 million by 2016 – an increase of some 31% compared with 1999). The number of households is expected to rise by some 30% over the same period, and employment by around 45%. Car ownership levels are also expected to rise considerably.

3.3 The DTO Strategy is therefore centred on a combination of demand management measures aimed at reducing the demand for travel and encouraging a transfer of trips (especially during peak periods) from cars to sustainable modes, e.g. public transport, cycling and walking, and substantial expansion of the public transport network. The Strategy envisages use of supporting complementary land use policies to achieve the goals.

3.4 The DTO Strategy envisages major improvements in the supply and quality of public transport and selective improvements to the highway network designed to improve flow without encouraging peak period commuting. Traffic and demand management measures are also envisaged to encourage transfer to public transport modes and optimise use of the

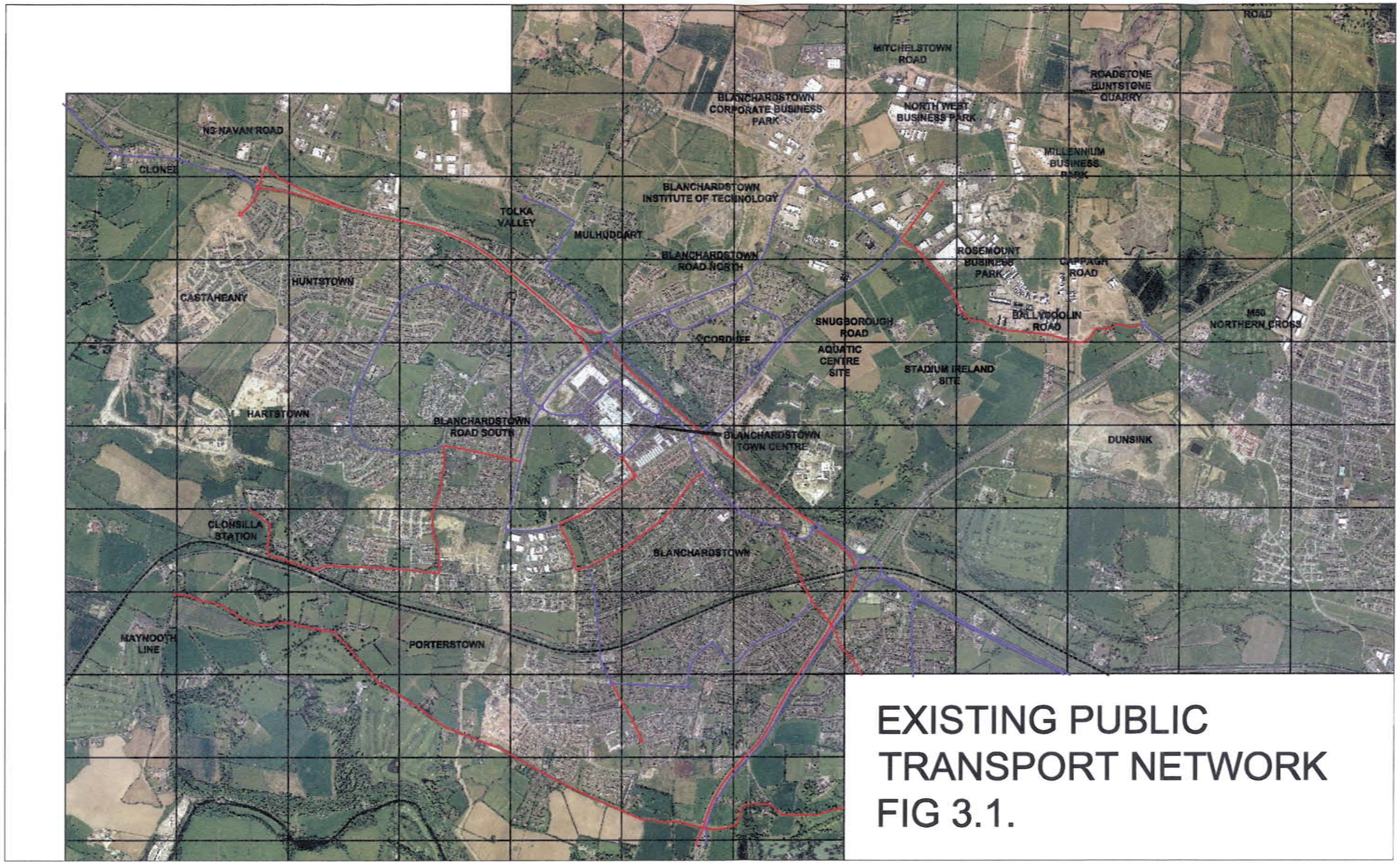
highway network, e.g. through implementation of road user charging, workplace parking levies, fiscal disincentives and mobility management plans.

3.5 The mode split targets envisaged in the Strategy are ambitious. The DTO forecasts that implementation will increase the proportion of peak hour trips made by public transport to some 63% compared with around 25-30% currently. The proportion of trips to and from the city centre is forecast to increase to some 85%. This high public transport mode share is comparable to that achieved in London during the morning peak where there are well established comprehensive suburban rail and Metro systems, and a strong presumption against the use of cars through tight controls on the supply of public on-street and off-street car parking, and correspondingly very high levels of parking charges. Whilst acknowledging the Strategy has only fairly recently been published, we note the layouts of new residential and commercial/industrial developments currently under construction are not generally compatible with high levels of public transport accessibility and mode share. Urgent action needs to be taken by the relevant planning authorities to encourage developers to make new residential developments more 'bus friendly', and to locate high density developments close to public transport nodes, especially rail stations.

3.6 The DTO Strategy emphasises the importance of achieving high levels of inter-modal and intra-modal integration – between rail/Metro and LUAS, and provision of bus feeder services to stations. The Strategy envisages it being "…possible to make almost all journeys on the public transport network with only one interchange". The opportunities for providing interchange with other modes will therefore be a major consideration in alignment choice for the Metro.

Public Transport Developments in Dublin

3.7 Buses form the mainstay of the current public transport network in Dublin, serving all the main radial corridors; orbital services are, however, relatively limited. In common with other major cities, bus service reliability, and hence the attractiveness of services to passengers, is inhibited by worsening traffic congestion resulting from increased levels of car ownership and use. This is being addressed through the progressive implementation of Quality Bus Corridors (QBCs) along key radial and orbital routes. Rail services operate along a number of radial corridors, focusing on Connolly, Tara and Pearse stations on the 'Loop Line' in the city centre, or on Heuston – some 2km to the west of the main



EXISTING PUBLIC TRANSPORT NETWORK FIG 3.1.

KEY

- HIGH FREQUENCY ROUTE
- LOW FREQUENCY ROUTE
- RAIL WAY LINE

Oifig Chóras Iompair Solais
Light Rail Project Office

Atkins McCarthy

DUBLIN METRO WESTERN ORBITAL FREQUENCY STUDY

EXISTING PUBLIC TRANSPORT NETWORK

PRELIMINARY

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commercial area. The contribution made by the rail network is however limited by system capacity constraints both within and outside the central area. A number of these are already being addressed, for example through doubling the track west of Clonsilla, and selective further enhancement elsewhere. However, central area capacity is the single greatest obstacle to major enhancement of the suburban rail network, and there has for some time been a longer term proposal to divert some train services to Spencer Dock, thence via a new 'Interconnector' tunnel between East Wall Junction and Heuston via Pearse, St. Stephens Green and Docklands. The Interconnector route would enable the Maynooth and Kildare Lines to be linked to form a 'through-service', and radically improve rail access to the city centre from those areas where trains currently terminate at Heuston.

3.8 It is understood that a number of other possible alternatives for the Interconnector have been considered more recently by DTO and CIE, for example by linking the northern DART route with an electrified Kildare Line, and that a number of shorter term options for increasing city centre capacity in advance of the Interconnector are also under consideration.

3.9 The opening of the DART in 1984 represented a major enhancement to the suburban rail network on the main north-south coastal corridor, and recent extensions have been built to Greystones in the south and Malahide in the north. Consideration is being given to converting suburban services to the west and south-west of Dublin to DART type operation in the longer term.

3.10 There is already a commitment to providing a network of light rail services (LUAS), and this is currently under construction or at an advanced stage of planning and procurement. This will provide lines from Tallaght to Abbey Street (Line A), Abbey Street to Connolly station (Line C) with a subsequent extension to the Docklands area (Line C1), and a line between Sandyford and St Stephen's Green (Line B). A north-south route from Ballymun to Dundrum via the city centre, with a branch to Kilbarrack via Coolock, is also planned, together with a new east-west route from Lucan to Docklands.

3.11 The Strategy also provides for a 'Metro' type system to serve highest demand corridors. In particular, the Metro will serve to connect Dublin Airport and the city centre with the western towns (Tallaght, Clondalkin and Blanchardstown), Swords and the

Sandyford/Cherrywood areas, thus opening up public transport access from a wide area of the city and its hinterland.

3.12 Inter-modal and intra-modal interchange feature highly in the development of Dublin's future public transport network. On completion, interchanges between the Metro and suburban rail (as conceived in "A Platform for Change") could be provided at Porterstown, Clondalkin, Tara Street, St. Stephen's Green, Connolly, Shanganagh and Liffey Junction, whilst Metro-LUAS transfers could take place at Coldcut, Cookstown, Harolds Cross, Harcourt, Connolly, Broadstone, Dundrum and Silogue. LUAS – DART/suburban rail interchange would also be available at a wide range of locations.

3.13 The DTO estimates that the Metro system as currently configured in "A Platform for Change" will cost some £5.7 billion, with a further £4.4 billion being spent on DART/suburban rail and roundly £1.7 billion on LUAS. Coupled with a further £770 million on implementation of QBC measures and traffic management, it is expected that over £12 billion will be committed to public transport improvements to the year 2016 (Source: DTO, estimates updated June 2001).

3.14 The DTO anticipates levels of operating subsidy required to support public transport services increasing markedly, to approximately £40 million a year for buses and around £65 million a year for the rail network by 2016 – a total in excess of £100 million per annum (Source: *A Platform for Change*).

Network Integration and Interchange

3.15 Rail based modes are inherently more efficient at carrying large passenger flows along densely trafficked corridors, whilst buses are better suited to catering for lower density and/or dispersed flow patterns. By their nature, rail systems may be less accessible than buses but generally afford significantly shorter journey times for middle and longer distance trips. Light rail is able to combine some of the benefits of bus and rail-based systems, and can be well suited to intermediate flows where the high cost of rail systems cannot be justified.

3.16 In these circumstances, the network needs to be planned and designed as far as possible such that each of the main modes meets needs to which they are best suited. This may

imply wholesale withdrawal, or at least substantial rationalisation, of bus services where they parallel rail over significant distances. This may be achieved by refocusing existing resources to provide high frequency feeder bus services offering convenient and easy interchange at stations and with minimum or nil fare penalty. The degree of bus service rationalisation may be conditioned by the extent to which radial bus services cater for local short-distance passenger trips along busy corridors. It is understood that DTO envisages buses catering principally for short-hop (local) trips in the long term.

3.17 Main interchanges therefore need to be located at key nodes such that journey opportunities are maximised. This implies bringing road-based modes (buses, taxis) and track-based modes (i.e. suburban heavy rail, Metro and light rail) together so that transfers can be made quickly and conveniently and the disutility of interchange minimised. The key features of a high quality multi-modal interchange will include the following:

- Minimum walking distance to/from and between platforms – ideally with cross-platform transfers where possible, although recognising that such open interchanges may raise revenue control issues. Travelators or escalators should be used to assist where level changes or lengthy walks are unavoidable. Lifts should be provided for the mobility impaired including people in wheelchairs, parents with prams/pushchairs and small children, and those otherwise encumbered

- Similarly, bus stops should be located as close as possible to station entrances and LRT stops

- Passages and walkways should be covered, well-lit and of sufficient capacity to accommodate expected peak passenger numbers in free-flow conditions

- Waiting facilities should be well lit, with suitably sized shelters offering protection from inclement weather

- High quality signing and information, preferably including real-time information on services, time to arrival of next bus/train etc.

- Secure passenger environment, including CCTV where appropriate

- Food and drink vending facilities, telephones etc.
- Provision for picking up/setting down by taxis and private cars ('kiss and ride')
- Cycle parking facilities

3.18 Although not directly related to the choice of interchange locations, the contribution of fares and ticketing systems to the achievement of a fully integrated public transport system must not be underestimated. Fare structures should be such that any financial penalty associated with interchanging between or within modes is minimised (or preferably eliminated). Singapore introduced the magnetically based stored value farecard in the early 1990s which, in addition to providing a pre-paid ticket facility, is able to offer 'rebates' for transfer trips (subject to meeting certain pre-defined criteria). It is likely that full Smartcard ticketing offering similar or enhanced functionality will follow. A number of other towns and cities in the developed world are increasingly moving over to Smartcard ticketing systems. Consideration should be given to a fully integrated fares and ticketing system for Dublin if the system is to be marketed and used to best effect.

3.19 The study requires key interchange locations within the study area to be identified. Based on the network concepts outlined in the DTO Strategy, it appears to us that major interchanges might reasonably be centred on:

- Porterstown, or further west at Clonsilla, particularly for interchange with the suburban rail line to the City Centre and Maynooth; and
- Blanchardstown Town Centre (or thereabouts)

3.20 Discussions were held with senior managers of Iarnród Éireann, Dublin Bus and Bus Éireann during the earlier stages of the study to discuss a range of issues associated with the Metro proposals, with particular reference to interchange.

3.21 We have formed the impression that Iarnród Éireann and Dublin Bus have not in the past been particularly enthusiastic or pro-active in the development and promotion of inter-modal interchanges for reasons of poor return, but that both recognise the need in future. Iarnród Éireann, for instance, has plans for a high quality interchange at Connolly station and are also actively moving towards the introduction of Smartcard ticketing.

3.22 Iarnród Éireann plans to develop a new station at Porterstown and has been actively involved in discussion with Fingal CC and the developer in its provision, with the cost to be funded by the developer. The upgrading of the Maynooth Line should enable Porterstown to play a significant role. It is understood the Draft DTO Short Term Action Plan envisages that five city-bound Maynooth trains will serve Porterstown in the morning peak in 2004, and doubling to ten in the morning peak by the end of 2006. DTO modelling work suggests that the station could become a key interchange position on the network by the middle of the next decade.

3.23 Porterstown or Clonsilla appear to us to be ideal locations for an interchange between the Maynooth Line and the western orbital Metro.

3.24 Similarly Blanchardstown Town Centre (BTC) appears to be ideally situated as a bus-Metro interchange. Preliminary discussions with Dublin Bus suggest they would be sympathetic to development of an interchange at BTC although experience elsewhere (e.g. with DART) suggests they may be lukewarm on the provision of local bus feeder services which are particularly unremunerative for bus operators. In practice, most or all bus services might be 'through' local rather than terminating services, fulfilling the dual role of providing local access to BTC and also acting as feeders to the Metro.

3.25 By way of contrast, Bus Éireann appear enthusiastic about the prospect of an inter-modal interchange at BTC, provided that access and egress arrangements to/from the N3 are not unduly circuitous. Indeed Bus Éireann sees feeding into the Metro at Blanchardstown as a positive market opportunity, given the improved accessibility the railway would afford for travel to and from the airport and other destinations to the north of the city centre.

3.26 In any event, access arrangements would need to be carefully considered to avoid unduly circuitous routeings, and to isolate buses from traffic congestion in and around the centre as far as possible. This would require a more detailed traffic study of the area, and it is possible there may be resistance (e.g. from the BTC management) to giving priority to bus access if this resulted in a worsening of accessibility for cars. This could in turn result in pressure for any major interchange to be located further along Blanchardstown Road (away from the town centre). Such pressures need to be strongly resisted if high levels of public transport accessibility to BTC and inter-modal integration are to be achieved, and we would strongly recommend that close dialogue is maintained with Fingal County

Council and other key stakeholders to safeguard public transport access arrangements in the medium and longer term.

3.27 A more detailed commentary on land use and transport planning and integration issues is attached as Appendix A.

Park and Ride

3.28 The DTO Strategy for Park and Ride, as set out in "A Platform for Change", is that it will "integrate the car with public transport. There will be Park and Ride facilities for commuters at strategic locations where the national road network meets the public transport networks. All proposed Park and Ride sites will be assessed to ensure that cars accessing them do not add to congestion."

3.29 We understand that, notwithstanding this general policy statement, the DTO is not generally favourably disposed to Park and Ride very close to the Metropolitan area on the grounds that it is likely to encourage railheading (i.e. car drivers making considerable parts of the journey by car which could otherwise have been made largely or completely by public transport). In addition, the DTO view tends to be that public transport should be used as a lever for further urban densification, rather than the continuation of existing urban form.

3.30 Views overseas are divided as to the extent to which Park and Ride contributes to the achievement of transportation policy objectives and the reduction in traffic congestion. Our understanding of the general policies adopted towards rail-based park and ride in London can be summarised as follows:

- Historically, London Transport has aimed to encourage sustainable feeder modes rather than access to stations by car. In general, there has been a disposition against the provision of car parks at stations within fare zones 1, 2 or 3 (these zones cover the area within approximately 10 km of central London)

- Existing car parks in zones 4, 5, and 6 (i.e. over approximately 10 km from the city centre) should generally be retained, and new car parks or extensions would be constructed as and when suitable opportunities arise

- Railheading within London is generally discouraged, with passengers being encouraged to park at their local station.

3.31 We are not aware as to the extent to which these policies may change in the longer term following the setting up of Transport for London (TfL) under the control of the directly elected Mayor in July 2000.

3.32 Park and ride appears to be popular amongst the Passenger Transport Executives, though few have formally adopted clearly defined park and ride strategies. The sophistication of evaluation techniques and speed of implementation varies by region.

The Dublin Context

3.33 Development of a Park and Ride strategy is beyond the scope of the present study, but evidence from elsewhere strongly suggests that policies for P&R should not be formulated in isolation. Rather, any strategy needs to be developed in a wider policy context, complementing other initiatives for improving overall transport efficiency. Specifically, P&R strategy should be considered alongside parallel strategies for improving pedestrian access, the provision of safe cycle routes to stations, and secure cycle parking facilities, and success may be heavily dependent on the implementation of stringent demand management measures.

3.34 These issues need to be discussed with DTO in advance of commitments to the provision of major Park and Ride facilities.

Suggested Locations

3.35 Clearly a location close to the N2/M50 interchange would be most logical to intercept longer distance car traffic from outside the study area. Plenty of land is available, and we would suggest a parking density of about 500-550 cars per hectare for open parking.

3.36 In the absence of policy direction from DTO, it is not possible at this stage to offer firm recommendations as to the capacity of a Park and Ride facility at this location. Given the

operational and practical considerations associated with car parking, however, our initial view is that it should not exceed 2000-2500 spaces at grade. Even this involves a significant walking distance between the station and the far end of the car park, but the way would be open to provide additional capacity and/or reduce walking distances through the provision of decked or multi-storey parking on the site at a later date.

3.37 The possibility of such a facility being used by airport passengers should be considered, and policies developed as to whether use of a Metro Park and Ride (in effect as a satellite car park for the airport) should be encouraged or discouraged.

