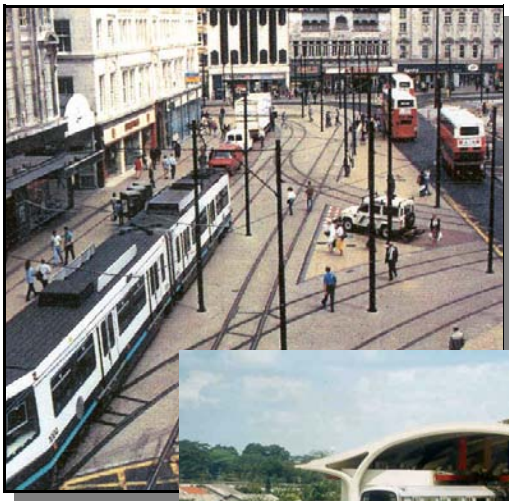
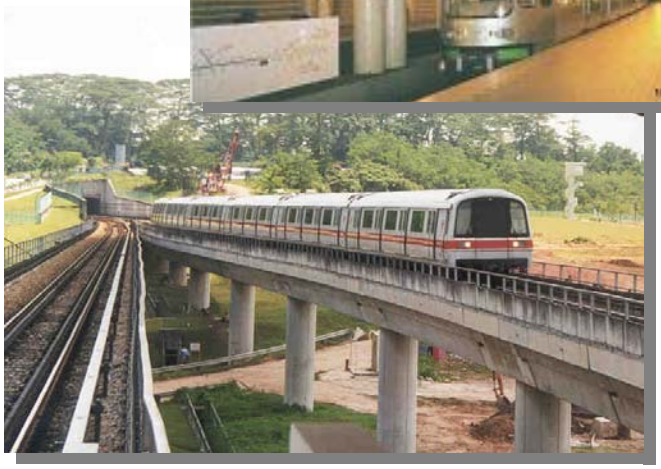
Dublin Metro
Western Route
Phase 2 Alignment Study





Railway Procurement Agency

FINAL REPORT

April 2002

WS/Atkins

Dublin Metro Study (Phase 2)

Final Report

WS Atkins, Balgriffin House, Balgriffin, Dublin 17, Ireland

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CONTENTS

EXECUTIVE SUMMARY

The attached report sets out the conclusions of a study undertaken by Atkins McCarthy (now trading under WS Atkins) to identify potential alignments for the western orbital Metro route between Porterstown/Clonsilla and Tallaght via Ronanstown and Clondalkin. The study follows on from an earlier phase of work to identify and cost route options between Porterstown/Clonsilla and the vicinity of the N2/M50 interchange via Blanchardstown Town Centre and the proposed Stadium Ireland Campus site at Abbotstown. The conclusions of which were reported in Atkins McCarthy's Phase 1 report dated August 2001.

This Phase 2 report should be read in conjunction with our Phase 1 report, which includes a commentary on the wider context in which the studies have been carried out. The discussion of these wider policy issues is not repeated in this report.

The study commenced in May 2001, work overlapping with that being carried out for Phase 1. The main activities were similar to Phase 1, namely:

- 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 South Dublin County Council, utility companies, Dublin Bus and Bus Eireann

The study area was defined by the route outlined in the DTO Strategy document "A Platform for Change". During the course of the study, however, LRPO (now acting as the Railway Procurement Agency - RPA) requested that potential alignments to Citywest also be examined, and later (following discussions with South Dublin County Council) that the Phase 2 study area be enlarged to consider opportunities for routes serving Adamstown. The results of the Citywest and Adamstown studies are reported separately in Chapters 7 and 8 respectively.

Three principal corridors were considered for the northern part of the original study area during the course of the study:

- an easterly route serving Liffey Valley Centre, crossing the Liffey River on a new bridge immediately to the west of the M50 motorway, then continuing through Ronanstown and Clondalkin to Tallaght where it would link into the planned route to the city centre via Kimmage (the subject of a separate study)
- a central alignment broadly following the line of a proposed new road between Porterstown and the east side of Lucan ; and
- a westerly alignment serving Lucan and Griffeen Park

All three routes converge in the vicinity of Ronanstown/Neilstown.

In total, some 24 combinations of potential routes were identified, including a number of sub-options at local level and, following a comparative evaluation, a best route was identified and carried forward for public consultation. The shortlisted alignment of the preferred route options for the entire study area, including City West and Adamstown, is shown in Figure 1. All options studied would be capable of providing an interchange with the Maynooth suburban railway line at either Porterstown or Clonsilla, and also with the Kildare Line in the vicinity of the proposed Fonthill Road station.