3.38 Notwithstanding the DTO's stance on Park and Ride, overseas experience suggests that a significant proportion of car drivers are not prepared to use buses as a means of access to and from stations. Decisions therefore need to be made as to whether a P&R facility at this location should be made easily accessible to more local users, or whether one or more alternative sites should be made available to meet more localised needs.

3.39 Intuitively, we believe that additional parking should be provided at or near a station in the vicinity of the new Stadium, possibly through use of Stadium parking facilities which would not normally be used other than on events days. This would potentially cater for traffic from the N3 corridor and the wider Blanchardstown area outside the walk-in catchment area of stations. We understand that, as currently planned, DTO envisage Stadium car parks being accessible only from the strategic routes rather than from local roads. Despite this position, we recommend that options be kept open to consider using Stadium car parks as Park and Ride locations for more locally based traffic.

Regulatory Issues

3.40 Dublin's Stage Bus services are currently operated within a wholly regulated environment, and Bus Atha Cliath (BAC) has an effective monopoly. Similarly all rail services are provided by IE. It is understood that consideration is being given to some relaxation in the degree of bus service regulation although our impression is that this is likely to stop short of full deregulation (where it would be open for bus operators –

Dublin Bus or others – to compete with rail services). Instead, we understand that the network will be regulated from within the public sector, but that contracts will be let through a process of competitive tendering for the operation of specified services or groups of services (e.g. area franchises).

3.41 In general, a deregulated framework is not compatible with the achievement of fully integrated transport services, as has been amply illustrated by experience elsewhere. Unfettered levels of bus service competition could lead to uncertainty in the levels of rail patronage (and hence revenue) that may be achieved which, in turn, may limit the attractiveness to potential investors in the system. This is particularly important in the context of the Dublin Metro where it is intended that the system should be procured through a Public-Private Partnership (PPP) arrangement.

4. DEMAND RELATED ISSUES

4.1 The study is adopting a multi-criteria approach to assess the relative merits of alternative alignments through the study area. Demand for the system is a key consideration in choosing appropriate alignments, though the chosen alignment of a system of this nature will seek to balance local needs with city-wide travel demands, objectives and priorities. This study has been restricted to reviewing alternative alignments in terms of possible demand implications within the catchment area of this section of the proposed system.

4.2 A starting point for the assessment of local demand was the DTO model, though four key limitations were acknowledged:

- The DTO model zoning system in peripheral areas of the city is currently relatively coarse. The whole of the study area is represented by some seven zones;
- Only an alignment through the centre of Blanchardstown had been tested in the DTO model. The sensitivity of the model to alternative alignments is limited due to the coarseness of the zone system mentioned above. It had therefore only been possible to infer demand for other potential alignments from the Blanchardstown town centre alignment;
- The magnitude of overall travel demand from the area is likely to be less than implied by the forecast level of development. This is because growth in jobs and population within the DTO's Trip Attraction Generation Model (TAGM) is constrained to a region-wide total based upon the Strategic Planning Guidelines; and
- The DTO model allows the total number of person trips to be split between the private car (highway) and public transport (Metro, heavy rail and LUAS) with the transfer of people between private cars and public transport driven by (amongst other factors) the capacity of the highway and the increase in generalised costs incurred due to highway congestion. The capacity of the public transport system is deemed to be infinite so can absorb unlimited transfers from the private car. Importantly, the DTO model does not offer a third choice of travel, i.e. do

something else. The results discussed in this chapter should therefore be read with this in mind.

4.3 To overcome the first two limitations, and to assist the process of option evaluation, LRPO requested that a more detailed comparison of demand along the various corridors in the Blanchardstown/Castaheany area be carried out using the DTO model. With DTO agreement, the zone structure in the Blanchardstown area of the DTO model was disaggregated to a more detailed level to enable some degree of comparison of alternative alignments in the study area. The methodology for disaggregating the existing seven zones is summarised as follows;

(i) New zone boundaries were identified by apparent land use from OS maps. The new zone structure has new smaller zones along the Metro corridor included in the DTO model, with parallel corridors of new zones either side of the Metro corridor. The new zone structure has 26 zones;

(ii) The total growth in trips between the base year and the forecast year (2016) was identified. The growth in the old zones was apportioned to the new zones based on apparent scope for land use growth in each of the new zones;

(iii) The total number of person trips remained unchanged in the new zone structure.

4.4 Whilst the new zone structure offers greater detail than the existing zone structure in the DTO model, it must be realised that there are still limitations in its accuracy for forecasting demand at local level, and we would expect that the model currently being developed separately for LRPO will provide a more robust basis of demand assessment.

4.5 The following Metro alignments were modelled:

(i) Option 6 - running to the north of Corduff and through the centre of Blanchardstown;

(ii) Option 8 - running to the south of Corduff and through the centre of Blanchardstown; and

(iii) Option 14/15 - running to the south of Corduff and encompassing Castaheany before heading south towards Lucan.

4.6 The following DTO model data was extracted:

- Origins and destinations of Metro trips in the wider Blanchardstown area, based upon station to station movements; and
- Line flows on the Metro through the study area.

4.7 This analysis has demonstrated that the model is forecasting that much of the demand on Metro links within the study area is being generated from beyond the immediate 'walk-in' catchment area, either through interchange to/from suburban rail or as a result of model 'connector links' designed to represent Park and Ride or bus feeder services.

4.8 The following commentary sets out a summary review of levels and patterns of demand forecast for the study area from the Blanchardstown and Castaheany areas for each of the options tested.

Trip Distribution Patterns

4.9 The TAGM gives existing and future (2016) population and job forecasts for each study area zone, from which trip ends can be calculated. For the zones within the study area (including both the Blanchardstown and Castaheany areas) the number of trips generated from the study area is forecast to increase by a factor of 2.3 relative to 1997, with a three-fold increase in trips attracted to the area.

4.10 As might be expected the growth in trip ends is not evenly distributed across the study area, with significant growth focussed on the zones representing the Mulhuddart and Tyrellstown areas. For trips generated from the area, growth in Car Available demand substantially out-strips 'Non Car Available' demand. Another notable feature is that much of the growth in trips attracted to the area is associated with the journey to education trip purpose, presumably reflecting the new educational developments, including the Institute of Technology.

4.11 Analysis has been undertaken of the distribution of peak hour trips to and from the Blanchardstown and Castaheany areas given by the DTO model. This trip distribution analysis is designed to show the maximum potential public transport demand for a range

of origin/destination movements. Table 4.1 to Table 4.3 detail the trip distribution patterns for each of the alignments tested.

4.12 Reading across individual rows within the table gives the total number of trips from a particular origin (e.g. Airport) to each of the destinations (e.g. Tallaght or City Centre), and (at the end of the row, in bold) a grand total for the number of trips from that area. Conversely, reading down each individual column gives total number of trips to a particular area from each of the origins and (at the foot of the column, in bold) a grand total for the number of trips to that zone. The table also gives total number of trips with both an origin and destination within a particular area (intra-zonal trips).

Table 4.1 – Option 6 Metro Distribution Patterns – 2016 AM Peak

	New Development Area	Blanchardstown	Castaheany	Ronanstown	Lucan	Clondalkin	Tallaght	Airport	City via Metro	City via Rail	**Total**
New Development Area	0	34		4		2	4	29	35	2	**110**
Blanchardstown	249	964		721		720	2469	631	1867	96	**7718**
Castaheany											**0**
Ronanstown	232	942		50		269	1559	408	393	32	**3883**
Lucan											**0**
Clondalkin	139	173		153		248	1423	147	216	24	**2522**
Tallaght	201	557		1109		937	571	247	1683	17	**5322**
Airport	159	430		183		56	168				**828**
City via Metro	1406	1494		371		497	6476				**3768**
City via Rail	52	68		84		32	55				**237**
Total	**2437**	**4662**	**0**	**2676**	**0**	**2761**	**12725**	**1462**	**4194**	**170**	**31087**

Trips Remaining within Phase 1 Corridor	1247	4%	City Centre to Phase 1 Corridor Trips	1999	6%
Trips Remaining within Western Orbital Corridor	12481	40%	Phase 1 Corridor to City Centre Trips	3020	10%

Table 4.2 – Option 8 Metro Distribution Patterns – 2016 AM Peak

	New Development Area	Blanchardstown	Castaheany	Ronanstown	Lucan	Clondalkin	Tallaght	Airport	City via Metro	City via Rail	**Total**
New Development Area	0	4		0		0	0	1	0	0	**5**
Blanchardstown	3	690		663		651	2391	605	1696	63	**6762**
Castaheany											**0**
Ronanstown	0	994		49		259	1542	415	391	32	**3681**
Lucan											**0**
Clondalkin	0	249		152		240	1378	147	216	24	**2405**
Tallaght	0	651		1092		927	556	247	1678	17	**5168**
Airport	2	464		184		81	168				**730**
City via Metro	0	2586		367		492	6404				**3445**
City via Rail	0	99		84		31	54				**213**
Total	**5**	**5735**	**0**	**2590**	**0**	**2681**	**12493**	**1415**	**3981**	**136**	**29035**

Trips Remaining within Phase 1 Corridor	697	2%	City Centre to Phase 1 Corridor Trips	1759	6%
Trips Remaining within Western Orbital Corridor	11793	41%	Phase 1 Corridor to City Centre Trips	2684	9%

Table 4.3 – Option 15 Metro Distribution Patterns – 2016 AM Peak

	New Development Area	Blanchardstown	Castaheany	Ronanstown	Lucan	Clondalkin	Tallaght	Airport	City via Metro	City via Rail	**Total**
New Development Area	0	4	0		0	0	0	1	0	0	**5**
Blanchardstown	3	192	58		160	279	917	470	1861	102	**4042**
Castaheany	0	146	87		358	641	1959	164	235	27	**3617**
Ronanstown											**0**
Lucan	4	439	1290		133	560	2183	473	1518	174	**6774**
Clondalkin	1	200	20		179	234	974	140	222	24	**1995**
Tallaght	0	444	287		968	940	556	247	1689	17	**5149**
Airport	2	443	93		127	55	167				**720**
City via Metro	0	2608	324		498	538	6827				**3968**
City via Rail	0	102	1		70	31	54				**205**
Total	**10**	**4580**	**2161**	**0**	**2495**	**3279**	**13636**	**1494**	**5524**	**344**	**33522**

Trips Remaining within Phase 1 Corridor	491	1%	City Centre to Phase 1 Corridor Trips	2224	7%
Trips Remaining within Western Orbital Corridor	13729	41%	Phase 1 Corridor to City Centre Trips	3036	9%

4.13 Some 29000 to 33500 Metro trips have been captured in the analysis with trips contained wholly within the Western Orbital, with the (Phase 1 and Phase 2) study area making up nearly half (roundly 12500 to 14000) of these movements. It would appear that overall Metro patronage in the corridor is not sensitive to alignment choice in the Blanchardstown area.

4.14 The difference in the options is the servicing of Blanchardstown, Corduff and Castaheany. Table 4.4 below summarises the trip ends to the Blanchardstown and Castaheany areas. Corduff and Porterstown are included in the Blanchardstown totals.

Table 4.4 – Summary of Blanchardstown / Castaheany Trip Ends

	Option 6		Option 8		Option 15	
	From	To	From	To	From	To
Blanchardstown	7720	4660	6760	5740	4040	4580
Castaheany	0	0	0	0	3620	2160
Total	7720	4660	6760	5740	7660	6740

4.15 Option 6 and 8 do not attract any trips from Castaheany because the alignments do not go through the Castaheany area. The total trips to and from the whole study area are similar for options Option 6 and 8 which capture 12500 Metro trips. Option 15 captures 6000 from Castaheany and 8500 from Blanchardstown, totalling 14500. (Figures rounded to nearest five hundred).

4.16 Looking at trip patterns from different parts of the Phase 1 study area, the largest attractors of trips from Castaheany and Blanchardstown are Tallaght (2500 to 3000), the city centre (approximately 3000) and the airport (600). These destinations lie on the proposed Metro routes and represent a significant proportion of all trips leaving Blanchardstown/Castaheany during the AM peak period. The development area between Finglas and Blanchardstown attracts 250 trips in Option 6, but very few trips from the other two alignments.

4.17 Table 4.1 to Table 4.3 also show there is a net outflow from the Phase 1 study area in the AM peak, i.e. more people travel out of the study area than into it, although this net figure is relatively small (approximately 10% more leave the area). This reflects the dominance of residential land use in the area, and is consistent with the assumption within the Trip

Attraction Generation Model that, at 2016, the study area population will be over 100,000, with a corresponding number of people employed in the study area of some 35000. All three options show that 9% – 10% of the trips captured in the analysis travel from the Blanchardstown/Castaheany area to the city centre and 6% - 7% of the trips travel from the city centre to the Blanchardstown/Castaheany area. The majority of city centre based trips use the Metro system to complete there journeys rather than the heavy rail options. The analysis also shows that 43% - 44% of the trips captured in the analysis remain in the Blanchardstown – Tallaght corridor.

Metro Link Flows

4.18 Flows along the Metro have also been forecast and are detailed in Figure 4.1.

4.19 Two-way flows through Castaheany (Option 15) are in the order of 6500 compared to 6000 (Option 6) and 5000 (Option 8) alignments along the Blanchardstown/Porterstown corridor.

4.20 The Option 6 alignment to the north of Corduff serves the development area better than the other two alignments, although the two way flows through Corduff are similar in Options 6 and 15 (13000). The flows are lower in Option 8 (11000).

4.21 On the basis of this analysis, the following broad conclusions may be drawn:

4.22 Slightly more trips are made by Phase 1 study area residents moving out of the area in the morning peak than are attracted into the study area by businesses and employers, though this is entirely a function of the assumptions used for data input to the TAGM (and the limitations highlighted in para.4.2. above should be noted);

4.23 There is a significant demand for peripheral movements between Blanchardstown/Castaheany and Tallaght, which, in total across all parts of the analysis study area, is of a similar magnitude to the radial City Centre movements;

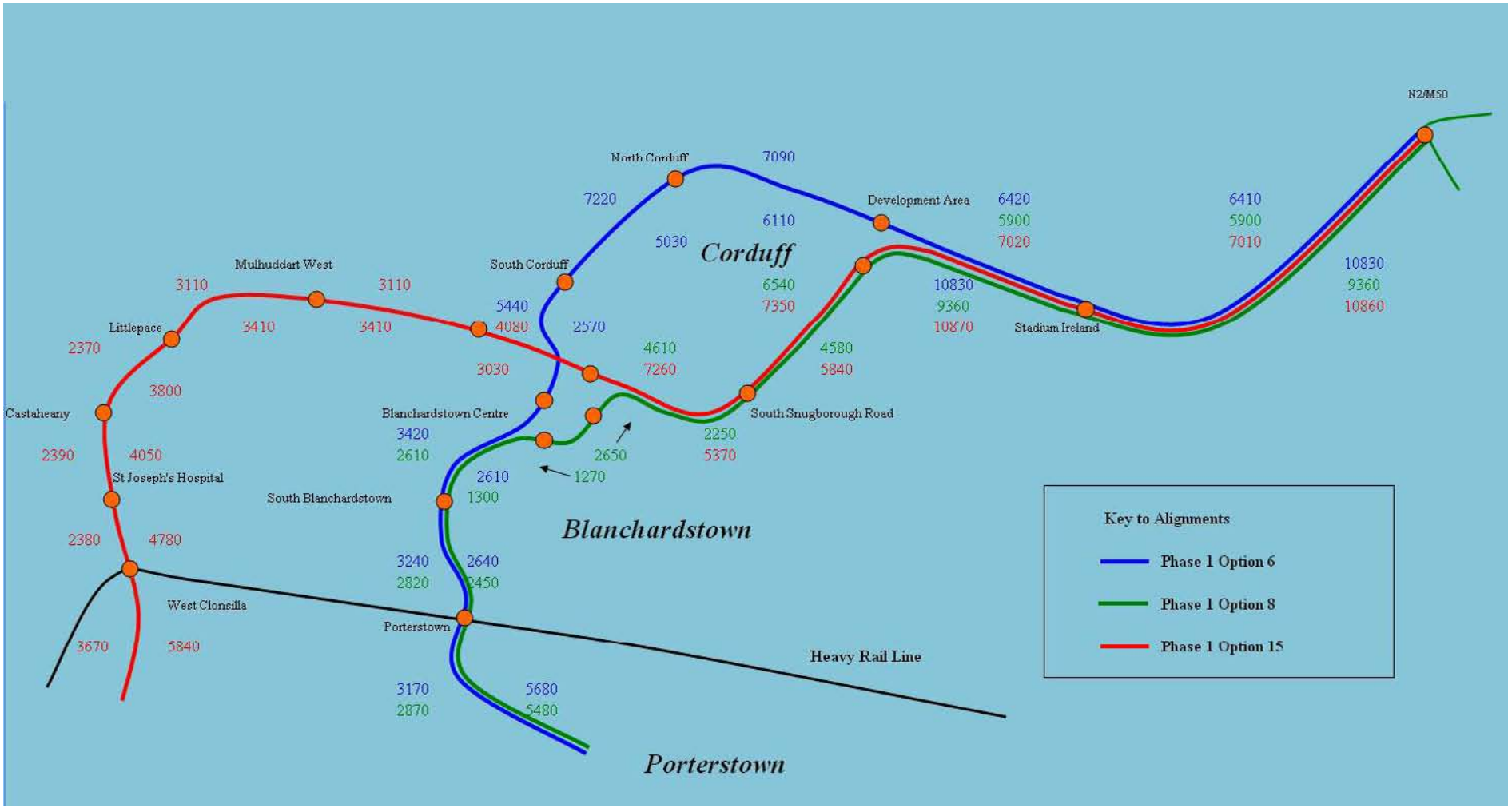
4.24 The dominant peripheral movements are to areas to the south, particularly Tallaght, though there is a significant travel demand to and from the Airport area;

4.25 The forecast number of local trips (i.e. those contained wholly within the Phase 1 study area) is not significant – at roundly 500 (Option 15), 700 (Option 8 and 1200 (Option 6) trips in the AM peak.

4.26 All three options capture a significant level of patronage with little Option 15 attracting the most (33000). This equates to 8% more than Option 6 and 15% more than option 8 (based on the trip distribution figures).

4.27 Option 15 has higher line flows through the Phase 1 study area (Blanchardstown/Castaheany) than the other two options. Option 8 has the least.

Figure 4.1 – Metro Flows – 2016 AM Peak



4.28 Acknowledging that this analysis is entirely dependent upon the reliability of the data, a few tentative conclusions may be drawn:

4.29 The proposed corridors of Metro provision in this part of the City are consistent with the pattern of travel demands outlined above;

4.30 The system has a more important potential role to play in serving travel demands to and from the study area including the city centre and Tallaght. The role of the Metro for meeting localised needs within the Phase 1 study area is likely to be more limited

4.31 While trips to and from the City Centre predominate, the study area will be well served by suburban rail links to the City Centre (directly from the southern part of the study area, and indirectly, through interchange, from other parts). It may be argued that the priority should therefore be placed upon facilitating interchange with suburban rail and ensuring optimum peripheral links. This applies particularly with the Blanchardstown / Castaheany alignments with the very high level of movements between this part of the study area and Tallaght.