As with Phase 1, the study had not had the benefit of access to a detailed demand forecasting model from which the relative patronage of the alternative routes could be derived. Instead 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

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KEY

- M50
- OTHER ROADS
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED STATION
- K ROUTE SECTIONS
- 51 STATION IDENTIFIERS

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AutoCAD File Ref. FIGURE 1

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

Project: DUBLIN METRO STUDY

Title: PREFERRED ROUTE OPTIONS
SHEET 1 OF 2

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 1

Rev

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- M50
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AutoCAD File Ref. FIGURE 1-2

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Project: DUBLIN METRO STUDY

Title: PREFERRED ROUTE OPTIONS
SHEET 2 OF 2

Scale	Drawn	Checked	Authorised
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- Serving new development
- Serving existing developments and Town Centre areas
- Impact on through journey times
- Safety considerations (especially level of segregation)

The evaluation framework followed the same principles as were adopted in Phase 1; however, a number of changes were made to the weightings to reflect differences in the relative importance of some of the attributes, and in particular to recognise the much greater environmental sensitivities in the Phase 2 study area, especially in crossing the Liffey Valley.

During the latter stages of the study, LRPO requested that some work be undertaken using the DTO's demand forecasting model to make a preliminary assessment of potential demand. This required some enhancement to the model zoning structure in the study area to test the relative patronage potential of selected routes.

The model suggested that a total of between 12000 and 15000 passenger trips could be expected to be made in the morning peak to, from or within the study area in the year 2016 (taking account of forecast growth in levels and patterns of trip making). It should however be emphasised that the resulting forecasts should still be treated with some caution and that RPA should use the bespoke demand forecasting model to reassess shortlisted options in due course.

Citywest

Two feasible alternative alignments linking to the 'main' Phase 2 route in the vicinity of Tallaght Hospital were identified – one following a direct route, and the other serving Fortunestown. Both routes would be capable of linking into route V (the Cookstown Road/Cookstown Way corridor) by a 'delta' (triangular) junction, hence Citywest could be served either from the north (Clondalkin) or from the south (Tallaght town centre). Alternatively the routes could be linked into Belgard Road and continue to Tallaght or Clondalkin via Route U.

The alignments are illustrated in Fig. 7.1.

Adamstown

Alignment opportunities between Lucan and Tallaght via Adamstown were subsequently investigated, and three basic alignments between Lucan and Adamstown identified, with options to run to Tallaght either via Grange Industrial Estate, Baldonnel and Citywest or Clondalkin and Belgard Road.

Taking account of local sub-options, a total of eleven options were identified, and are illustrated in Fig. 8.1 in the main report.

The Adamstown route options were compared using the same evaluation framework as for Phase 1 and the 'main' routes in the Phase 2 study area, based upon which the preferred routing is (Option 2A/3) - route 11 L/A-ACHIK/TU running via Lucan, Sarsfield Park, (tunnel to) Superquinn, central Adamstown, Nangor industrial area, thence to Clondalkin (Fonthill Road) and on to Tallaght via Belgard Road. The route would provide interchange with the Kildare Line at Adamstown.

Conclusions

Main Study Area

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

- A rail-based system would suit the likely levels of demand, forecast at around 10,000 passengers per hour at the peak loading point in the peak direction. However, it should be noted that the model includes a substantial congestion charge in the suburbs as well as in the city centre, which will have the effect of increasing public transport's forecast mode share. Passenger numbers could be expected to be significantly reduced in the event that complementary demand management/traffic restraint measures were not implemented

- Nearly half of trips are internal to the study area, the remainder travelling to or from the city centre (predominant), airport or other destinations

- The Metro is serving local transport needs as well as catering for longer distance movements

- High interchange flows are forecast between the Metro and both the Maynooth and Kildare suburban railway lines in the vicinity of Porterstown and Clondalkin

- Tallaght is the largest single attractor of trips in the morning peak

- A number of feasible alignments have been identified through Lucan, Ronanstown, Clondalkin and Tallaght, most of which can be achieved with only relatively limited tunnelling in Lucan, Clondalkin and in Tallaght. An underground route would almost certainly be the only feasible way of providing a high level of accessibility to Clondalkin town centre, and is also likely to be required in Tallaght where the routes would link into the route via Kimmage to the city centre

- There would be major environmental impacts associated with all the alignments but the Liffey Valley crossing will be particularly sensitive.

From this point of view, an easterly crossing adjacent to the M50 motorway would appear to be preferable

- Although there would not appear to be any insurmountable problems with utilities, inevitably some significant diversions will be required. The extent and cost of such works would need to be the subject of more detailed study, and no allowance for major utility diversion works has been included in our assessment of capital costs

- Westerly alignments via Lucan or more easterly alignments via Liffey Valley serve similar residential populations in the northern part of the study area. There is little to choose between options via Fonthill Road or Neilstown Road in Ronanstown but the population catchment is slightly higher along the Fonthill Road corridor in Clondalkin

- There is a higher employment catchment associated with more easterly alignments via Liffey Valley Centre than western routes via Lucan

- In Tallaght, there is a significantly higher residential catchment for alignments running via Cookstown Road rather than via Belgard Road into Tallaght centre; in employment terms, however, the Belgard Road corridor has a slightly higher employment catchment than Cookstown Road

- In terms of population catchment, there would appear to be no merit in considering a tunnelled alignment through Clondalkin with the associated high capital costs and construction impacts. However, a tunnelled route does provide access to and from a greater number of jobs in the Clondalkin area

- Porterstown is a better starting point than Clonsilla for central and eastern alignments through the study area, but either is suitable for interchange between the Metro and the Maynooth Line of the suburban railway

- Clonsilla should not be considered as an alternative to Porterstown for central or easterly alignments within the study area

- Overall route lengths between Porterstown/Clonsilla and Tallaght range from 12.2 to 15 kilometres depending on route choice, offering end-to-end journey times of 17-22 minutes and average service speeds of around 37-43 kph (including station dwell times)

- Construction costs are likely to be in the broad range [text deleted], i.e. much larger than for Phase 1 routes, principally due to the generally longer distances compared with many of the Phase 1 routes, and also due to the need for tunnelling in a number of areas and/or greater use of elevated structures

- Some 8- 10 trains would be required to provide a service at 5- minute intervals within the Phase 2 study area. The cost of rolling stock, (including allowance for spare vehicles) would be in the order of [text deleted].

- 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]. at –10% /+40% levels of certainty

Citywest

The conclusions from the study of Citywest can be summarised as follows:

- Two potential feasible alignments have been identified to link Citywest with the 'main line' Metro route at Tallaght, one direct via Cookstown Road (Route W) and one via Cookstown Way and Fortunestown Road (Route X). The route lengths are 4.8 km and 5.5 km respectively

- Both routes could form delta junctions such that Citywest can be served from Clondalkin in the north/east or from Tallaght town centre (or both)

- Each route would include five stations, two of which are common to both routes at the end of the line in Citywest

- There are no insurmountable environmental problems with either route. Route W would involve some noise and visual intrusion for local residents whilst route X would have a greater impact, particularly on residents and community facilities (overall, the environmental impacts of route X are considered to be 'moderate')

- Route X has a significantly greater residential catchment than route W although the employment catchment of route W is somewhat higher. In terms of overall coverage (residential and employment), route X has a larger catchment (in the order of 10%) than route W although this will be partly due to its greater route length

- Journey time between Tallaght Hospital and the Citywest terminus could be expected to be in the order of 9- 10 minutes via routes W and X respectively, an average service speed of around 33-34 kph

- It is clearly not particularly meaningful to assess rolling stock requirements for the Citywest branch in isolation. However, viewed as an incremental addition to the network, Citywest would require an estimated 4-5 trains over and above the fleet requirement for the rest of the system

- Capital construction costs are estimated to be in the order of [text deleted] for route W, and much higher at [text deleted] for route X. However, route W runs close to overhead power lines over a significant length of the route, the effects of which require more detailed investigation. The cost estimates do not include any allowance for diversion of power cables at this stage

- The overall capital costs including allowances for rolling stock, contingencies, client costs and VAT could be expected to be in the broad order of [text deleted] to [text deleted] for route W and [text deleted] to [text deleted] for route X (-10%/+40% in both cases)

Adamstown

The conclusions from the study of potential routes through Adamstown can be summarised as follows:

- Eleven potential alignments have been identified through Adamstown; the route lengths range from roundly 16 to 21 km. The routes would include between 10 and 13 stations

- There are a number of potentially major environmental problems with several of the routes, and in particular in the Lucan area

- Options 2A/1 and 2A/3 (routes A-ABHIK and A-ACHIK) appear to serve the highest number of residents, closely followed by Option 2A/5 (route A-ADFHIK).