4.32 Further consideration of the issue of demand is given in Chapter 7, on the basis of desk-top analysis, in the context of the appraisal of alternative alignments. The analysis in Chapter 7 has been geared towards extracting the following demand-related information for alternative alignments, for inclusion within the appraisal framework:

- population within 500 and 800 metres of stops;
- size of workforce within 500 and 800 metres of stops;
- ability to serve other specific main trip attractors/generators (Blanchardstown Town Centre, National Stadium, Technology College);

4.33 The source of data for this exercise has been provided by SIAS from their Blanchardstown Area Integrated Development Framework Study, as this is more recent and locally-orientated information than the DTO model TAGM. Analysis has focused on the potential catchment for the system within the immediate local area, but needs also to take account of trips to and from areas beyond the immediate catchment areas (for instance through bus feeder or Park and Ride trips).

5. SYSTEM DESIGN PARAMETERS AND ALIGNMENT PROPOSALS

General

5.1 LRPO has been clear from the outset that the system is likely to be based on a form of technology more closely resembling that of light rail rather than use of traditional heavy metro designs. Given the intention to achieve a system which is capable of incremental upgrading, this appears to us to be an eminently logical and sensible approach. Use of a technology which is similar if not identical to that proposed for LUAS offers the opportunity for shared running where desired without recourse to sophisticated and expensive safety protection systems to meet crashworthiness requirements for shared running between heavy and light rail vehicles.

5.2 Light rail type vehicles also have the added advantages of being able to negotiate substantially tighter curves and steeper gradients than heavy rail vehicles. In an existing urban environment where the built fabric may heavily constrain alignments, this may afford better penetration than could otherwise be achieved by heavy rail systems

5.3 Our starting point has been to assume the Metro will in general be fully segregated from traffic, given the high service frequencies and operating speeds envisaged for the system. There are a number of locations, however, where we have assumed that road traffic levels will be low, and that level crossings may be considered acceptable. The safety and other risks associated with at-grade crossings would need to be considered at the detailed design stage, be subject to a full risk assessment when Metro services and future traffic levels have been assessed more accurately, and measures to minimise safety risk would need to be identified.

Safety Issues

5.4 Our conceptual proposals have been prepared using standard railway safety design principles including, for instance, provision of fencing to segregate the railway from pedestrians and road traffic (except at designated crossing points). Clearly there is a very wide range of safety issues which would need to be considered at the detailed design stage to identify and manage safety risk. Safety issues associated with the conceptual designs of rolling stock and signalling will also need to be considered at the appropriate stage, but are outside the scope of this report (see below).

Geological Considerations

5.5 Information on the geology of the study area was obtained from Geological Survey of Ireland. The Geological Survey of Ireland 1:100,000 map 16 was referenced to identify underlying rock/soil types. The study area consists entirely of limestone, although there are different types of limestone. The main bulk of the area consists of Calp, which is a dark grey and black limestone. The area bounded by Castleknock, Coolmine, Clonsilla and Lucan, and the area bounded by Blanchardstown, Ballymun and Mulhuddart, consist of the following limestones: Waulsortian Limestone, massive unbedded fine–grained limestone; Tober Colleen Formation, calcareous shale, limestone conglomerate and Boston Hill Formation, nodular and muddy limestone and shale.

5.6 The underlying limestone will provide sound founding geology for elevated structures. It is understood that the limestone stratum is generally within a couple of metres of the current ground level. Accordingly any lowering of the track into cutting or cut and cover tunnel will involve difficult excavation.

5.7 The overlying superficial deposits may increase in thickness around the River Tolka.(i.e greater than 2 metres depth).

5.8 The ground water table will be high in the superficial deposits.

Vehicles and Frequency

5.9 We understand it is the long-term intention to use single-articulated cars, each some 30 metres long, coupled to operate in four-car sets on the Metro at intervals of around two minutes over the busiest sections. Overall train length will therefore be in the order of 120 metres. In the short to medium term, trains may operate at lower frequencies and/or shorter formations.

Signalling

5.10 LRPO envisages that driving on ‘line of sight’ principles may be possible in most surface running areas, with full high-capacity signalling likely to be required in the City Centre tunnel sections. A definitive view will not, however, be formed until the preliminary design stages of the Metro procurement process.

5.11 LRPO is being separately advised by consultants Parsons Brinckerhoff on all railway safety issues, and signalling is therefore outside the scope of this study except insofar as it may influence alignment choice.

Alignment Design Criteria

5.12 The applicable standard is the LRT Project: Track Alignment – Tramway Clearances: Design Criteria (Identification Number TI/Pr/001), adapted to allow for a ultimate vehicle width of 2.65 metres as opposed to the 2.4 metres of LUAS vehicles – (Metro Structures Gauge drawing B-000-CV-SK-020A refers).

Additional Requirements

- Vehicle size - design to permit 2·65 m width rolling stock to be introduced in the future without revision to alignments.
- The minimum track radius on running lines shall be 100m
- The maximum gradient shall not exceed 6%
- The design will generally be at ground level. However, as full segregation is proposed for this metro alignment, elevated road crossings are proposed. In order to minimise the extent of structures, the approach ramps to road crossings and elevated structures will be at the maximum gradient of 6%. This route evaluation has not considered the effects of transitions between straight track and curves; however, the tightest curvature has generally been limited to 150 metres radius. This will give the appropriate allowance for transitions to be applied with some tightening of the curved elements.

Constraints

5.13 The alignment options proposed have been developed from the premise of serving residential, business and industrial areas, both existing and planned, together with the Blanchardstown Town Centre and the proposed Stadium Ireland development.

5.14 The following constraints were applied to the route option selection.

- Provide reasonable journey times for most passengers (average standing time of 20 minutes maximum)
- Minimise effect on the built environment (although noting that displacement of current low density/low grade land uses in favour of potentially higher grade/high density development land uses as a result of Metro construction may be worthy of consideration, and particularly where the Metro may open up accessibility and contribute to local regeneration)
- Avoid cultural heritage sites such as graveyards and sites of archaeological significance
- Minimise effects on the road network through grade separation
- Minimise adverse effects on planned developments whilst seeking to serve them as well as possible
- Take due account of utilities.

Castlethorne Development Issues at Porterstown

5.15 Castlethorne Construction are in the process of developing the land around the main line railway at Porterstown, Castleknock. This is a residential development and includes a new road that will cross the main line with a new overbridge. Halcrow Rail were engaged to prepare options for the Metro through the development site, and these proposals have now been finalised. They include a Metro station located generally to the south of the proposed new main line station, with the Metro alignment then crossing northwards over the railway and along the east side the new road towards the south end of Blanchardstown Road South.

5.16 This could meet the requirement to provide an interchange between the Metro and the suburban rail line at Porterstown.

5.17 Clonsilla has been identified as an alternative potential location for interchange with the Maynooth railway line. Three alternative proposals have been prepared (dependent on the

line of approach from the north (i.e. via Castaheany or the Blanchardstown Road corridor) to provide interchange with the Maynooth line at Clonsilla station.

Alignment Proposals

5.18 Two sets of route options were investigated. The first set of route options served the Blanchardstown Town Centre, the Corduff area, the south side of the industrial areas, and the Stadium site. The second set of route options serves the Castaheany area and either the north side of the industrial area or the Blanchardstown Town Centre and the Corduff area.

Blanchardstown Corridor

5.19 Three basic alignments have been developed for the Blanchardstown corridor, with sub-options in the vicinity of Blanchardstown Town Centre and also between Blanchardstown Road North and Ballycoolen. Taking account of the permutations of sub-options, nine route options were initially considered between Porterstown and the junction of the N2 and the M50. Two of these options (routes 1A and 2A), serving Mulhuddart, were subsequently dropped since Mulhuddart can be better served by alignments through Castaheany. One of the sub-options of Route 3 (route 3A) was also dropped as it did not compare favourably with two others.

5.20 The various alignments are described in outline below and illustrated diagrammatically in Fig. 5.1.

5.21 All options are common between Porterstown and the access road into the Blanchardstown Town Centre (BTC) where they divide into three.

- Route 1 continues alongside Blanchardstown Road South and crosses the N3.
- Route 2 goes into the BTC alongside the north west access road and then over the N3
- Route 3 goes around the BTC on two sides towards the east corner, crossing the N3 close to the Snugborough Interchange.

5.22 For Routes 1 and 2,

- Alternative A goes via Mulhuddart. This option was later discounted and replaced with options serving the Castaheany Corridor. Consequently, the following commentary omits the 'A' options.

- Alternative B continues along Blanchardstown Road North, either:

  i) crossing to Snugborough Road between the residential and industrial areas and thence to Ballycoolen Road, or

  ii) continuing alongside Blanchardstown Road North, to Ballycoolen Road and south eastwards towards the Stadium site.

5.23 Route 3 has three alternative routes through the BTC then along Snugborough Road rejoining the other routes at Ballycoolen Road.

- Alternative A goes alongside the south-west side of the BTC and then to the north side of Blanchardstown village. Following discussion with LRPO, this option has been discounted.

- Alternative B goes alongside the south-west and south-east sides of the BTC and then across the N3 at a skew, thence to Snugborough Road

- Alternative C goes alongside the north-west and north-east sides of the BTC and then across the N3 at a skew, thence to Snugborough Road.

5.24 All routes then combine, running alongside Ballycoolen Road, thence south eastwards to the Stadium station and then curving north-east past the proposed Stadium Business Park, and across to the N2 where a Park and Ride station is proposed together with rolling stock maintenance depot.

5.25 The options are defined as follows:

Option 1	1 A (discounted)
Option 2	1 B (1)
Option 3	1 B (2)
Option 4	2 A (discounted)
Option 5	2 B (1)
Option 6	2 B (2)
Option 7	3 A (discounted)
Option 8	3 B
Option 9	3 C

Description of Routes

1, 2 & 3 Porterstown to BTC Access Road

A new interchange station with the main line will be provided at Porterstown. The Metro line spans over the main line and along the east side of the proposed new road as far as Clonsilla Road. The line then rises over Clonsilla Road and continues, generally at grade, on the green land to the east side of Blanchardstown Road South as far as the BTC access road. The tracks will need to rise over one side adjacent to the school. A station is proposed opposite the estate access road. The west side of Blanchardstown Road South is proposed for additional residential development, and a large gas main has recently been installed.

Route 1 rises over the BTC access road, then continuing at grade along the south-east side of Blanchardstown Road South towards the N3 junction. A station is proposed alongside to serve the BTC. The track rises to bridge over the N3 and slip roads of the interchange and then crosses the Tolka Valley.

Route 2 rises over the BTC access road, then continues at grade along the car park by the north-west access road for the BTC. A station is proposed in this car park serving the BTC. The track rises to bridge over the N3 and slip roads of the interchange and then crosses the Tolka Valley.

B (1) Alternative B (1) continues at grade along the south-east side of Blanchardstown Road North rising over entrances into the residential estates which are served with a station. This route then turns south-east through an undeveloped strip between the residential and business areas to

Snugborough Road, serving Blanchardstown Business Park. It then rises over the road and then joins route 3.

B (2) Alternative B (2) continues at grade along the south-east side of Blanchardstown Road North rising over entrances into the residential estates which are served with a station. It continues along this road to serve Blanchardstown Business and Technology Park (to the west of Blanchardstown Road South (west side) and Blanchardstown Business Park (on the east side) with another station before curving south-east along the south-west side of Ballycoolen Road. Alternative A (from Mulhuddart) joins this route at this point. The track continues at grade, affecting three bungalows, to the junction with Snugborough Road. A station is proposed to the north of the junction. The route bridges over the road junction and then joins the other route options.

3B Route 3B leaves Blanchardstown Road South and follows the south side of the BTC access road before rising up through the south-west side of the centre on viaduct. An elevated station is proposed by the main entrance to the centre. The viaduct then curves north-east along the south-east side of the BTC with an option for an elevated station. The route then turns eastwards over the BTC access roads and crosses the N3 at a skew, the Tolka Valley and Snugborough Road and over a side road before falling to ground level.

3C Route 3C leaves Blanchardstown Road South and rises up and crosses the BTC access road and then along the north west side of the centre on viaduct. An elevated station is proposed adjoining the side entrance to the centre. The viaduct then curves south-east along the north-east side of the BTC with an option for an elevated station. The route then turns eastwards over the BTC access roads and crosses the N3 at a skew, the Tolka Valley and Snugborough Road and over a side road before falling to ground level.

All alternatives for route 3 then continue along the south-east side of Snugborough Road at grade with a station to serve the residential areas and west corner of the Stadium site. Close to the junction with Ballycoolen Road, it is joined by the B (1) alternative of routes 1 and 2. A station is proposed at the north corner of the Stadium site serving the offices and adjacent industrial areas. The route curves south-east and is joined by the remaining alternatives.

1, 2 & 3 The route continues at grade along the south-west side of Ballycoolen Road to the station proposed to serve the Sports Campus Ireland site for main events. This station will also

serve the adjacent Business and Industrial Estates. Beyond this station the alignment is indicative only. The ideal alignment will be routed to serve the development sites, yet to be determined, but the route shown does serve the Stadium and Rosemount Business Parks. Two alternative alignments are proposed through the business park, one on the south side of the main east-west access road, and the other sweeping to the north through the centre of the park. These alignments could be either elevated, or in open cutting, subject to visual and constructional constraints. The alignment is shown going north of the electrical substation before crossing the existing and proposed enhanced N2. There are a considerable number of overhead cable routes leaving this substation that suggests that route should pass below the N2. The north-east side of the N2/M50 junction is proposed for the Park and Ride station and rolling stock maintenance and stabling depot. This depot will require a site in the order if 1,800 metres long by up to 300 metres wide if 100 x 4-car trains are to be accommodated.

5.26 The Castaheany alignments within the study area (see below) could interchange with the Maynooth railway line at either Porterstown or Clonsilla. Depending on the outcome of Phase 2 of the study, the Blanchardstown corridor could equally be served if the interchange station is at Clonsilla. This route has been designated alternative 6.

6 Route 6 runs from the west side of Clonsilla Station, bridging over the railway, the Royal Canal and the Clonsilla to Clonee Road. The route continues at grade around the north west side of the Porter's Gate estate to the south side of Lohunda Road and bridging over Shelerin Road. At the east end of Lohunda Road, the route rises up to bridge over Blanchardstown Road South and joins routes 1, 2 and 3.

5.27 The key locations served by each of the routes along the Blanchardstown Road corridor are summarised in the following table:

Option	1 *	2	3	4 *	5	6	7 *	8	9
Route	1A	1B1	1B2	2A	2B1	2B2	3A	3B	3C
Blanchardstown Road South		•	•		•	•		•	•
Blanchardstown Town Centre					•	•		•	•
Mulhuddart									
Blanchardstown Road North		•	•		•	•			
Blanchardstown Business Park		•			•			•	•
Blanchardstown Business and Technology Park			•			•			
Ballycoolen Industrial Park			•			•			
Snugborough Road								•	•
Ballycoolen Road			•			•		o	o
Sports Campus Ireland		•	•		•	•		•	•
Rosemount Business Park		•	•		•	•		•	•
Stadium Business Park		•	•		•	•		•	•
Business Parks (N2/M50)		•	•		•	•		•	•

* Options 1, 4 and 7 (routes 1A, 2A and 3A) discounted in discussion with LRPO

o Note: Options 7, 8 and 9 (routes 3A, 3B and 3C) serve only the eastern end of Ballycoolen Road, i.e. east of Snugborough Road

Castaheany Corridor

5.28 The Castaheany corridor serves the new housing developments on the west side of Hartstown, the industrial developments around Damastown and Parlickstown or the residential areas around Mulhuddart before either heading north to the industrial areas around Mitchelstown or south eastwards to the Blanchardstown Town Centre and thence rejoining the Blanchardstown Corridor route 3. Options involving interchange with the Maynooth railway line at either Porterstown or Clonsilla have been considered.

5.29 The routes have been split into segments for route identification purposes.

4 Porterstown to Castaheany via the south side of Hartstown.

5 Clonsilla to Castaheany.

D Castaheany to the N3 via Littlepace.

E Castaheany to the N3 via Westhaven, Deerhaven and Bramblefield.

F N3 to Parlickstown via Damastown.

G N3 to Mulhuddart.

H Littlepace to Blanchardstown Town Centre along the south side of the N3.

A Parlickstown/Mulhuddart to Mitchelstown via the R121 (Church Road)

I Mitchelstown to Cappoge via Cappagh Road.

S Mitchelstown to Cappoge via Ballycoolen Road and the Stadium site

Where the options that join with the Blanchardstown Corridor options have been denoted:

B Via Blanchardstown Road North and Ballycoolen Road.

C Via Blanchardstown Town Centre and Snugborough Road.

All the routes combine with the Blanchardstown Corridor options at Cappoge and thence to the eastern boundary of the study area.

5.30 The options are defined as follows:

Option 10 4 D F A I

Option 11 4 D F C

Option 12 4 D G A I

Option 13 4 D G B

Option 14 4 D G C

Option 15 4 D H C

Option 16 4 E F A I

Option 17 4 E F C

Option 18 4 E G A I

Option 19 4 E G C

5.31 Alternative sub-options with Clonsilla as the start point are not described separately to avoid undue proliferation. These options show the **relative differences** for each corridor.

Option 20 5 – Clonsilla station to Castaheany Corridor (for options 10 – 19)

Option 21 6 – Clonsilla station to Blanchardstown Corridor (for options 1 – 9).

5.32 For options via the Mitchelstown Industrial area, a loop is proposed to serve the Stadium site.

Option 22 S – Mitchelstown to Cappoge via Ballycoolen Road and the Stadium site.

5.33 For options via Blanchardstown Road North and the Stadium, a loop is proposed to serve the Mitchelstown area.

Option 23 I - Blanchardstown Road North to Cappoge via Mitchelstown Road and Cappagh Road.

The basic options (10 - 19) plus the variants (20 – 23) are included on the alignment map shown at Fig. 5.1.

Description of Routes

4 Porterstown to Castaheany.

A new interchange station with the main line would be provided at Porterstown. The Metro line spans over the main line and along the east side of the proposed new road as far as the Clonsilla Road. The line then rises over Clonsilla Road and continues, generally at grade, on the green land to the west side of Blanchardstown Road South as far as Lohunda Road. The route curves westwards along the south side of Lohunda Road, rising over Shelerin Road and continuing to Stonebridge Road, thence curving northwards to Castaheany and the recent housing developments.

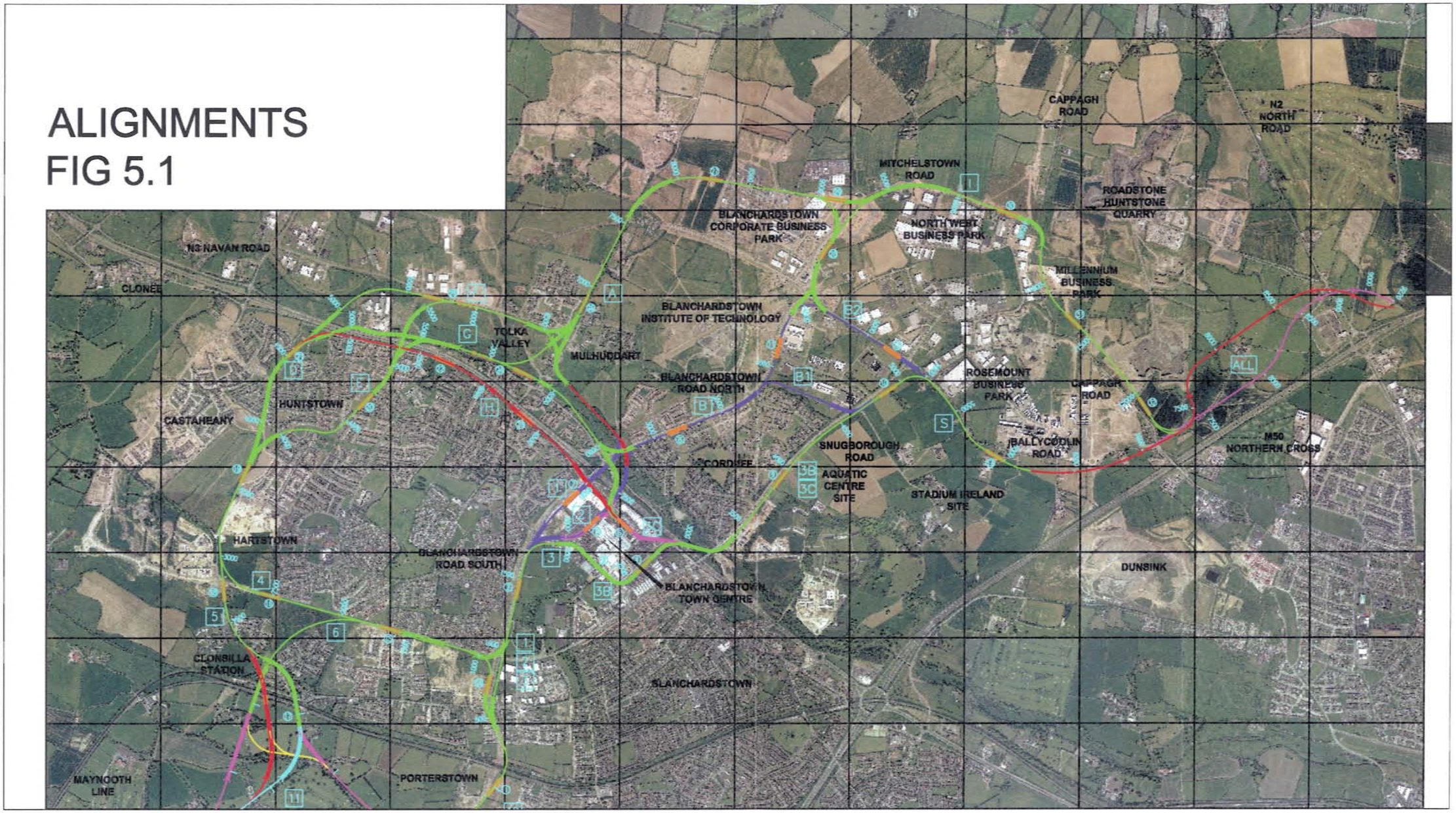
D Castaheany to N3 (Central Route)

The route rises onto viaduct to pass over estate access roads through Castaheany to the east side of the shopping centre in Littlepace. The line falls to grade in the open land between Pace Avenue and The Park in Hunter's Run. The location of a station will need to be considered in relation to the proposed school. The route rises to bridge over the N3 Navan Road.

E Castaheany to N3 (East Route)

The route curves eastwards and rises to bridge over estate roads then follows at grade the open land between Hansfield and Rusheeney. The route curves northwards to the open

ALIGNMENTS
FIG 5.1



KEY

- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED SITE OF STATION

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Light Rail Project Office

Atkins McCarthy

DUBLIN METRO
WESTERN ORBITAL
ALIGNMENT STUDY

ROUTE OPTIONS
PHASE 1

PRELIMINARY

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land between Deerhaven and Huntstown Wood. This section would require either tunnelling under, or acquisition and demolition of, a run of houses in Westhaven between the sections of open land. The route then rises onto viaduct to bridge over the estate access road and Bramblefield Drive to another area of open land before crossing the N3 Navan Road.

F N3 to Parlickstown

Having crossed the N3, the route continues northwards to the Damastown industrial areas, falling to grade as soon as it is clear of the road network below, and then follows the south side of the new industrial estate road to the residential area at Parlickstown and Lady's Well Road. The line then rises up to bridge Lady's Well Road and continues northwards on the open area to the east of Church Road (R121).

G N3 to Mulhuddart

Having crossed the N3, the route continues along the north side of the N3 until it crosses the main road through Mulhuddart. It continues along the north side of this road, the south side of the Tolka River, to the village centre. The line will need to rise up to cross Church Road, and this would affect the night club attached to the public house in the village. This route is similar to that proposed by the Dublin 15 Community Council.

Alternatively the route could cross the Tolka river and join route F at Parlickstown.

B & C Parlickstown/Mulduddart to Blanchardstown Corridor.

Both the F & G routes could be routed along the banks of the Tolka River to Blanchardstown Road North and thence to route B or on viaduct and bridge over the N3 to the Blanchardstown Town Centre and join route 3C.

H Littlepace to Blanchardstown Town Centre.

Instead of crossing the N3 this option follows the south side of the N3 from Littlepace to the Blanchardstown Town Centre. There appears to be adequate space for this route adjacent to the road, although the back gardens of the houses in Ashfield Grove and Huntstown Rise will be affected. The route will bridge over Blakestown Road and

continue to the N3/Blanchardstown Road interchange, where it will rise to bridge over Blanchardstown Road South and thence on viaduct through the BTC to join route 3C.

A Parlickstown to Mitchelstown

The route continues northwards from Parlickstown along the west side of the R121 before rising to bridge over the road and head eastwards past the Swords Laboratories to Mitchelstown passing through the area zone for industrial development.

I Mitchelstown to Cappoge

The route rises to bridge over the Mitchelstown Road twice, initially on the south side and then along the north side past the North West Business Park. The route rises to cross a road as it curves south east along the north east side of Cappagh Road. The line curves north east to join the other routes by the Cappagh Road/Ballycoolen Road junction.

For route options to Mitchelstown from routes 1B2 and 2B2, the line would continue northwards along the east side of Blanchardstown Road North, rising to cross the Ballycoolen Road and thence to Mitchelstown Road.

S Stadium Loop

In order that routes via Mitchelstown can serve the stadium, a loop will need to be provided. The Stadium loop would diverge from route A near its crossing with Mitchelstown Road heading southwards to Ballycoolen Road. This route would need to bridge over Mitchelstown Road and Ballycoolen Road before joining route 1/2B2 to the Stadium site and Cappoge where it would rejoin the main route to the N2/M50 junction.

5.34 The table below provides information on a range of locations/developments served by the more westerly alignments. These alignments have two different starting points, either Porterstown station or Clonsilla station, but the route options for the remainder of the alignment are otherwise the same. Alignments beginning at Porterstown station serve the residential areas of Charnwood/Lohunda Park and Portsergate. Options originating at Clonsilla station access the developments in western Clonsilla including Portersgate and Windermere/Aldermere. A further option is provided in an easterly direction from Clonsilla station linking into the Blanchardstown Road routes.

Option	10	11	12	13	14	15	16	17	18	19
Route	DFAI	DFC	DGAI	DGB	DGC	DHC	EFAI	EFC	EGAI	EGC
Hartstown – Manorfields	•	•	•	•	•	•	•	•	•	•
Castaheany	•	•	•	•	•	•	•			
Littlepace	•	•	•	•	•	•				
Hunstown						•	•	•	•	•
N3 – Navan Road	•	•	•	•	•	•	•	•	•	•
Westpoint Business Park	•	•					•	•	•	
Mulhuddart Wood			•	•	•				•	•
Parlickstown	•						•			
Church Road	•		•				•		•	
Blanchardstown Road North				•						
Blanchardstown Town Centre		•			•	•		•		•
Blanchardstown Corporate Park	•		•				•		•	
North West Business Park	•		•				•		•	
Milleum Business Park	•		•				•		•	

Implications for Utilities

General

5.35 Roads in and around urban areas tend to contain a full range of utilities, such as electricity, gas, telecommunications, cable television, water supply and drainage (foul and surface water). Any developments alongside and over such roads are likely to interfere with such utilities, and will require some diversion or protection to some extent. The following paragraphs summarise the utility interfaces which will need to be considered within the study area

Electricity

5.36 A utilities search has identified the presence of high voltage circuits along the line of, or crossing, the alignment route options.

5.37 110kV overhead power lines cross the shortlisted alignments at a number of locations as follows:

Routes FC, GB, GC and HC (options 11, 13, 14, 15, 17 and 19) pass beneath 110 kV overhead lines before crossing Blanchardstown Road North from Mulhuddart and adjacent to the Tolka Valley. The lines are within the ramp length from the road bridge, and as such there may be a conflict. This will require further checks to confirm the feasibility of these routes.

Routes 1B2, 2B2, 4DGB and S (options 3, 6, 14 and 22) pass beneath where these lines cross Blanchardstown Road North and/or Ballycoolen Road. Routes A (options 10, 12, 16 and 18) pass beneath the overhead power lines north east of Mulhuddart. The tracks are at grade at these locations and as such it should not be a problem. Precautions will need to be taken during construction.

All routes via Castaheany (options 10 to 20) pass beneath the overhead power lines south of Castaheany, but again the tracks are at grade and should not be a problem subject to precautionary measures being taken during construction.

All routes pass beneath a set of five 110 kV overhead power lines and two sets of 220 kV power lines north and west of the substation by the M50/N2 interchange. This will restrict the elevation of the railway through the area, probably requiring the route to cross under the N2.

Underground Power Lines

5.38 38kV underground power lines run along the south east side of Snugborough Road. These lines are below routes 3B, 3C, 4DFC, 4DGC, 4DHC, 4EFC and 4EGC (options 8, 9, 11, 14, 15, 17 and 19) over a considerable length and routes 1B1 and 2B1 (options 2 and 5) for a shorter length. The other routes cross where these power lines cross Ballycoolen Road. These power lines may require diversion or protection to some extent for most route options.

Gas Mains

5.39 A new 914 mm diameter 70 Bar gas main has been laid alongside Blanchardstown Road. This gas main is routed on the north west side of Blanchardstown Road South and will not conflict with the metro route which runs on the opposite side of the road.

5.40 The gas main is routed along the south east side of Blanchardstown Road North between the bridge over the N3 and the end of the residential area where it crosses to the north west side. Metro alignment routes 1B1, 1B2, 2B1, 2B2 and 4DGB (options 2,3 5, 6 and

13) pass above this gas main. There is insufficient room on the north west side of the road for the metro alignment due to the arrangement of residential access roads. The gas main would need to be relocated to provide access and protection against the effects of stray current leakage from the proposed DC railway. Failure to provide effective protection could result in electrolytic erosion of the gas pipe.

5.41 The gas main could be relocated to the north west side of Blanchardstown Road North over a length of approximately 1,000 metres. This would require the temporary removal of the estate wall and disruption to several side roads while the work is undertaken.

Water Mains

5.42 27" steel and 1000mm pre-stressed concrete water mains cross all routes 4 and 6, and cross routes FC, GC, GB & H in a second location. The tracks are at grade at these locations and should not significantly affect these mains. However some protection against stray electrical currents may be required.

Foul Sewers

5.43 All routes cross a foul sewer running along the north-east side of the N3. All routes are elevated at the crossing points, and therefore the sewer can be avoided through careful selection of foundation locations. Routes G pass alongside this route in the Mulhuddart area. The sewer alongside the north-west side of Blanchardstown Road North is crossed by routes FC, GC and GB. However these routes are elevated at this location and the sewer can be avoided through careful selection of foundation locations.

Summary Observations

5.44 The Blanchardstown Road corridor options described above are designed to serve the primary traffic objectives along the spine of the study area, and to provide reasonably direct routeings as far as possible.

5.45 It is not considered desirable to serve both the Blanchardstown Road corridor and Castaheany with a single Metro alignment, particularly taking account of the impact on journey times for longer distance travellers to the city centre and destinations to the north (including the airport). Preliminary estimates suggest that alignments via Castaheany

(Options 10 – 19) would involve considerably longer journey times than via the Blanchardstown Road corridor. – typically 21 to 23 minutes compared with 13 to 14 minutes for trips across the study area. Average end-to-end service speeds are broadly similar although slightly higher for the Blanchardstown Road options at 38-42 kph compared with 37-40 kph for the Castaheany options.

5.46 Taking the upper and lower ends of these cost ranges, the Castaheany routes would be likely to involve an additional 5 km of construction (approximately [text deleted] extra, excluding rolling stock and other add-ons, contingencies etc) and an additional journey time of 7-10 minutes for trips between Porterstown and the eastern end of the study area when compared with the Blanchardstown Road corridor options. This will tend to make journeys from the study area to the City centre seem relatively less attractive, especially during the AM and PM peak periods. The imbalance between the routes would be reduced if the Metro entered the southern part of the study area at Clonsilla – decreasing the route length via Castaheany (options 10 – 19) by some 1.7 km and increasing the route length for the Blanchardstown Road corridor options (1 – 9) by some 1.1km. The net 'penalty' in route length is halved to around 2 – 2½ km and the additional end-to-end journey time penalty associated with the Castaheany routes is reduced to around 3 – 4 minutes.

5.47 Inevitably, there will be a trade-off between maximising accessibility to the system and journey times for 'through passengers'. A possible compromise may be to 'split' the service, seen in some metro systems already, albeit at additional capital cost and lower service frequencies over each individual 'branch'. Peak services on the Castaheany branch could be higher to meet the needs of commuters travelling between the residential areas and the city centre, for example, and for the benefit or employees travelling to and from work in the newly zoned areas to the north of the N3. Frequencies to and from Blanchardstown Town Centre would be lower at these times, with the pattern reversed during the inter-peak when services might be more heavily focused on BTC. The concept could involve one of the branches operating as a light rail route, with the other running as a fully segregated metro and with (preferably cross-platform) interchange at each end.

5.48 To illustrate, it might be possible to operate a shuttle service (Metro or light rail) between Porterstown and Blanchardstown Town Centre via route 4 between these points, with the

shuttle trains terminating in a central bay providing cross-platform interchange with the Metro. This would provide access (with interchange) for Metro passengers travelling to and from Castaheany and Mulhuddart whilst at the same time providing a high quality means of local access to BTC. Alternatively a circular route serving BTC, Hartstown, Castaheany and Mulhuddart thence returning to BTC may be feasible.

Interchanges

5.49 In addition to the achievement of rail-Metro interchange at Porterstown or Clonsilla, suitable interchange facilities with buses are required. As discussed in Chapter 3, the two principal bus operators - Dublin Bus and Bus Éireann– are keen to have an interchange in the vicinity of Blanchardstown Town Centre although there appears to be no clear consensus as to its preferred location. The preferred location will be in part dependent on the choice of Metro alignment in the vicinity.

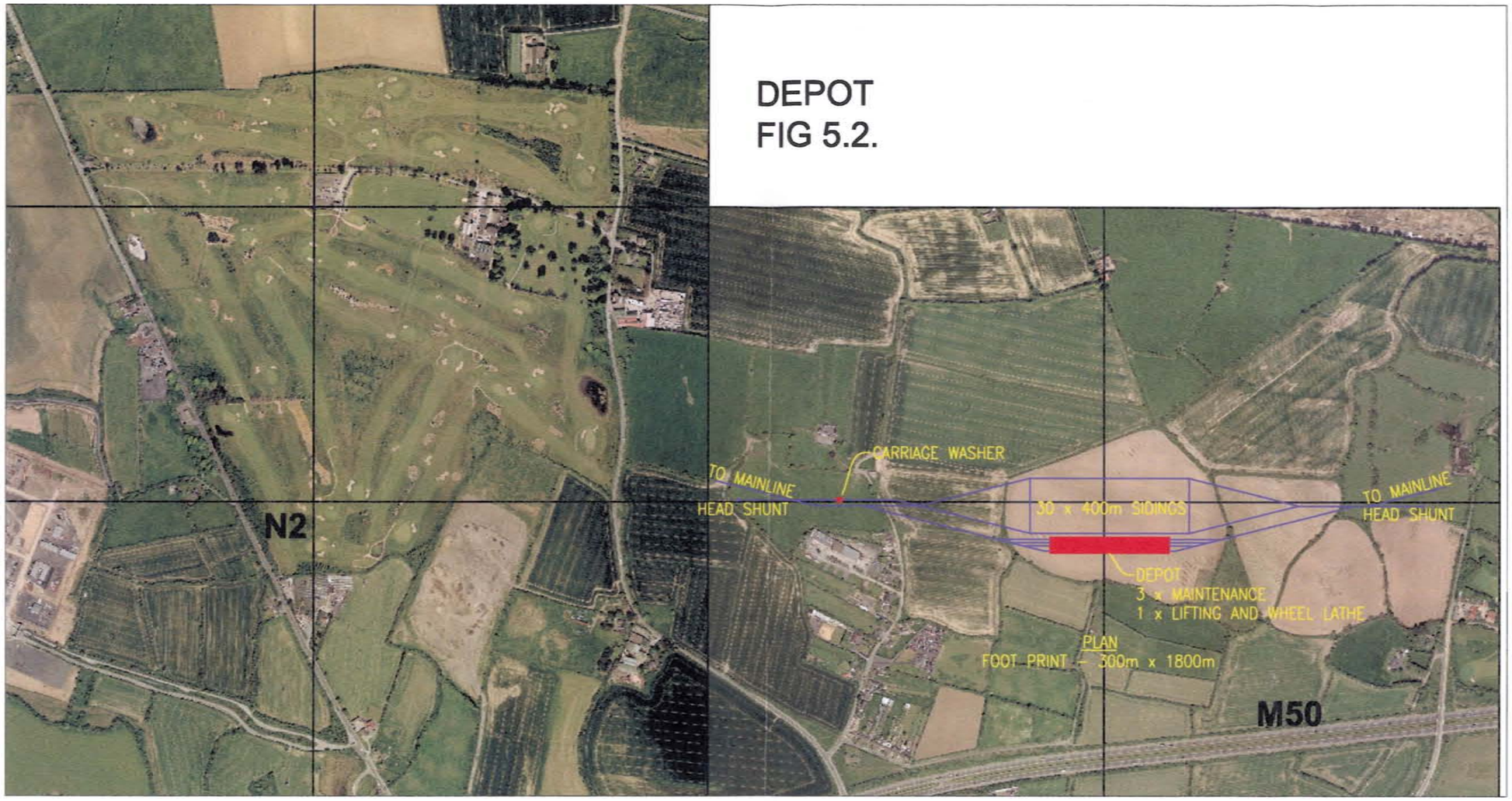
5.50 The footprint required by such an interchange will be dependent on a number of factors including the number of bus services involved and the extent to which routes terminate there. This will in turn determine the area required for buses standing on layover as well as picking up and setting down passengers. Dublin Bus advises the number of bus movements on services currently operating in the area total over 80 per hour during the peak periods, but potentially rising to well over 100 per hour in the long term.