- Options 2A/2, 2A/4, 2A/6, 2A/8 and 2A/10 perform best in terms of employment catchment within 800 metres of stations

- End to end journey time is estimated to be in the order of 25-29 minutes for most options, or about 23 minutes for Option 2A/11. These times are generally 4-5 minutes longer than for the routes via Ronanstown/Clondalkin

- Most options would require 11-13 trains to run a five minute service (10 trains for Option 2A/11)

- Capital construction costs are estimated to be in the broad range [text deleted] The cost estimates do not include any allowance for diversion of overhead power cables at this stage

- The overall capital costs including allowances for rolling stock, contingencies, client costs and VAT could be expected to be in the broad order of [text deleted] to [text deleted] (-10%/+40%). Although longer than some of the routes via Liffey Valley, Ronastown and Clondalkin, the lower capital cost for some of the Adamstown route options can be attributed to at-grade construction in place of high level structures and/or tunnels.

Our initial assessment of the performance of the preferred routes along each of the two corridors is summarised in the following table. However, notwithstanding that the option performed poorly in the evaluation framework, RPA requested that the route via Kishoge (Option 2A /11) be carried forward into the consultation process. Accordingly, our assessment of its performance in relation to the other shortlisted alternatives is included in the tabulation for the purposes of comparison.

Route	Option 2/9 10JOTU (Fonthill Road)	Option 2A/3 11L/A-ACHIK/TU (Adamstown)	Option 2A/11 11LP/ A-JL/WVU (Kishoge)
Route length in total	13 km	17.1 km	17.5 km
- at grade/ on ramps	4.6 km	11 km	11.4 km
- elevated/ on bridges	8.4 km	4.9 km	4.9 km
- tunnelling	None	1.2 km	1.2 km
Relative Capital Cost –10%/+40% in €	[text deleted]	[text deleted]	[text deleted]
Residents within 500 metres	33,400	37,400	23,600
Employment within 500 metres	16,300	14,700	29,600

Criterion Route	Option 2/9 10JOTU (Fonthill Road)	Option 2A/3 11L/A-ACHIK/TU (Adamstown)	Option 2A/11 11LP/ A-JL/WVU (Kishoge)
Ease of Construction/Time to implement	Very Good	Good	Fair
Relative Capital Cost	Good	Good	Good
Residents within 800 metres	Fair	Good	Very Poor
Employment within 800 metres	Poor	Poor	Good
Environmental Impact	Low	Moderate	High
Serving New Development	Fair	Good	Fair
Through journey times	Good	Fair	Fair
Safety (Level of Segregation)	Good	Good	Good

The key passenger objectives served by each of the routes are summarised below:

Route	Option 2/9 10JOTU (Fonthill Road)	Option 2A/3 11L/A-ACHIK/TU (Adamstown)	Option 2A/11 11LP/A-JL/WVU (Kishoge)
Carpenterstown	•		
Liffey Valley Centre	•		
Ronanstown	•		
Fonthill Road Retail	•		
Fonthill Road Station	•		
Sarsfield Park (Lucan)		•	
SuperQuinn		•	
Cannonbrook Estate		•	
Adamstown Proposed Major Development		•	
Adamstown Station		•	
Grange Castle Business Park		•	•
Esker Meadow Estate			•
Castle Riada Estate			•
Griffeen Estate			•
Clondalkin			•
Citywest			•
Clondalkin	•	•	
Tallaght Belgard Heights	•	•	
Tallaght Cookstown Industrial area	•	•	
Tallaght Hospital	•	•	
Tallaght "The Square"	•	•	•

Alignment Workshop

The RPA as the responsible railway planning authority is interested in an integrated planning process involving all main residential, commercial and planning organisations

from an early stage. 13 key stakeholders took up an invitation from the RPA to participate in a workshop held on 7th March 2002. The aim was to gain feedback from the key local and strategic groups as guidance for the future planning process.

Key conclusions can be summarised as follows:

- Route option 10 JOTU via the Liffey Valley Centre seems to be the most promising route option in terms of optimising integration whilst avoiding unnecessary severance.
- The Adamstown and Lucan options found support only by the strategic planning bodies DTO and SDCC - depending on the town centre decision - and one resident.
- The Kishoge option failed due to its poor service of the existing communities and estates.

The preferred Liffey crossing appears to be parallel to the M50 bridge, while the canal and rail crossing at the Fonthill Road got most support, as it will connect the Metro with the main line suburban services at the new Clondalkin station. Following the alignments further to the south, the Naas Road crossing at the Bewleys Hotel site seems to be a major concern if realised on an elevated structure.

Prior to detailed assessment and a decision on an Emerging Preferred Route it would be worth considering preserving the availability of the void 6 acre site, presently owned by CIE at the LUAS entry to Tallaght, or at the very least preventing dense long term development taking place. This site is furthermore affected by route option V, where the alignment would descend into a tunnel towards the Square.