Depot Footprint

5.51 The study is required to identify a suitable location for a maintenance and stabling depot. Fingal County Council is understood to favour a location in the vicinity of the N2/M50 interchange at the eastern end of the Phase 1 study area. As outlined in the discussion of Park and Ride in Chapter 3, a large area of farmland is currently available in this area.

5.52 We are advised by LRPO that this is likely to be the main depot for the whole Metro system, with secondary depot and stabling facilities being provided elsewhere in accordance with land availability and considerations of operational efficiency (e.g. to minimise the amount of unproductive running of trains to and from service on other parts of the system).

DEPOT
FIG 5.2.



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DUBLIN METRO PHASE 1

DEPOT

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5.53 LRPO advises the long-term requirement is to provide maintenance and stabling facilities for up to 100 trains (400 cars) at this location. Fig. 5.2 illustrates in broad terms the size of the footprint such a depot would require, assuming 120-metre long trains. This figure highlights the potential scale of the depot facility and provides an indicative illustration of the land requirements for such a facility. The layout assumes 30 open-air stabling sidings each accommodating 3 x 4-car trains, with provision for 10 trains being made within the depot building.

5.54 The configuration of the depot is beyond the scope of this study, and will in any event be partly dependent on the long-term service pattern and hence junction arrangements between the western orbital route and the spine route from Swords. These junction arrangements and an overall depot strategy are likely to be determined in the Swords – Airport – City centre study which LRPO has recently separately commissioned.

5.55 The assumed footprint provides for the depot to be double-ended to avoid being 'locked up' in the event of a derailment on the fan.

Conceptual Station Design

5.56 Again, it is premature to prepare station designs at this pre-feasibility stage. However, broad station footprints have been overlaid onto the alignment plans to illustrate the likely requirements.

5.57 Figures 5.3 (i) - 5.3 (v) illustrate the likely broad layout of two generic station types – major and minor – assuming 120-metre long trains, with provision for passenger shelters on platforms. The schematic plans also provide for ticket issuing facilities and assume a 'fully closed' system with automatic barriers for ticket validation on entering and leaving the system. Clearly the requirement will vary between stations, dependent on peak passenger flows.

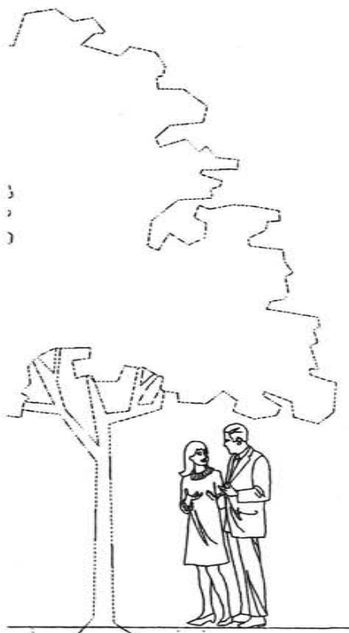
Rolling Stock Requirements

5.58 Although not required by the brief, we have modified a simple existing model to assess in broad terms the rolling stock requirement attributable to the section of the western orbital route between Porterstown and the N2/M50 interchange. Whilst it is of limited meaning in the context of a much wider network, the options considered above are estimated to

involve a peak vehicle requirement in the region of 27-31 cars for the Blanchardstown Road corridor alignment options, assuming a five-minute peak headway and a 10% margin of spare vehicles for maintenance and traffic cover. Assuming a cost in the order of [text deleted] per car, this could involve a capital cost in the region of [text deleted] for rolling stock.

5.59 A similar frequency via Castaheany would require an estimated 2 – 3 additional trains compared with the Blanchardstown Road options (starting at Porterstown), the equivalent extra cost being roughly [text deleted] (including allowance for spare vehicles).

5.60 Outline construction costs are discussed in Chapter 6.



BARRIER AT EDGE OF PLATFORM.
CONSIDER:

- –NOISE BARRIER OPAQUE AS VISUAL SCREEN OR TRANSPARENT TO ALLOW VIEW
- –ADVERTISEMENT OPPORTUNITY
- –REQUIREMENT FOR SECURITY FENCE

AXIAL TRACTION POLE

CANOPY DESIGN
CONSIDER:

- –ATTACHING CANOPY TO BARRIER TO AVOID CLUTTER ON PLATFORM
- –VISUAL IMPACT FROM CANOPY STRUCTURE IN SENSITIVE AREAS. DESIGN OF CANOPY TO REFLECT SURROUNDING ARCHITECTURE TO MINIMISE VISUAL IMPACT.
  CANOPY TO BE PROVIDED WHERE JUSTIFIED BY WAITING PASSENGER NUMBERS

PLATFORM LEVEL TO SUIT ROLLING STOCK

MINIMUM 2.5m WIDE PLATFORM

BALLASTED TRACK

SERVICE TRENCH.
CONSIDER:

- –DISTANCE FROM TRACK
- –DISTANCE FROM EXISTING VEGETATION.
- –VEHICULAR ACCESS FOR MAINTENANCE OF TRENCH.

CONSTRUCTION OF TRACK.
CONSIDER:

- –CONTAMINATED SOIL AND REMOVAL OFF SITE.
- –TRACK DRAINAGE.

PASSENGER FACILITIES.
CONSIDER:

- –CAR PARKING REQUIREMENTS
- –SEVERENCE OF FOOTPATH
- –GRADIENT OF RAMP
- –PEDESTRIAN LIGHTING

PROPOSED PLANTING.
CONSIDER:

- – ENHANCEMENT OF STATION
- – HEIGHT OF TREES IN RELATION TO CATENARY MASTS
- – DISTANCE FROM SERVICES

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DUBLIN METRO NORTH

TYPICAL SECTION AT GRADE STATION WITH ENVIRONMENTAL CONSIDERATIONS

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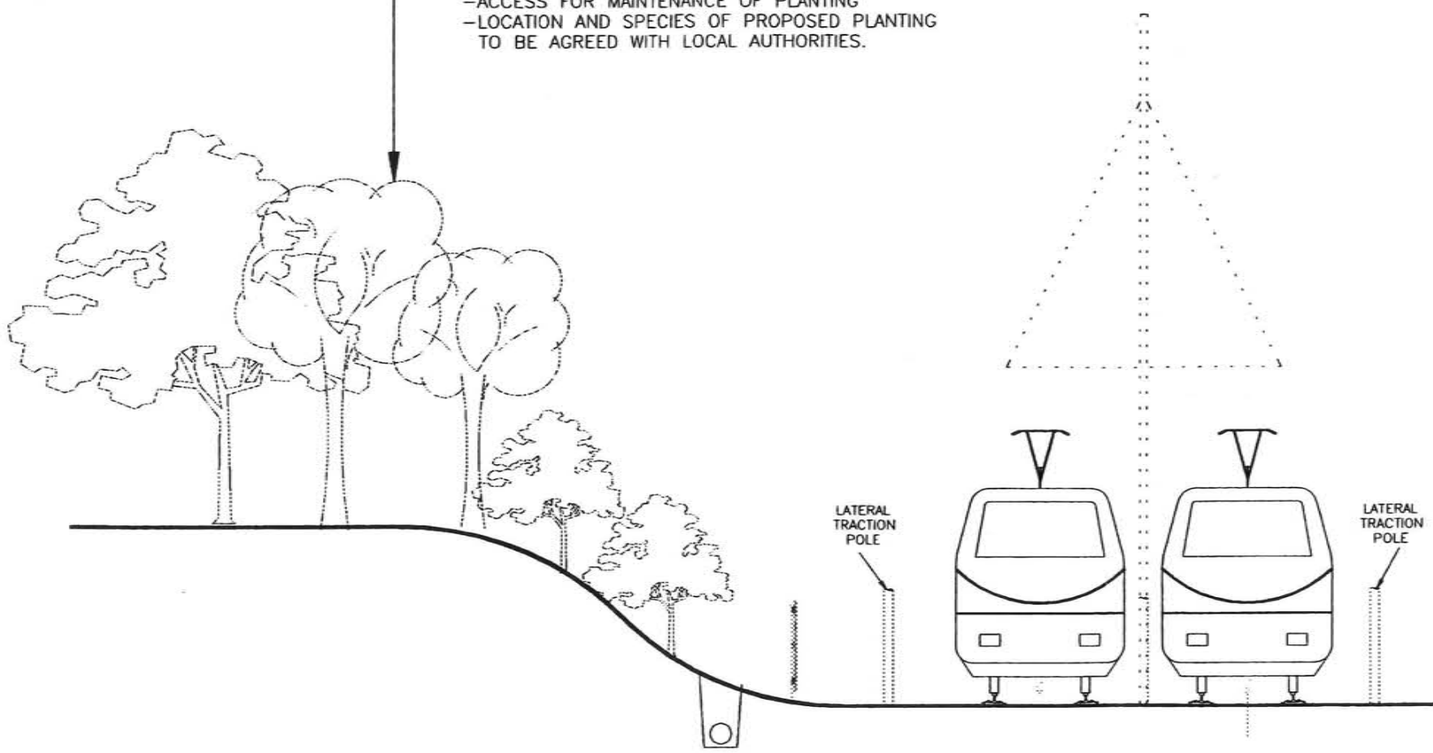
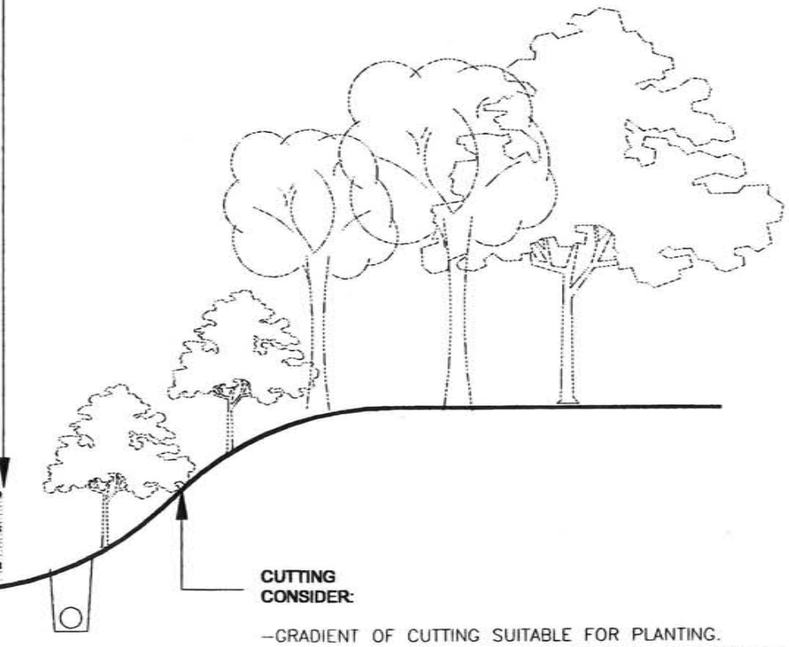
BOUNDARY PLANTING.
CONSIDER:

- –EXISTING AND PROPOSED TREES DISTANCE FROM TRACK AND CATENARY MASTS FOR SAFETY.
- –ACCESS FOR MAINTENANCE OF PLANTING
- –LOCATION AND SPECIES OF PROPOSED PLANTING TO BE AGREED WITH LOCAL AUTHORITIES.



BARRIER.
CONSIDER:

- –REQUIREMENTS FOR SECURITY FENCE
- –NOISE REDUCTION FROM CUTTING. BARRIER MAY NOT BE REQUIRED
- –BARRIER FOR VISUAL SCREEN NOT REQUIRED DUE TO CUTTING.



CUTTING
CONSIDER:

- –GRADIENT OF CUTTING SUITABLE FOR PLANTING.
- –ROCK CUTTING/EARTH CUTTING, REMOVAL OF MATERIAL
- –ACCESS FOR MAINTENANCE
- –DRAINAGE FROM SLOPE AND LOCATION OF CHANNELS
- –MINIMISE REMOVAL OF EXISTING VEGETATION
- –CONTAMINATED SOIL AND REMOVAL (

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WS Atkins

TYPICAL SECTION IN CUTTING
WITH ENVIRONMENTAL CONSIDERATIONS

Drawing Number: 1840–RS010

PLANTING.
CONSIDER:

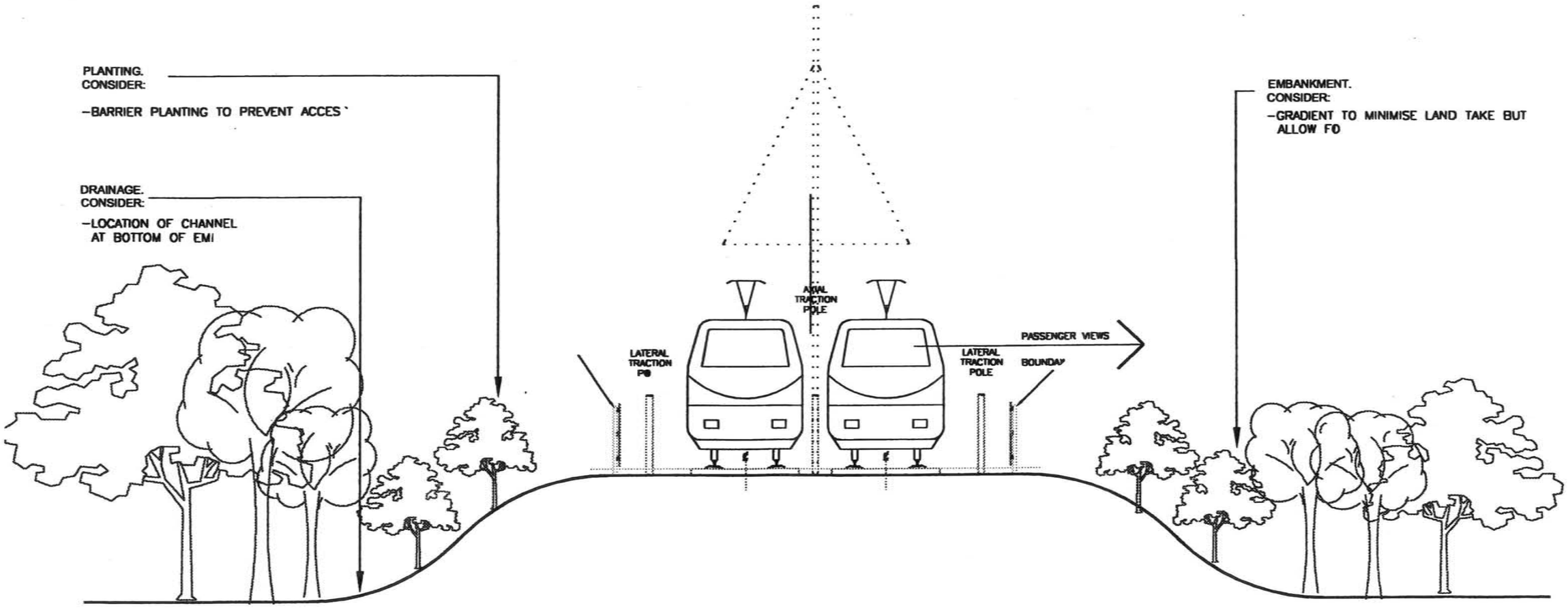
–BARRIER PLANTING TO PREVENT ACCES`

DRAINAGE.
CONSIDER:

–LOCATION OF CHANNEL
AT BOTTOM OF EMI

EMBANKMENT.
CONSIDER:

–GRADIENT TO MINIMISE LAND TAKE BUT
ALLOW FO



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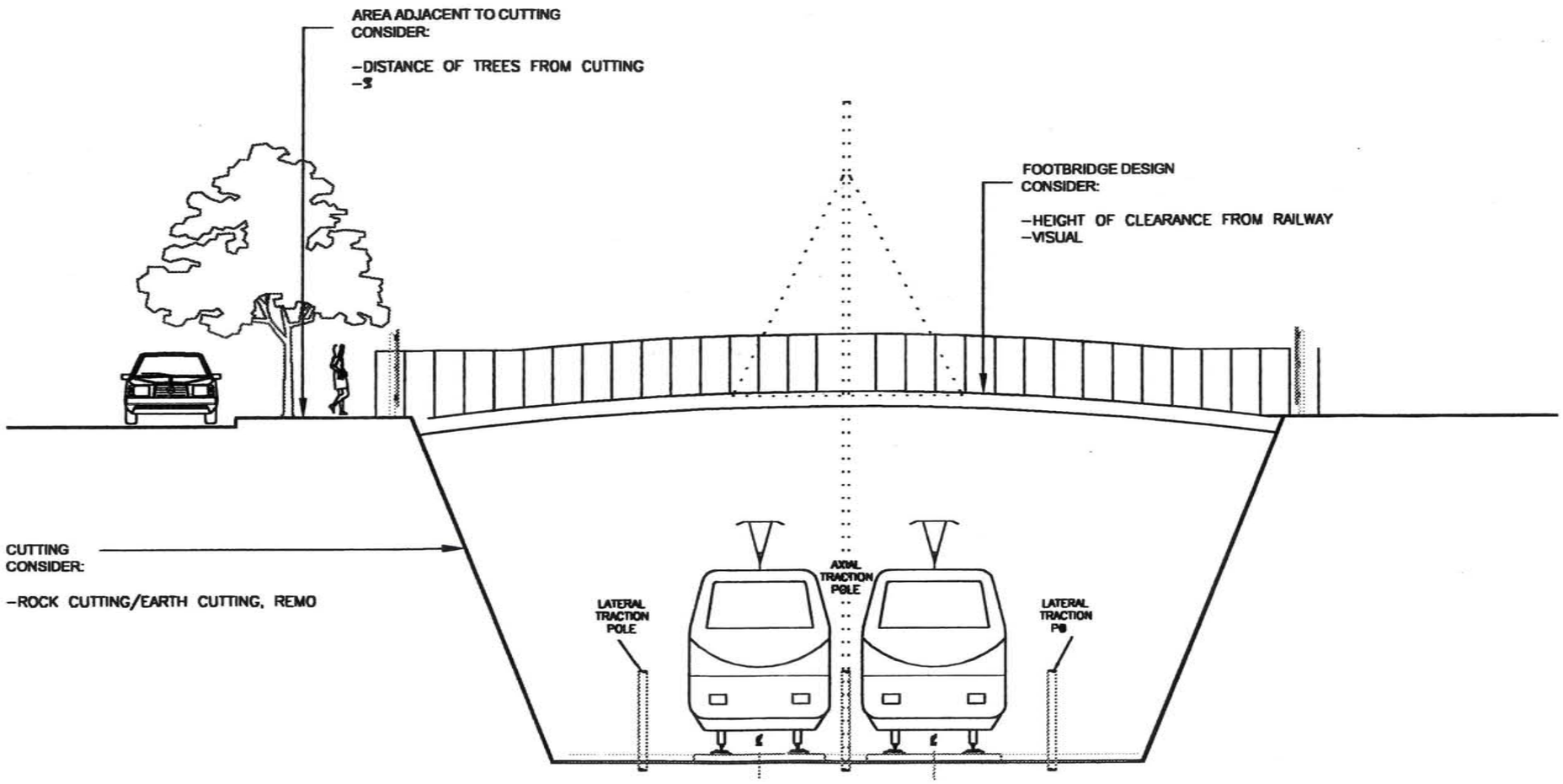
DUBLIN METRO PHASE 1