Next Steps

Clearly the conclusions are presently based on the study team's assessment of the relative merits of the alternatives and its judgement on the relative importance of each of the attributes of individual schemes. RPA may wish to revisit the conclusions in the light of discussions with key stakeholders and also following more detailed analysis of the relative patronage (and hence revenue) impacts of the alternatives.

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, Porterstown, Blanchardstown, Ballycoolen and Cappagh, and linking with the Swords route in the vicinity of the N2-M50 Interchange. In addition the Liffey Valley Centre and/or Lucan may be serviced by the route. This orbital route traverses an area of ongoing rapid development in Greater Blanchardstown and the South Dublin corridor in and around Clondalkin and Ronanstown, and the development pressures are such that preferred alignments need to be safeguarded at an early stage.

1.4 The Dublin Light Rail Project Office (LRPO) commissioned Atkins McCarthy to develop alignment proposals for the Western Orbital route between Tallaght and the N2/M50 Interchange area in two stages:

- Phase 1 – Porterstown/Clonsilla to N2/M50 Interchange, the report on which has been submitted to LRPO, and

- Phase 2 – Porterstown/Clonsilla – Tallaght via Ronanstown and Clondalkin

1.5 This report sets out the results, conclusions and recommendations of work undertaken in Phase 2. It should be read in conjunction with the Phase 1 study report which also includes a description of the contextual background against which the study is being undertaken together with a commentary on wider transport and other policy issues. Accordingly these background issues are not rehearsed in this Phase 2 report.

Definition of the Study Area

1.6 The limits of the Phase 2 study area were defined as Porterstown/Clonsilla in the north and Tallaght town centre in the south. In discussion with LRPO, it was agreed that westerly alignments serving Lucan and easterly alignments serving Liffey Valley shopping centre would be considered, with a pre-requisite to serve Tallaght town centre. Particular attention has been paid to ensuring the alignment at Tallaght is consistent with the need to continue towards the city centre, e.g. via Kimmage as proposed in 'A Platform for Change'.

1.7 During the course of the study, LRPO requested that options be developed to serve Citywest to the west of Tallaght, and later to investigate alignment options through Adamstown. These are reported as free-standing Chapters within this report.

Structure of Report

1.8 Following this introductory section, Chapters 2 and 3 respectively set out the planning and environmental issues specific to the study area, followed in Chapter 4 by an overview of demand related issues (incorporating the results of some work undertaken using the DTO model to improve the robustness of demand forecasts for the main study area, i.e. excluding Citywest and Adamstown).

1.9 Chapter 5 outlines the alignment options considered for the 'main' study area together with preliminary suggestions for the location of stations, including a commentary on the implications for utilities.

1.10 Chapter 6 sets out comparative construction costs for each of the shortlisted options, followed in Chapters 7 and 8 by a free-standing commentary on the opportunities for an extension to Citywest, and on opportunities for alignments through Adamstown.

Chapter 9 sets out the results of our evaluation of schemes, followed in Chapter 10 by our conclusions and recommendations.

2. PLANNING ISSUES

2.1 A brief outline of the national planning context in which the Metro proposals are being developed was included in the Phase 1 report.

2.2 This section summarises local planning issues insofar as they are relevant to alignment development in the Phase 2 study area based on a review of the appropriate local planning documents.

Strategic Planning Issues

2.3 In 1996 the population of South Dublin was roundly 220,000. The Strategic Planning Guidelines anticipate that the population of South Dublin will see an increase of over 13**%** by the year 2011. These population projections for South Dublin are in line with the anticipated growth of the Dublin Metropolitan area where an expected increase of 12.5% in population is envisaged over the same period. The number of households in the Dublin Metropolitan Area is expected to increase by 42% overall, although South Dublin is expected to see a significantly greater proportional increase of 62% (from 61,800 in 1996 to 100,000 in 2011).

2.4 The Strategic Planning Guidelines make particular reference to the accommodation of additional population by the consolidation of the three western towns of Tallaght, Lucan-Clondalkin and Blanchardstown. It is envisaged that the best use of existing infrastructure would be made.

South Dublin County Council Development Plan 1998

2.5 Tallaght and Lucan/Clondalkin have been designated as scheduled towns in the South Dublin County Development Plan 1998. The population of Tallaght at the time of the publication of the South Dublin Development Plan 1998 was roundly 74,000 - a huge increase from 6,000 in 1971. The town has developed rapidly from a small village to an area with extensive residential, industrial and warehousing areas, served by a range of social, civic and commercial facilities. There are areas of economic disadvantage in Tallaght. The population of Lucan/Clondalkin as set out in the 1998 Development Plan was 70,000, again a massive growth from 5,000 in 1971.