Drawn	Chk.	Auth	Scale
DH	BOC	CF	1:100
Date 15.05.01	Date 15.05.01	Date 15.05.01	

TYPICAL SECTION ON EMBANKMENT
WITH ENVIRONMENTAL CONSIDERATIONS

Drawing Number
1840–RS011

1840-RS011



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DUBLIN METRO PHASE 1

TYPICAL SECTION IN DEEP CUTTING
WITH ENVIRONMENTAL CONSIDERATIONS

Drawn	Chk	Auth	Scale
D.R.	S.O'C	C.F.	1:100
Date 15.05.01	Date 15.05.01	Date 15.05.01	

Drawing Number 1840-RS012 P1

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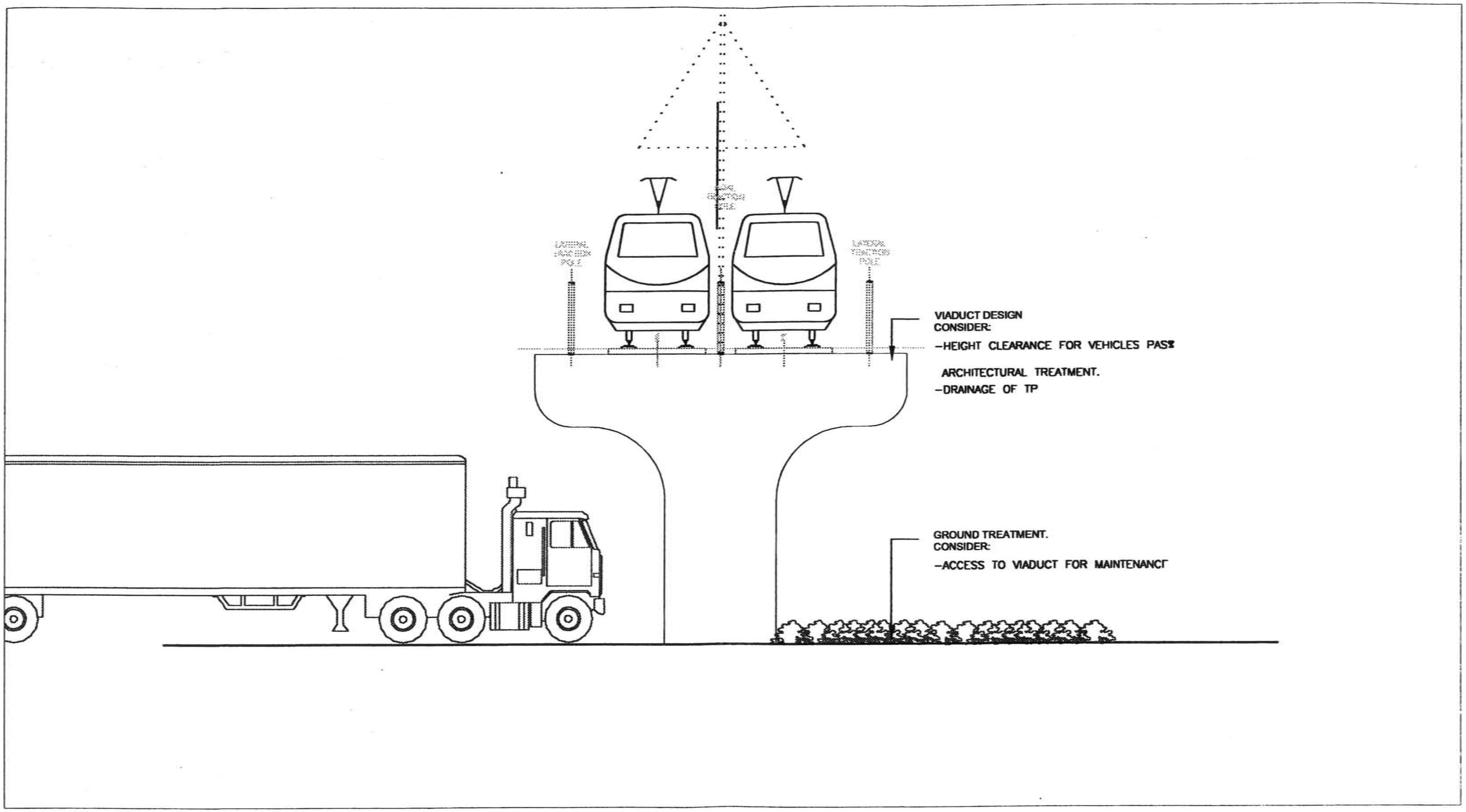

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DUBLIN METRO PHASE 1

TYPICAL SECTION ON VIADUCT
WITH ENVIRONMENTAL CONSIDERATIONS

Drawn	Chk	Auth	Scale	Drawing Number	
D.H.	B.O'C	C.F.	1:100	1840-RS013	P1
Date 15.05.01	Date 15.05.01	Date 15.05.01			

RS52-013

6. CAPITAL COSTS

Scope

6.1 It has been necessary at this early stage to make specific assumptions in order to enable a preliminary cost to be assessed, the majority of which were in respect of either the system specification or perceived operational constraints.

6.2 The available information regarding both design and specification levels are such that the costs provided within this section of the report are deemed to be to an accuracy of ±40% (-10% and +40%). The technical information on which the estimates have been based is limited solely to the indicative route details, the unit cost spreadsheet (Structure lengths.xls) and a brief overview of the bridge structure requirements.

6.3 Preliminaries are included within the rates to cover costs in connection with typical contractual requirements, specified requirements and contractors method related charges. They include, but are not limited to, insurance, compliance with safety conditions, provision of accommodation, temporary services, access etc, all temporary works required during the works, and contractors' welfare, transport, plant and supervision costs.

6.4 The elements for which unit rates have been assessed are:

- Trackworks – site preparation, track formation, permanent way, signalling, telecommunications, segregation measures and provision of traction power supplies.

- Bridge works – primarily the construction costs for pre-cast concrete multi-span bridges of varying length for the relatively straightforward and functional spans over the existing roads; and the architectural and form-driven signature bridge over the Tolka Valley.

- Ramps – to elevate tracks to bridge heights - have been costed on the basis that they will generally be of pre-cast concrete crossheads supported on in-situ columns on piled foundations. The 'viaducts' will culminate in abutment walls that are subsequently bridged over.

- Stations – initially two generic station types have been considered, simple station halts at either high or low level. These "halts" comprise low level platforms 120m long with proprietary passenger shelters and lighting throughout. The high level station would be constructed on piled foundations approximately 6 metres above ground level complete with two staircases, two escalators and two 12-person capacity lifts to provide access. Indicative costs for station buildings have been included. From these unit rates, it is then possible to assess indicative costs from the defined requirements.

Qualifications and assumptions

6.5 Construction will be undertaken in a "Greenfield" rail environment, i.e. in a non-operational environment and with no restrictive working practices (such as railway possessions or electrical isolations) normally associated with Railway works.

6.6 Liaison with local authorities regarding traffic management where works impact upon the public roads will not impact upon the construction programme

6.7 The Metro will be totally segregated from highway traffic within the study area, i.e. provision has not been made within the permanent way, signalling or electrification elements for level crossings (this may be subject to some revision for the small number of locations where at-grade road crossings have been incorporated in then preliminary scheme proposals.)

6.8 The overall width of route (two running tracks and cess) has been assumed to be 10 metres, for both at-grade and ramped/bridged sections

6.9 The assumed method of raising the formation for road flyovers is a concrete 'viaduct' construction either side of a multi-span pre-cast concrete bridge.

6.10 The works will be undertaken as a single phase of the overall Dublin Metro project and the section will be brought into operation as a whole, e.g. the section will not be brought into operation in a number of sub-sections.

6.11 No allowance has been made for a maintenance depot at this stage, or for a multi-modal interchange at Porterstown, Park and Ride facilities in the vicinity of the N2/M50 interchange, or for a more extensive station at the proposed National Stadium.

6.12 Whilst the escalation of construction costs resultant from inflation has been excluded from this pre-feasibility estimate, it is a significant factor to be considered at the Cost Plan stage.

6.13 The pre-feasibility estimate assumes that there is sufficient capacity within the Irish National Grid to provide the Metro system with generated power. In addition, it is assumed that such power will be available from local supply points (sub-stations) throughout the proposed routes.

Caveats

6.14 The design information that forms the basis of this Pre-Feasibility Estimate does not contain sufficient detail to enable more accurate costings to be produced and the conceptual design will need to be further developed in order to allow the production of more robust construction budgets and cost plans. During the preparation of a more robust cost plan, consideration should be given to such matters as local geology, contaminated land, traffic management and diversions due to either the presence of utilities or archaeological discoveries.

6.15 It has been assumed that the existing ground conditions will allow the proposed works to be undertaken without the need for complex / abnormal ground works (such as piling) beyond those specifically identified, for example piling required at the elevated station.

Exclusions

6.16 The following items are specifically excluded from this pre-feasibility estimate.

General Items

- County Council / Local Authority costs and charges.
- Building Regulation or Planning Fees.
- Professional and Legal Fees / charges throughout the duration of the Project.

- Compensation payments to existing tenants / adjoining owners.
- Escalation after 1Q2001.

Specific Items

- Diversion of all / any existing utilities or services, other than where specifically identified (BGE 914 mm main at Blanchardstown Road North).
- Abnormal foundations and obstructions that may arise following a detailed site and ground exploration survey.

6.17 Land Acquisition costs have been based on unit rates provided by LRPO

6.18 Value Added Tax is included as an 'add-on' at current (April 2001) levels

6.19 Table 6.1 below summarises the unit cost rates utilised in the assessment of capital costs:

Table 6.1: Unit Cost Rates

Track works		
Per metre of twin-track section at grade		[text deleted]
Ramps		
Per metre of twin-track section (including track works)		[text deleted]
Bridges		
10 metre span bridge	Over twin tracked bridge sections (including track works)	[text deleted]
20 metre span bridge		[text deleted]
30 metre span bridge		[text deleted]
40 metre span bridge		[text deleted]
50 metre span bridge		[text deleted]
60 metre span bridge		[text deleted]
70 metre span bridge		[text deleted]
90 metre span bridge		[text deleted]
100 metre span bridge		[text deleted]
115 metre span bridge		[text deleted]
140 metre span bridge		[text deleted]
150 metre span bridge		[text deleted]
180 metre span bridge		[text deleted]
220 metre span bridge		[text deleted]
240 metre span bridge		[text deleted]
260 metre span bridge		[text deleted]
280 metre span bridge		[text deleted]
220, 240 or 250 metre span Signature bridge over N3 and / or Tolka Valley		[text deleted]
305 metre span Signature bridge over N3 and / or Tolka Valley		[text deleted]
350 metre span Signature bridge over N3 and / or Tolka Valley		[text deleted]
400 metre span bridge		[text deleted]
460 metre span bridge		[text deleted]
550 metre span bridge		[text deleted]
Stations – Extra Over Costs		
Station Halt – including platforms	Each halt	[text deleted]
High Level Station	Each Station	[text deleted]
Station Buildings – extra over station halts	3 ticket window	[text deleted]
	4 ticket window	[text deleted]

6.20 Table 6.2 below summarises the capital construction costs associated with each of the shortlisted options, based on the scope of works outlined above. Costs are rounded to the nearest €1 million, with a breakdown by route set out in Appendix B.

Table 6.2: Summary of Construction Capital Costs

Option	Reference	Route distance (km)	Number of Stations		Cost € millions (rounded) inc stations, starting at:	
			Low level	High level	Porterstown	Clonsilla
1	1A	10.7				Deleted
2	1B1	9.2	6	1	[text deleted]	[text deleted]
3	1B2	9.5	7	1	[text deleted]	[text deleted]
4	2A	10.8				Deleted
5	2B1	9.3	5	2	[text deleted]	[text deleted]
6	2B2	9.6	6	2	[text deleted]	[text deleted]
7	3A	9.3				Deleted
8	3B	9.3	6	2	[text deleted]	[text deleted]
9	3C	9.2	5	3	[text deleted]	[text deleted]
10	4DFAI	14.4	13	1	[text deleted]	[text deleted]
11	4DFC	14.8	10	2	[text deleted]	[text deleted]
12	4DGAI	14.3	13	1	[text deleted]	[text deleted]
13	4DGB	13.9	11	1	[text deleted]	[text deleted]
14	4DGC	14.3	10	2	[text deleted]	[text deleted]
15	4DHC	14.1	11	2	[text deleted]	[text deleted]
16	4EFAI	14.3	13	1	[text deleted]	[text deleted]
17	4EFC	14.7	11	1	[text deleted]	[text deleted]
18	4EGAI	14.1	13	1	[text deleted]	[text deleted]
19	4EGC	14.1	10	2	[text deleted]	[text deleted]

Other Alternatives Considered

6.21 Entry into the study area at Clonsilla instead of Porterstown increases the cost of the Blanchardstown Road corridor routes (Options 1 – 9) by in ~~the order~~ of [text deleted] and

reduces the cost of the Castaheany corridor routes (Options 10 - 19) by roundly [text deleted] (see Table 6.2 above).

6.22 Station costs have been included on the basis of:

- Low-level station, including 3 ticket window station building [text deleted]
- High Level station, including 3 ticket window station building [text deleted]

6.23 For this exercise of alignment selection, the stations at Porterstown and the N2/M50 junction have been treated as simple stations. Ultimately they are likely to be Multi-modal and Park and Ride respectively.

6.24 Our costings include an allowance for minor utility diversion works, but the above figures exclude the cost of diverting the major gas main along the Blanchardstown Road corridor, the extent and cost of which cannot be determined without significant further detailed work. In the meantime, following discussion with LRPO, we consider a broad allowance of [text deleted] per km for diversion of the gas main might reasonably be added to the above costs. This is likely to add in the region of [text deleted] for Options 2, 3, 5 and 6 (routes 1B1, 1B2, 2B1, 2B2respectively).

6.25 At LRPO's request, we have made further additions to reflect:

- Rolling stock 'attributable' to study area (largely independent of alignment choice)
- Contingency [text deleted] of construction and rolling stock costs)
- Client costs ([text deleted] of construction costs, rolling stock and contingency)
- VAT (20% on rolling stock, 12% on other costs)
- Property acquisition costs (roundly [text deleted] per km.)

6.26 On this basis, the total cost of Options 1 – 19 (from Porterstown) including the above global allowances might be expected to be in the following broad range:

Table 6.3: Summary of Total Capital Costs

Option	Reference	Route distance (km)	Cost € millions (rounded) Low (-10%)	High (+40%)	
1	1A	10.7			Deleted
2	1B1	9.2	[text deleted]	[text deleted]	
3	1B2	9.5	[text deleted]	[text deleted]	
4	2A	10.8			Deleted
5	2B1	9.3	[text deleted]	[text deleted]	
6	2B2	9.6	[text deleted]	[text deleted]	
7	3A	9.3			Deleted
8	3B	9.3	[text deleted]	[text deleted]	
9	3C	9.2	[text deleted]	[text deleted]	
10	4DFAI	14.4	[text deleted]	[text deleted]	
11	4DFC	14.8	[text deleted]	[text deleted]	
12	4DGAI	14.3	[text deleted]	[text deleted]	
13	4DGB	13.9	[text deleted]	[text deleted]	
14	4DGC	14.3	[text deleted]	[text deleted]	
15	4DHC	14.1	[text deleted]	[text deleted]	
16	4EFAI	14.3	[text deleted]	[text deleted]	
17	4EFC	14.7	[text deleted]	[text deleted]	
18	4EGAI	14.1	[text deleted]	[text deleted]	
19	4EGC	14.1	[text deleted]	[text deleted]	

7. EVALUATION OF OPTIONS

Demand Analysis

7.1 The extent to which each of the alignment options attracts patronage will be determined by the scale of trip attractors and generators in the catchment area and the accessibility to and from the system. The DTO model disaggregation work described in Chapter 4 suggested that metro patronage levels are likely to be broadly similar regardless of alignment through the Phase 1 study area, although the Castaheany alignment does have higher line flows and the trip distribution analysis also captured more trips on the Castaheany alignment. However, the strategic nature of the DTO model makes it difficult to forecast absolute levels of patronage on the Metro with a high level of certainty. We have therefore carried out a comparative analysis of population and employment within the catchment area of stations along each of the shortlisted alignments.

7.2 The immediate job and population catchments (at 2016) of the alternative alignments (assuming the routes start at Porterstown) are given in Tables 7.1 and 7.2 below.

Table 7.1: Catchment Analysis (Blanchardstown Road corridor)

Option		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Route		**1A1**	**1B1**	**1B2**	**2A1**	**2B1**	**2B2**	**3A**	**3B**	**3C**
Population	500m		17100	17800		16100	16800		18600	17900
	800m		25400	27400		29100	31100		35100	34900
Employment	500m		7900	17400		9000	18600		12000	12800
	800m		19200	31700		19200	31700		22100	22100

Table 7.2: Catchment Analysis (Castaheany corridor)

Option		**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Route		**4DFAI**	**4DFC**	**4DGAI**	**4DGB**	**4DGC**	**4DHC**	**4EFAI**	**4EFC**	**4EGAI**	**4EGC**
Population	500m	33500	34700	35700	35700	36900	40100	36000	37100	38200	39300
	800m	79000	81500	84400	83200	86900	92300	81800	84300	87200	89700
Employment	500m	25000	13700	22200	16700	10900	12300	23600	12300	20800	9500
	800m	56400	29800	49400	32400	22800	27000	50800	24200	43800	17200

7.3 A high level comparison of Tables 7.1 and 7.2 shows that much higher numbers of people are likely to be within the catchment area of routes running through Castaheany than along the Blanchardstown Road corridor in the year 2016 – typically 80,000 – 90,000 compared with 25,000 – 35,000 within an 800-metre radius of stations.

7.4 Table 7.1 indicates that, for the Blanchardstown Road corridor, there is some significant variation between the alignment options in terms of serving areas of population with Options 8 and 9 (routes 3B/3C running along Snugborough Road)) having a larger 800m catchment area population than the others. Table 7.2 suggests that options 15, 18 and 19 perform slightly better than the other options running via Castaheany although, in reality, there is probably little to choose between them within the levels of accuracy of the analysis.

7.5 The forecast number of employees within the catchment area of stations along Blanchardstown Road options 3 and 6 (Routes 1B2 and 2B2) are appreciably higher at around 32,000 than the other route options along this corridor – in the range 20 – 22,000. The 800 metre employment catchment along the Castaheany corridor is much higher than the Blanchardstown Road corridor – in some cases in the region of 50 – 55,000 (Options 10, 12 and 16).

7.6 Taking jobs and population together, a similar picture emerges, with Options 10, 12, 16 and 18 appearing to offer the best balance between serving jobs and population.

7.7 The net effect of starting the Castaheany routes at Clonsilla instead of Porterstown is to reduce the size of the population catchment area significantly (by around 30000 residents within 800 metres of stations), particularly since this involves 'missing' the major centres of population in the Charnwood/Lohunda Park areas. The net effect of starting Blanchardstown routes at Clonsilla instead of Porterstown is less marked although still negative, reducing the population within 800 metres by some 2000 residents. The effect of the alternative starting points on employment catchments is insignificant in relation to the impact on residential catchments.

7.8 In addition to jobs and population, the trip generating potential of the Stadium and of the shopping centre at Blanchardstown need to be taken into account. Based on information recently supplied by Stadium Campus Ireland, numbers of visitors arriving/departing on weekdays and at weekends for each of the "stadium" stations is expected to be as follows (rounded to nearest 100):

Station Location	Weekday	Weekend
Station 1 - Aquatic Centre - Snugborough Road	6600	14600
Station 2 Snugborough /Ballycoolin Road Junction	2800	3000
Station 3 Ballycoolin Road	3000	5700

On event days (of which there are expected to be 100 per annum) the Arena is anticipated to attract a further 7500 people, with 70% using station 2 and 30% using station 3. The stadium itself is expected to cater for some 18 events per annum - on average 40,000 persons attending, predominantly using station 3.

7.9 Blanchardstown town centre is expected to attract up to 30,000 shoppers on an average weekday by 2005.

7.10 The analysis indicates a need to identify the best balance between residential, employment and shopping needs.

7.11 Although the disaggregation of Blanchardstown area zones within the DTO model has provided some guidance on the relative patronage associated with alternative route alignments, more detailed modelling work is required to establish the optimum route.

Evaluation Framework

7.12 In view of the uncertainty attached to the demand forecasts from the DTO model, the options outlined above have been the subject of a framework evaluation approach. To assist in interpretation and to provide maximum transparency, the framework has been set up in the form of a simple spreadsheet.

7.13 For each of the nineteen options, scores from 1 to 5 (very poor to very good) have been awarded to a range of attributes as set out below. Weightings (discussed and agreed with LRPO) were then applied to each of the attributes such that the relative importance of each of the attributes could be reflected in the final (weighted) scores for each option.

7.14 Table 7.3 summarises the attributes considered and the weightings attributed to each for the Blanchardstown options. Table 7.4 provides a similar analysis for the Castaheany routes. The scores awarded to each of the attributes are also shown, culminating in unweighted and weighted total scores for each option.

Table 7.3: Evaluation Framework for Option Assessment (Blanchardstown Routes)

		Score (out of 5)								
Criterion	**Option Weight**	**1A**	**1B1**	**1B2**	**2A**	**2B1**	**2B2**	**3A**	**3B**	**3C**
Ease of Construction/Time to implement	**5**	Deleted	3	3	Deleted	2	2	Deleted	1	1
Capital Cost	**5**		5	5		5	5		4	3
Residential catchment area	**3**		1	1		1	1		1	1
Employment catchment area	**3**		2	3		2	3		2	2
Environmental Impact	**2**		2	4		4	4		2	2
Serving New Development	**4**		2	3		2	3		3	3
Serving Blanchardstown Town Centre	**5**		1	1		3	3		5	5
Impact on through journey times	**1**		5	4		4	4		4	4
Safety (Level of Segregation)	**3**		3	3		3	3		4	4
Transport Integration	**4**		3	3		5	5		4	4
Total Unweighted Score		0	27	30	0	31	33	0	30	29
Weighted Score		**0**	**92**	**102**	**0**	**108**	**115**	**0**	**107**	**102**

Table 7.4: Evaluation Framework for Option Assessment (Castaheany Routes)

		Score (out of 5)									
Criterion	**Option Weight**	**4DFAI**	**4DFC**	**4DGAI**	**4DGB**	**4DGC**	**4DHC**	**4EFAI**	**4EFC**	**4EGAI**	**4EGC**
Ease of Construction/Time to implement	**5**	3	2	3	2	2	2	3	2	3	2
Capital Cost	**5**	4	1	3	3	2	2	4	2	4	1
Residential catchment area	**3**	4	4	4	4	5	5	4	4	5	5
Employment catchment area	**3**	5	3	5	3	2	2	5	2	4	1
Environmental Impact	**2**	2	3	3	4	4	3	2	3	3	3
Serving New Development	**4**	5	4	4	3	4	4	4	4	4	4
Serving Blanchardstown Town Centre	**5**	1	5	1	2	5	5	1	5	1	5
Impact on through journey times	**1**	1	1	1	2	2	1	1	1	1	2
Safety (Level of Segregation)	**3**	4	4	4	3	4	4	4	4	4	4
Transport Integration	**4**	2	5	2	2	5	5	2	5	2	5
Total Unweighted Score		31	32	30	28	35	33	30	32	31	32
Weighted Score		**112**	**116**	**105**	**95**	**124**	**121**	**108**	**118**	**110**	**114**

7.15 The results of this framework approach suggest that each of the routes has its own advantages and disadvantages, and there is no clear 'winner'. Overall, Option 6 (Route 2B2) – serving Blanchardstown Town Centre, then following Blanchardstown Road North and Ballycoolen Road – appears the most favourable, followed by Option 8 (Route 3B), serving Blanchardstown Town Centre and then running along the Snugborough Road corridor. Of the Castaheany routes, Options 14 and 15 (Routes DGC/DHC) – serving Castaheany (Littlepace), Mulhuddart (Option 14) or running immediately to the south of the N3 (Option 15), Blanchardstown Town centre and Snugborough Road - perform best based on the results of the evaluation framework..

Stakeholder Workshop

7.16 Following the preparation of the preliminary Phase 1 alignment proposals, a workshop was held with key stakeholders. This workshop was held on 25 July, the aim being to:

- Gauge preliminary views and reactions to the alternatives considered
- Assist the process of filtering this long-list down to a short-list of options which might be carried forward to the next stage of development and which might reasonably form the subject of public consultation

7.17 The workshop was attended by representatives of Green Properties, Castlethorn Construction, SIAS, John Moylan and Associates, Blanchardstown Town Centre management, Fingal County Council, Bus Éireann, Dublin Bus, Iarnród Éireann,, BAC Stadium Developments, Dublin Transportation Office and the Dublin 15 Community Council (the main local residents' group within the study area). Attendees were split into three groups for the purposes of discussion, with the main focus being on a comparative debate on alignments selected, and with particular reference to potential locations for crossing the Liffey River.

7.18 Key points emerging can be summarised as follows:

- Fingal CC would like maximum possible coverage of the study area by a single route alignment for the Western Orbital Metro, i.e. without branches

- There was a need for strengthening of existing town centres (e.g. Liffey Valley Centre)
- Blanchardstown Town Centre is a major objective which must be served by the Metro, and should be served on the west side rather than the south-east
- Views are divided over how and where the Metro might cross the Liffey River, but it seems clear that any proposal to cross the Liffey via a route adjoining the M50 motorway or by a central route across green fields south of Porterstown is likely to be met with great hostility from local residents. This should be considered further when proposals for the Phase 2 study area had been developed
- On the Blanchardstown Road corridor, options running via Snugborough Road appear to be favourably received
- Blanchardstown Institute of Technology is seen as a key objective
- The northern industrial areas around Damastown and Tyrrelstown are important objectives, but cannot be effectively served from the Blanchardstown Road corridor
- Severance is likely to be a major issue within the Castaheany residential area
- The residents' group favours an alignment following the general routeing of Options 14 or 19, but starting from Clonsilla rather than Porterstown, i.e. Routes 5DGC/5EGC, serving Damastown and Mulhuddart, BTC and the Stadium sites
- Existing and planned public transport systems, together with existing and future highway networks, should be superimposed onto our proposals maps

7.19 Developer interest appeared to centre on localised issues rather than at a strategic level over a wider area.

7.20 From the workshop discussion it seems clear that the role of the Metro in the study area needs to be clarified before proposals are developed in further detail.

Fingal County Council

7.21 Fingal County Council (FCC) submitted a more formalised response to the initial alignment proposals in a letter to LRPO dated 21 September 2001. Significantly, FCC expressed a strong preference for alignments centred on the Blanchardstown Road corridor, its first preference being for Route 2B1 (Option 5) followed by Routes 3B/3C (Options 8 or 9). FCC is strongly opposed to options which do not serve Blanchardstown Town Centre and/or which follow unduly circuitous routeings. The Council expressed its opposition to more westerly alignments through Castaheany for a number of reasons outlined in the letter.

7.22 The Council made a number of other comments on the proposals, the most significant of which is that consideration should be given to routeing the metro underground in the vicinity of Blanchardstown Town Centre.

A copy of the Council's letter is attached at Appendix C for reference.

8. CONCLUSIONS

8.1 The key conclusions emerging from the study can be summarised as follows:

- The mode split targets being adopted in the DTO's transportation strategy for Dublin are ambitious, and a high quality public transportation system is a key ingredient to their achievement. It is also likely that bold demand management measures will be needed to achieve such high mode split targets in favour of public transport;

- It is likely that planning bodies will need to exert considerably stronger influence in the designation of land use and on planning decisions than has been the case hitherto. There is evidence that the layout new residential and commercial developments currently under construction are not highly conducive to being served by public transport. In particular, high density employment needs to be concentrated round public transport nodes and residential developments need to be designed to allow high levels of public transport accessibility;

- A rail-based system is likely to be suited to meet the likely levels of demand, based on the limited amount of model data which has been available to the study team;

- There is a net outflow of people from the Phase 1 study area in the morning peak. Slightly more travel demand is generated by study area residents than by study area businesses and employers;

- There is a significant demand for peripheral movements, which, in total, is of a similar magnitude to the radial City Centre movements in the Blanchardstown / Tallaght orbital corridor;

- The dominant peripheral movements are to areas to the south, particularly Tallaght, though there is a significant travel demand to and from the Airport;

- Demand for trips entirely within the Phase 1 study area is not significant;

- Given the observations in Chapter 4 regarding the relative attractiveness of suburban rail for journeys to the city centre, and the dominant role of the Metro in taking people to and from (rather than through) the study area, further consideration may need to be given to the role of the metro in the study area

- A number of feasible alignments have been identified along the Blanchardstown Road and Castaheany corridors, all of which can be achieved without tunnelling although some property acquisition and demolition would be required for one of the central alignments through Castaheany.

- The Blanchardstown alignments comprise three basic routes, all of which would go through or near Blanchardstown Town Centre, for each of which three sub-options have been identified (although three of the nine have subsequently been discarded following discussion with LRPO)

- The 'Castaheany' alignments comprise combinations of two options through Castaheany, then either via Damastown/Parlickstown or via Mulhuddart, thence either via a loop serving BTC or via the Mitchelstown Road industrial areas

- All the shortlisted alignments serve the proposed Stadium Ireland site with the exception of options 10, 12, 16 and 18

- Although there would not appear to be any insurmountable problems with utilities, inevitably some diversions will be required, in particular the gas main along the Blanchardstown Road corridor. Further work will be needed to identify the most cost-effective means of accommodating the road, metro alignment and gas mains within the confines of the corridor.

- Alignment options through the Castlethorne development at Porterstown have been prepared by Halcrow Rail in advance of the study. Discussions with Halcrow confirm that a suitable alignment compatible with the conclusions of the current phase of the study could be provided

- Alignments through Castaheany appear to have significantly greater potential populations within the catchment area of stations than do routes along the Blanchardstown Road corridor. However, journey times through the study area are

likely to be significantly longer via Castaheany due to the relatively circuitous routeing when compared with Blanchardstown.

- Alignments entering the Phase 1 study area at Porterstown appear to be markedly more promising in patronage terms than routes entering at Clonsilla (regardless of whether they continue via Blanchardstown Road or via Castaheany).

- Hence, the greatest 'coverage' in terms of residential and employment populations within the catchment areas of the options considered is provided by alignments serving starting at Porterstown and then running via Castaheany

- Routes through the Mitchelstown industrial area (Options 10, 12, 16 and 18) have potentially substantial employment catchment areas, and in any event significantly greater than the other alternatives

- Porterstown or Clonsilla would appear to be suitable interchanges between the Metro and the Maynooth Line of the suburban railway.

- Blanchardstown Town Centre would appear to be a suitable location for a major multi-modal interchange. It is supported in principle by the main bus operators although there is no firm consensus as to its precise location or configuration within the site. Access arrangements would need careful study and nearby locations outside BTC may need to be considered as an alternative, although attendees at the stakeholder workshop expressed a clear preference for the interchange to be located at BTC

- There would appear to be scope for a major park and ride facility at a station at the eastern end of the study area in the vicinity of the N2/M50 interchange. Plenty of land is available, and our initial suggestion is that land be earmarked to provide up to 2000-2500 spaces

- Consideration should be given to provision of an alternative P&R facility for more local users in the Stadium area, possibly using spaces which would normally only be in use on events days

- A depot capable of accommodating up to 100 four-car trains could be provided in the vicinity of the N2/M50 interchange

- Assuming the Metro enters the study area at Porterstown, construction costs are likely to be in the broad range [text deleted] for options via Blanchardstown, excluding depot and rolling stock, to which the cost of diversion of the gas main along Blanchardstown Road North must be added for options 2, 3, 5 and 6 (notionally in the order of [text deleted]. The comparable construction costs for options via Castaheany would be likely to be in the range [text deleted]

- Options involving the Metro entering the study area at Clonsilla would increase construction costs for Blanchardstown Road routes by roundly [text deleted] and reduce the cost of Castaheany routes by approximately [text deleted] compared with above

- The additional cost of routing Blanchardstown Road alignments (Options 2, 3, 5, 6 and 13) via Mitchelstown and Huntstown (the 'Industrial Loop') instead of Ballycoolen Road and Cappoge is in the order of [text deleted]

- The additional cost of extending the industrial loop routes (Options 10, 12, 16 and 18) via Mitchelstown and Huntstown to serve the stadium as well (the 'Stadium Loop') is in the order of [text deleted]

- Approximately 6-7 trains costing some [text deleted] (including allowance for spare vehicles) would be required to operate a five-minute headway service over the study area section of route for the Blanchardstown options (1 – 9). 9 - 10 trains would be required to operate the Castaheany routes (options 10 – 19)

- The total cost including 'attributable' rolling stock, contingency, client costs, VAT and property acquisition costs could be expected to be in the broad range [text deleted] to [text deleted] at –10%/+40% levels of certainty if the Metro enters the study area at Porterstown or [text deleted] to [text deleted] if it enters the study area at Clonsilla (Option 21). The corresponding cost of routes entering the study area at Clonsilla and running via Castaheany would be in the broad range [text deleted] to [text deleted] at –10%/+40% levels of certainty, the increased cost compared

with the Blanchardstown Road routes being attributable to the considerably longer route length and associated rolling stock requirement

- Detailed demand forecasts using a purpose built model are required to provide a more robust assessment of alternative alignment proposals. These could be generated using the LRPO demand forecasting model being developed by consultants separately for LRPO independently of this study, and which we understand is nearing completion and validation

- Public consultation on the route options will help to clarify the demand and employment profile issues

Next Steps

8.2 The following options should be taken forward for further consultation with key stakeholders:

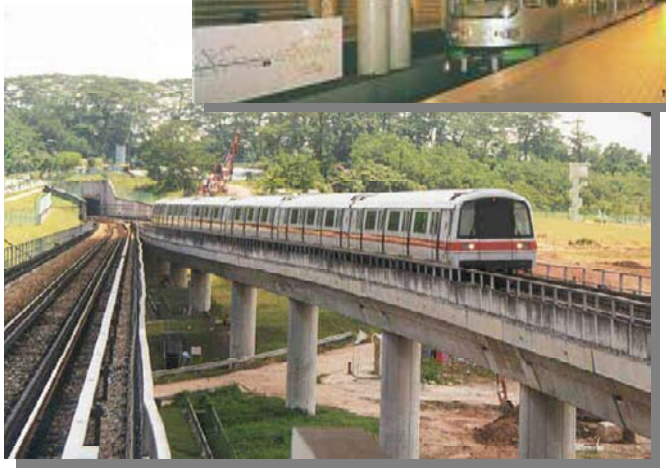
- Option 6 (Route 2B2) serving the Blanchardstown Road corridor via Blanchardstown Road South, Blanchardstown Town Centre, Blanchardstown Road North, Ballycoolen Road and the Stadium

- Either Option 8 or 9 (Route 3B or 3C) serving Blanchardstown Road South, Blanchardstown Town Centre (Route 3B runs via the south west and south east faces of the centre, route 3C runs via the north west and north east faces), Snugborough Road, Ballycoolen Road and the Stadium

- Either Option 14 or 15 (Route 4DGC or 4DHC) serving Central Castaheany (Littlepace), Mulhuddart, Blanchardstown Town Centre, and thence via Route 3C along the Snugborough Road corridor to the Stadium

8.3 The conclusions should be reviewed and updated in the context of emerging recommendations in the Phase 2 study on possible alignments to Tallaght in the south.

Dublin Metro
Western Route
Phase 1 Alignment Study



Light Rail Project Office

FINAL REPORT

Appendices

January 2002

WS/Atkins

A

Appendix A

Discussion Paper
Transport Integration

WS Atkins

APPENDIX A

TRANSPORT INTEGRATION

INTRODUCTION

This note sets out a brief review of issues related to forecast future levels of trip making in and around Dublin in the context of developing proposals for the Metro. It outlines complementary transportation and other policy measures and strategies which are likely to be required to accommodate growth in a sustainable manner.

Background

Ireland's recent economic success has, in common with other countries in the developed world, been accompanied by a dramatic rise in the volume of travel, fuelled particularly by substantial increases in levels of car ownership and use.

A number of countries have addressed this growth through a 'predict and provide' approach to infrastructure development, primarily through construction of new roads to accommodate an ever-increasing number of vehicles. This greater reliance on the private car has been accompanied by a steady decline in public transport use, and many of these countries' public transport systems have consequently been allowed to decline. In some instances, the level of decline has been to the point where buses and trains are regarded as a mode of last resort, patronised principally by the young, the elderly and those who cannot afford to own and run a car.

More recently, there has been a general acknowledgement that such unfettered growth in car use cannot be allowed to continue, either in terms of the capacity of the road network to meet demand or the wider adverse environmental impacts on society; there is a growing realisation that a more sustainable system has to be achieved if the economic vitality of towns and cities is to be maintained and enhanced. There has also been a substantial increase in awareness of the adverse economic and environmental impacts of transportation systems through traffic congestion, noise, emissions and the severance they necessarily cause. It has also been increasingly recognised that land use and transport planning are inextricably linked, and that policy measures are

required both to reduce the need to travel and to encourage the use of more sustainable modes – walking, cycling and public transport.

The Dublin Context

The Strategic Planning Guidelines for the Greater Dublin Area (March 1999) are centred on promoting sustainable patterns of development. The preferred Strategy is based on the consolidation of growth in the Dublin city area, with containment of growth within the Dublin Metropolitan area, the establishment of Strategic Green Belt areas in the hinterland, and a number of primary and secondary development centres based on existing towns in the hinterland. In terms of transportation there is emphasis on public transport improvements.