2.6 The objectives of the Development Plan seek to support the implementation of the transportation strategy for the Dublin Region as set out in the Dublin Transportation Initiative Final Report. Particular emphasis is placed on the need for improved public transport especially through the development of strategic public transport corridors where increases in the density of developments will be encouraged. The Plan also proposes that land be protected to facilitate the extension of the proposed Light Rail Transit System to Clondalkin, Oldbawn and Citywest. These public transport improvements will be supported by the development of park and ride facilities subject to securing suitable finance.

2.7 The Plan seeks to encourage growth of enterprise and employment in the County and to this end the Council will co-operate with other agencies including the private sector in promoting economic and social development and in assisting the provision of employment opportunities. The Council seeks to ensure that sufficient serviced lands are available to facilitate the growth of enterprise and employment activities in the County.

Local Planning Issues

2.8 There are a number of major development proposals within the study area that are important to consider in the development of alignment options, and which will influence levels of Metro patronage and hence revenue.

2.9 The study area is a major location for new residential development. There a number of recent major planning consents for groups of houses ranging from 100 to 400+ dwellings. Major housing developments are proposed in the Liffey Valley Park area totalling over 550 dwellings on two sites. Additional housing development is also proposed in the Griffeen area where a proposal for over 300 houses has recently been granted planning permission. Some 350 dwellings have also been granted consent in the Ballydowd Manor area. However the main area of future housing growth is located to the north of the study area in the townland of Carpenterstown where a total of some 1,500 new houses are proposed in five new developments.

2.10 In association with this level of residential development a number of new local centres are proposed providing a mix of uses, community facilities and retailing at areas such as Firhouse shopping centre, and a site off the Nangor Road.

2.11 Additional considerations have been the development potential of the Liffey Valley shopping centre, and The Square Tallaght, where there are major proposals for an increased range of uses in the locality including business and office uses. The potential of land currently unzoned at Balgaddy has also been a consideration in this study, given its location adjacent to the Kildare railway line, and particularly given the improvements to the station and other improvements proposed by Iarnrod Eireann.

2.12 The Retail Planning Guidelines for the Greater Dublin Area recommend that in the South Dublin County Council area Liffey Valley centre be expanded to a Major Town Centre, complementing the role already performed by the Square in Tallaght. Potential is also identified for further development of the District Centres at Clondalkin Village and Lucan Village/Esker, together with the designation over time of further District Centres serving the rapidly expanding Lucan Clondalkin area. The most easterly Metro alignments which serve the Liffey Valley centre would therefore benefit the development of the centre as a Major Town Centre and vice versa. Serving this proposed Major Town Centre supports the principles set out in the Retail Planning Guidelines. The emergence of the scale of development as envisaged in the Adamstown Action Area plan is not covered in any detail by the Retail Planning Guidelines. However, the Guidelines do state that Adamstown would be a new District Centre – the scale of which should be related to the level of population envisaged for the development.

2.13 South Dublin County Council has recently commissioned consultants to prepare Integrated Framework Plans for Land Use and Transportation for the areas of Lucan/Clondalkin and Tallaght. These plans will seek to integrate the growth and development of these areas with a more sustainable transportation network, which will include the Metro system.

2.14 The Kildare Route Project is identified as a key project within the Dublin Transportation Office 'Platform for Change' document for implementation by 2006. The project aims to increase capacity on the existing line between Heuston and

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Project	DUBLIN METRO STUDY		
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KEY

>20MIN FREQUENCY (LESS FREQUENT)

<20MIN FREQUENCY (MORE FREQUENT)

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Project: DUBLIN METRO STUDY

Title: EXISTING PT NETWORK SHEET 2 OF 2

Scale	Drawn	Checked	Authorised
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Drawing Number: FIGURE 2.2

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Kildare stations. It is intended to add one track to the two existing tracks from Heuston to the Cherry Orchard area and adding two tracks from there to beyond Hazelhatch. The resulting increased capacity would provide an enhanced frequency of service.

2.15 The project also involves proposals to develop new rail stations at a number of locations in the Phase 2 study area including Adamstown (in association with the development proposals), Kishoge, and the replacement of Clondalkin station with a new station to be provided at Fonthill Road which will service the potential development at Balgaddy. Clearly these station development proposals have been important elements in developing alignment options to enhance the interchange opportunities for future passengers and integration of development opportunities. The project is at the planning and design stage at present; the exact timetable for delivery of the project has yet to be determined.