The Guidelines envisage a better balance between public and private transport based on the principles of sustainable development, including reducing the growth in demand for transport through improved land-use planning and increasing emphasis on alternatives to the private car, in particular the rail network. The guidelines emphasise that future development must be based around public transport and, as a consequence, significant investment in public transport infrastructure will be required.

The Planning Guidelines have been further reinforced by the DTO's Strategy for 2000-2016 set out in 'A Platform for Change' published in September 2000. The population of the Greater Dublin area is expected to rise by some 20% between 1999 and 2016 - from 1.46 million to 1.75 million (The latest Regional Population Forecasts, published by the central Statistics Office in June 2001, envisage the level of growth being even higher to 1.91 million by 2016 – an increase of some 31% compared with 1999). The number of households is expected to rise even more - by some 30% over the same period, and further rises in employment and car ownership are expected.

The DTO Strategy is therefore centred on a combination of demand management measures aimed at reducing the demand for travel and encouraging a transfer of trips (especially during peak periods) from cars to sustainable modes. The Strategy envisages use of supporting complementary land use policies to achieve the goals.

The DTO Strategy envisages major improvements in the supply and quality of public transport, and selective improvements to the highway network designed to improve flow without encouraging peak period commuting. The Strategy envisages this being accompanied by traffic and demand management measures to encourage transfer to public transport modes and optimise use of the highway network, e.g. through implementation of road user charging, workplace parking levies, fiscal disincentives and mobility management plans.

The DTO forecasts that implementation of the Strategy will increase public transport's share of peak hour trips from around 25-30% currently to some 63% overall, and to some 85% for journeys to and from the city centre. This predicted level of modal split will be a remarkable change, the high public transport mode share being comparable to that achieved in London where there are well established, comprehensive suburban rail, Metro and bus systems, and where there has long been a strong presumption against the use of cars in City Centre destination journeys.

The DTO Strategy emphasises the importance of achieving high levels of inter-modal and intra-modal integration – between rail/Metro and LUAS, and provision of bus feeder services to stations. The Strategy envisages it being "…possible to make almost all journeys on the public transport network with only one interchange".

In addition the DTO strategy predicts that the great majority of Dubliners will be within a ten minute walk of a public transport service by 2016, emphasising the need for appropriate walking access from housing areas.

The Role of Planning Policies

The private car offers substantially increased mobility to many people. Coupled with the effects of journey time reductions afforded by new road construction, and the inherent flexibility the car offers in origin-destination choice, there has been a general increase in journey length and trip patterns have become substantially more diverse. There has been a trend towards decentralisation of employment and a presumption in favour of car as the means of access, and consequently high levels of on-site car parking provision. This dispersal of employment makes it correspondingly more difficult to serve by public transport.

Implementation of the Strategic Planning Guidelines and the DTO Strategy as currently envisaged should assist the process of slowing the growth in traffic and provide a realistic alternative to the use of cars for at least a significant proportion of trips. However, it is clear that much of the development currently taking place is still based on land use and planning policies which are not at all conducive to pubic transport, and indeed which run totally counter to the framework of the Planning Guidelines and the DTO Strategy. It is therefore imperative that local authorities and developers alike work together **now** to ensure that new developments are planned and located such that they are compatible with longer term objectives. In particular, there needs to be a move away from:

- cul-de-sac style residential developments (especially walled developments) - these cannot practicably be served by buses and can lead to excessive walk time access for public transport services – for example Castaheany and Littlepace; and

- low density campus style commercial development located in areas which cannot readily be served by public transport, such as the IT based companies in the North Blanchardstown fringe.

Careful planning of the location, scale, density, design and mix of land uses can help to reduce the need to travel, reduce the length of journeys and make it safer and easier for people to walk, cycle or use public transport. Consistent application of these planning policies will help to reduce some of the need for car journeys – by reducing the physical separation of key land uses – and enabling people to make sustainable transport choices.

Planning policies can increase the effectiveness of other transport policies and help maximise the contribution of public transport to improving quality of life. Hence land use planning objectives should seek to:

- Promote more sustainable travel choices

- Reduce the need to travel, especially by car

Strategies for achieving these objectives in the context of the Metro might include:

- Focusing major generators of travel demand as close as possible to main public transport nodes, especially rail stations. This applies particularly to commercial office developments where public transport may be a feasible option for a significant proportion of journey to work trips

- Increased densities for housing and other uses at locations highly accessible by Metro – to increase the proportion of the population within the catchment area of stations

- Significantly altered urban form within new developments and modified form in existing developments, where practicable

- Using parking policies to promote sustainable transport choices and reduce reliance on the car for work and other journeys

- Giving people priority over traffic in town/village centres

- Protection of sites/routes which could be critical in developing infrastructure to widen transport choices

Transport Strategy

The transport strategy is an integral part of the planning process. It needs to recognise the settlement pattern, economic opportunities and development needs for Dublin and the neighbouring region. By implication a high quality public transport system based on the Metro implies controlling the use and dominance of the car – by the provision of a quality infrastructure for the sustainable alternatives, and demand management measures designed to discourage the use of cars where trips might reasonably be made by more sustainable modes.

There needs to be a high level of accessibility to public transport – to the network (e.g. through careful location of stations/stops in relation to local attractors and generators), and to the vehicles (e.g. through use of low-floor buses, level access to trains and provision of lifts and escalators to platforms where necessary.

In general, the infrastructure required to achieve the objectives should be provided at an early stage in order that:

- New development can be focused on, and properly integrated with, public transport nodes rather than transport infrastructure having to be ‘shoe-horned’ into existing developments; and

- People have access to public transport, cycleways, attractive and safe walkways and other essential infrastructure from the outset, and hence less likely to get into the ‘car habit’.

This implies adherence to clearly-defined and enforced planning conditions and the implementation of complementary environmental policies. The operation of a design code/planning brief is essential if the outcomes are to be successful.

Recent experience in other European countries shows that transport and land use have to be much more closely integrated through the planning process. There has to be evidence of a level of commitment to similar “best practices” in Dublin, which may entail changes to the current system.

DTO and the Light Rail Project Office intend to develop a series of best practice manuals for key stakeholders relating to the planning and design parameters which can lead to optimised transportation and land use patterns of development.

Network Integration and Interchange

Rail based modes are inherently efficient at carrying large passenger flows along densely trafficked corridors, whilst buses are better suited to catering for lower density and/or dispersed flow patterns. By their nature, rail systems may be less accessible than buses but generally afford significantly shorter journey times for middle and longer distance trips. Light rail is able to combine some of the benefits of bus and rail-based systems, and can be well suited to intermediate flows where the high cost of rail systems cannot be justified.

In these circumstances, the network needs to be planned and designed as far as possible such that each of the main modes meets needs to which they are best suited. This may imply wholesale withdrawal, or at least substantial rationalisation, of bus services where they parallel rail over significant distances. This may be achieved by refocusing existing resources to provide high frequency feeder bus services, offering

convenient and easy interchange at stations and with minimum or nil fare penalty. The degree of bus service rationalisation may be conditioned by the extent to which radial bus services cater for local short-distance passenger trips along busy corridors.

Main interchanges therefore need to be located at key nodes such that journey opportunities are maximised. This implies bringing road-based modes (buses, taxis) and track-based modes (i.e. suburban heavy rail, Metro and light rail) together so that transfers can be made quickly and conveniently and the disutility of interchange minimised. The key features of a high quality multi-modal interchange will include the following:

- Minimum walking distance to/from and between platforms – ideally with cross-platform transfers where possible, although recognising that such open interchanges may raise revenue control issues. Travelators or escalators should be used to assist where level changes or lengthy walks are unavoidable. Lifts should be provided for the mobility impaired including people in wheelchairs, parents with prams/pushchairs and small children, and those otherwise encumbered

- Similarly, bus stops should be located as close as possible to station entrances and LRT stops

- Passages and walkways should be covered, well-lit and of sufficient capacity to accommodate expected peak passenger numbers in free-flow conditions

- Waiting facilities should be well lit, with suitably sized shelters offering protection from inclement weather

- High quality signing and information, preferably including real-time information on services, time to arrival of next bus/train etc.

- Secure passenger environment, including CCTV where appropriate

- Food and drink vending facilities, telephones etc.

- Provision for picking up/setting down by taxis and private cars (‘kiss and ride’)

- Cycle parking facilities

Although not directly related to the choice of interchange locations, the contribution of fares and ticketing systems to the achievement of a fully integrated public transport system must not be underestimated. Fare structures should be such that any financial penalty associated with interchanging between or within modes is minimised (or preferably eliminated). Singapore introduced the magnetically based stored value farecard in the early 1990s which, in addition to providing a pre-paid ticket facility, is able to offer 'rebates' for transfer trips (subject to meeting certain pre-defined criteria). It is likely that a full Smartcard ticketing offering similar or enhanced functionality will follow. A number of other towns and cities in the developed world are increasingly moving over to Smartcard ticketing systems. Consideration is being given to a fully integrated fares and ticketing system for Dublin at present, with a view to implementation over the next few years, as more rail based infrastructure comes on-stream.

Conclusions

The key conclusions to be drawn from the above discussion can be summarised as follows:

- Land use and transportation planning are inextricably linked – high levels of accessibility must be incorporated into new developments at the design stage

- There is a need to locate major new developments at or close to public transport nodes, and high levels of accessibility to public transport should be provided in residential and employment areas

- Significant changes will be required to the design principles on which residential and commercial development schemes have been traditionally based if high levels of accessibility to efficient public transport are to be achieved – there needs to be a move away from walled cul-de-sac residential developments and campus style commercial developments

- High quality public transport systems are needed to attract people out of cars in large numbers. This implies making use of public transport attractive relative to use of cars, e.g. through minimising end-to-end journey times, and high levels of reliability

- Complementary demand management measures may be required to achieve the desired mode split targets – indeed such measures are almost certain to be needed to achieve the ambitious public transport mode shares set out in the DTO Strategy. These may include high levels of public transport priority over traffic, or fiscal measures to deter use of cars

- Inter-modal transfer should be as seamless as possible in terms of infrastructure design , e.g. so that walking distances are minimised, and people can wait in a secure and comfortable environment

- A fully integrated fare structure which minimises or preferably eliminates the fare penalty of interchange can make a major contribution to the attractiveness of public transport use. Such structures can be more easily achieved through the introduction of Smartcard ticketing

- The achievability of some of these goals may be influenced by changes to the regulatory framework under which public transport services are financed and operated

B

Appendix B

Summary Costs

Elemental Cost analysis		**Option 2 - Ref 1B1**	**Option 3 - Ref 1B2**	**Option 5 - Ref 2B1**	**Option 6 - Ref 2B2**	**Option 8 - Ref 3B**	**Option 9 - Ref 3C**
		€	**€**	**€**	**€**	**€**	**€**
Civil Engineering Costs		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Electrical and Mechanical		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Stations		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Park & Ride Facility		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Maintenance Depot		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Rolling Stock	Allow	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Contingency Allowance	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Client Costs	[text deleted]	€15,084,432	€15,039,156	€15,457,464	€15,999,126	€17,704,698	€18,577,482
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on Rolling Stock	20.00%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on all remaining costs	12.50%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Property Costs	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
	7.94045						
Likely cost range	**-10% to +40%**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**

Engineering costs include bridges, all earthworks and segregation.

E&M costs include for all trackworks, signalling, overhead line electrification works, provision of power and telecoms

Elemental Cost analysis			**Option 10 - Ref 4DFAI €**	**Option 11 - Ref 4DFC €**	**Option 12 - Ref 4DGAI €**	**Option 13 - Ref 4DGB €**	**Option 14 - Ref 4DGC €**	**Option 15 - Ref 4DHC €**
Civil Engineering Costs			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Electrical and Mechanical			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Stations[text deleted]			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Park & Ride Facility			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Maintenance Depot			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Rolling Stock	Allow		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Contingency Allowance	[text deleted]		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	text deleted]	[text deleted]
Allowance for Client Costs	[text deleted]		€20,101,620	€27,127,716	€21,670,836	€20,917,974	€28,480,980	€23,781,912
Sub-Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on Rolling Stock		20.00%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on all remaining costs		12.50%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Property Costs	[text deleted]		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Total			[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
		7.94045						
Likely cost range	**-10% to +40%**		**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**

Civil Engineering costs include bridges, all earthworks and segregation.

E&M costs include for all trackworks, signalling, overhead line electrification works, provision of power and telecoms

Elemental Cost analysis		**Option 16 - Ref 4EFAI €**	**Option 17 - Ref 4EFC €**	**Option 18 - Ref 4EGAI €**	**Option 19 - Ref 4EGC €**	**Option 20 - Ref 5 €**	**Option 21 - Ref 6 €**
Civil Engineering Costs		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Electrical and Mechanical		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Stations		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Park & Ride Facility		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Maintenance Depot		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Rolling Stock	Allow						
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Contingency Allowance [text deleted]		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total							
Allowance for Client Costs [text deleted]		€19,122,048	€26,042,544	€19,647,408	€26,457,552	-€1,679,832	€1,078,308
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on Rolling Stock	20.00%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on all remaining costs	12.50%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Property Costs [text deleted]		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Total		[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
	7.94045						
Likely cost range	**-10% to +40%**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**	**[text deleted] [text deleted]**

Civil Engineering costs include bridges, all earthworks and segregation.

E&M costs include for all trackworks, signalling, overhead line electrification works, provision of power and telecoms

Elemental Cost analysis			**Option 22 - Ref S (Stadium loop) €**	**Option 23 - Ref I (Industrial loop) €**
Civil Engineering Costs			[text deleted]	[text deleted]
Electrical and Mechanical			[text deleted]	[text deleted]
Stations			[text deleted]	[text deleted]
Park & Ride Facility			[text deleted]	[text deleted]
Maintenance Depot			[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]
Rolling Stock	Allow			
Sub-Total			[text deleted]	[text deleted]
Contingency Allowance	[text deleted]		[text deleted]	[text deleted]
Sub-Total			[text deleted]	[text deleted]
Allowance for Client Costs	[text deleted]		€3,884,364	€3,160,608
Sub-Total			[text deleted]	[text deleted]
VAT on Rolling Stock		20.00%		
VAT on all remaining costs		12.50%	[text deleted]	[text deleted]
Sub-Total				
Allowance for Property Costs	[text deleted]		[text deleted]	[text deleted]
Total			[text deleted]	[text deleted]
		7.94045		
Likely cost range		**-10%**	**[text deleted]**	**[text deleted]**
		to +40%	**[text deleted]**	**[text deleted]**

Civil Engineering costs include bridges, all earthworks and segregation.

E&M costs include for all trackworks, signalling, overhead line electrification works, provision of power and telecoms

C

Appendix C

Fingal County Council Submission

WS Atkins

21st September 2001

Our Ref.: JC/SF

Ms. Fidelma Fahey,
Transport Planning,
Light Rail Project Office,
Heuston Station,
Dublin 8.

Dear Ms. Fahey,

RE: Dublin Metro Study (Phase I) - Draft Final Report

I refer to your letter dated 29th August on the above matter. The following is the response of Fingal County Council.

Evaluation Criteria

In considering the route options outlined in the report, the evaluation criteria are as follows:-

1. The major function of the metro is to serve the City Centre, the proposed stadium, Dublin Airport and Blanchardstown Town Centre.
2. Maximisation of the land use and transportation benefits accruing from the provision of this high order facility.
3. Upholding Blanchardstown Town Centre as the primary route focus and attractor within Blanchardstown for higher order service uses inappropriate in more peripheral neighbourhood areas.
4. Minimisation of physical and visual severance effects.
5. Strengthening the existing urban form and supporting the individual identity of Blanchardstown Town Centre.
6. The feasibility and ease of servicing the proposed line for feeder bus transport services east and west over the entire Blanchardstown area to the metro service.

Preferred Route

On the basis of the above evaluation criteria the preferred route is the Blanchardstown corridor.

Other Routes

The other route options shown to the west and north are not recommended for the following reasons.

- The options would create a convoluted network which would dilute / reduce the benefit of the facility as they do not concentrate linkage of the town centre to other strategic nodes (Tallaght, Dublin Airport, Stadium).
- The western and northern routes could be better served by other public transport networks ie bus.
- The provision of the metro west and north is an inappropriate scale of public transport provision to these areas.
- The routes to the west would entail significant extra costs in terms of compulsory purchase and other legal issues in relation to severance of dedicated public open space and residential amenity.
- In strategic terms the western option would create further pressure for continued expansion of the contiguous built up area to the west. This would result in an unsustainable urban sprawl which would seriously distort the development structure and viability of Blanchardstown New Town.
- Having regard to the existing low density urban form of development in the west, the metro in this location would have severe visual and physical severance effects.
- The routes to the west would adversely impinge on high amenity and sensitive land scape areas.
- The convoluted option to the west is not in conformity with the objectives of the current Development Plan.

However there is an existing Development Plan objective for the provision of a rail link from the Dublin / Sligo line to the Town Centre.

Blanchardstown Corridor : The Preferred Route

The Blanchardstown corridor is the Council's preferred route. In this regard, the Council recommends the following:-

1. The Porterstown rail interchange to be developed as a single station and integrated with commercial facilities and services for both passengers and residents of the local neighbourhood.
2. A segregated pedestrian and cycle route to be provided to connect the residential zoned lands north and south.
3. In general the treatment of metro viaduct in terms of visual, noise, safety and use of land underneath, to be so designed as to enable pedestrians / cycle routes and limited service type use facilities.

4. Where the viaduct intersects with road networks, the opportunity for innovative bridge design to be availed of. It is noted that no viaduct / bridge appears to be proposed at the Snugborogh Road extension / Ongar Road. Particular regard must be given to this intersection vis-à-vis bus networks.
5. Where the rail line passes at high level close to residential areas substantial amelioration measures are required in respect of landscaping and barrier enclosure.
6. Where the viaduct traverses the town park, public access must be maintained along the pedestrian desire lines. The rail line must respect the open visual park land amenity of the park.
7. The preferred route alignment to the town centre should be route no. 2 between the existing shopping centre and the retail warehousing to the west.
8. The rail alignment in the town centre must not impede pedestrian movement at grade. Investigation must be given to undergrounding the metro for this section.
9. Where the rail crosses the Navan Road and Tolka Valley Park, functional architecture for the bridge crossing is inappropriate.
10. The preferred route north of the N3 would run north-east along Blanchardstown Road North as far as Blanchardstown Business Park, turning east along the southern edge of the Business Park and continuing north-east along Snugboro Road. to the Ballycoolin Road. This route serves residential, educational and employment generating uses and also the proposed stadium. This route is considered a reasonable compromise in terms of catchments served.
11. The second preferred route would be the Snugborogh Road / Option 3 through the town centre and up the Snugborogh Road.
12. It should be noted that there is an existing gas pipe line in the eastern edge of the Blanchardstown Road.
13. The intersection of the metro with the entrance roads to the Corduff neighbourhood to be carefully designed.
14. In general consideration should be given to the retention of the efficient and safe movement of road traffic.

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Seán Ó Faircheallaigh,
Senior Planner.