2.16 Public Transport Network (see Figure 2.1)

At present there is one train station in the study area located near the northern industrial estate of Clondalkin, facilities at the station are poor and the level of passenger usage is low. The frequency of trains along the Kildare Route are far behind the scheduled numbers recommended in the DTO strategy.

The bus network has undergone some improvements as a result of the QBC implementations, buses now run every 5 to 20 minutes in the peak hours along the amended routes. There are four QBCs in place at present: Lucan QBC along the N4, North Clondalkin QBC on the Coldcut Road, South Clondalkin QBC on the Naas Road, Tallaght QBC at the Tallaght Road.

The bus network concentrates on movements from the city centre to the suburbs. The "Orbital" bus services between Clondalkin and Tallaght are infrequent, attempts to start a local bus network in Tallaght have not been very successful to date.

3. ENVIRONMENTAL ISSUES

Introduction

3.1 This chapter describes the Environmental Constraints within the Phase 2 study between Lucan and Palmerston in the north and Tallaght in the south.

3.2 The route for the Metro will pass through the Liffey Valley between Lucan and Palmerstown. The Liffey Valley is a sensitive natural environment and parts of the valley are included within the Liffey Valley Special Area Amenity Order 1990 and within a proposed Natural Heritage Area. Due to the sensitivity of the Liffey Valley and the need to provide a crossing for the Metro, a literature review was carried out to highlight the issues which have already been addressed as part of other studies for similar infrastructure development within this area.

Alternative Routes for Liffey Crossing

3.3 Four routes incorporating a River Liffey Crossing have been considered to date for the link between Phase 1 and Phase 2 of the Metro. These include:-

- A low level crossing immediately west of Lucan House;
- A low level crossing east of the existing Lower Lucan Road bridge;
- A high level crossing between Woodville and Hermitage following the route of a long term proposed road in South Dublin County Development Plan (1998); and
- A high level bridge adjacent to and on the western side of the existing M50 Bridge.

BACKGROUND

3.4 The following reports and publications were reviewed:

Atkins McCarthy (2000) *Review of Metro and LRT Proposals at Liffey Valley*, Draft Report.

Clifton Scannell Emerson Associates (2001) *Blanchardstown Transportation Study* Overview; Liffey Crossing, 48-55.

Environmental Protection Agency (EPA) (1996) *Advice Notes on Current Practice*, Project Type 8 Railway lines.

Ove Arup & Partners (1998) *Environmental Impact Statement for the Second Liffey Valley Bridge at Westlink.*

South Dublin County Council (1998) *South Dublin County Development Plan*

3.5 General environmental issues which have emerged from the above studies are summarised below:

Human Beings

3.6 Key impacts on people include:

- Noise and vibration during the construction and operational phases, requiring suitable mitigation measures
- Impacts on local amenities during the construction phase.
- Traffic impacts during construction, including local traffic diversions
- Landscape impacts, e.g. visual intrusion associated with structures, earthworks and superstructure
- Some properties may have to be demolished.
- Improved air quality resulting from reduced car dependence and traffic congestion.

3.7 Electro Magnetic Radiation (EMR) produced from the Railways electrification system would need to be measured in accordance with European standards such as ENV50121–1 and D D ENV50166-1 1995. ENV50121-1 covers radio emissions (9KHz upwards) and the measurement methods applicable to the railway. ENV50166-1 relates to bio limits for humans although required compliance should be inherent i.e. railway not of sufficient power as they are not railway oriented standards.

Flora and Fauna

3.8 The proposed Metro line has many associated environmental impacts to flora and fauna during both the construction and operational phases including clearance of cover along the corridor, which will have a major impact on habitats and wildlife.

3.9 There are a number of parks, golf courses and open spaces within West Dublin, e.g. Clondalkin Newlands Golf Course, Corkagh Park, Kilcarbery Golf Course, Lucan Golf Course, Backweston Park, Hermitage Golf Course, Citywest Golf Course, Tymon Park, and Sean Walsh Memorial Park, and all are highlighted on the environmental constraints Figure 3.1. These maps also include proposed Natural Heritage Areas (NHAs), of which there are three within the study area, and all of which are of ecological interest. These include:

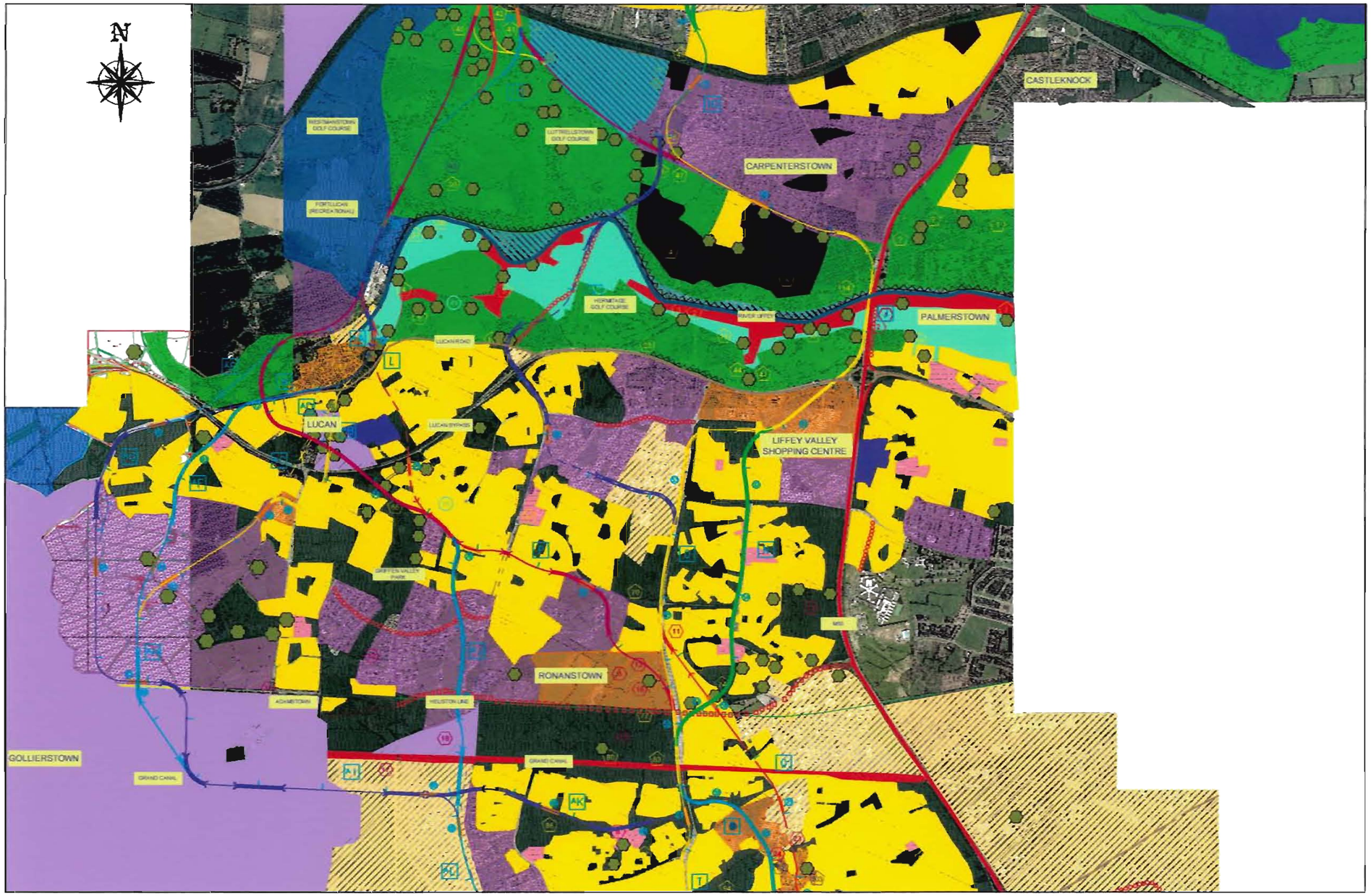
Site Name	Code
Liffey Valley	(00128)
Grand Canal	(02104)
Dodder Valley	(00991)

3.10 Parts of the Liffey Valley have a Special Amenity Areas Order (SAAO) designation due to the diversity of the habitats within the valley, ranging from aquatic to terrestrial. A number of rare and threatened plant species have been recorded from the site. The river has an annual (*salmo salar)* salmon run. The Dodder is a registered trout river *(Salmo Trutta)*. (DUCHAS, 2001). Certain species along the river within the site are listed in the Irish Red Data Book, and the legally protected Hairy St. John's-Wort (Hypericum hirsutum) under the (Flora Protection Order 1987) (DUCHAS, 2001).

Cultural Heritage

3.11 South Dublin has a wealth of features of historic interest. The National Monuments Service has separated these structures into two lists (subsequently consolidated in "Protected Structures" under the Planning and Development Act 1999) which include:

- List 1 - Structures to be preserved; and



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Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 3.1-1

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

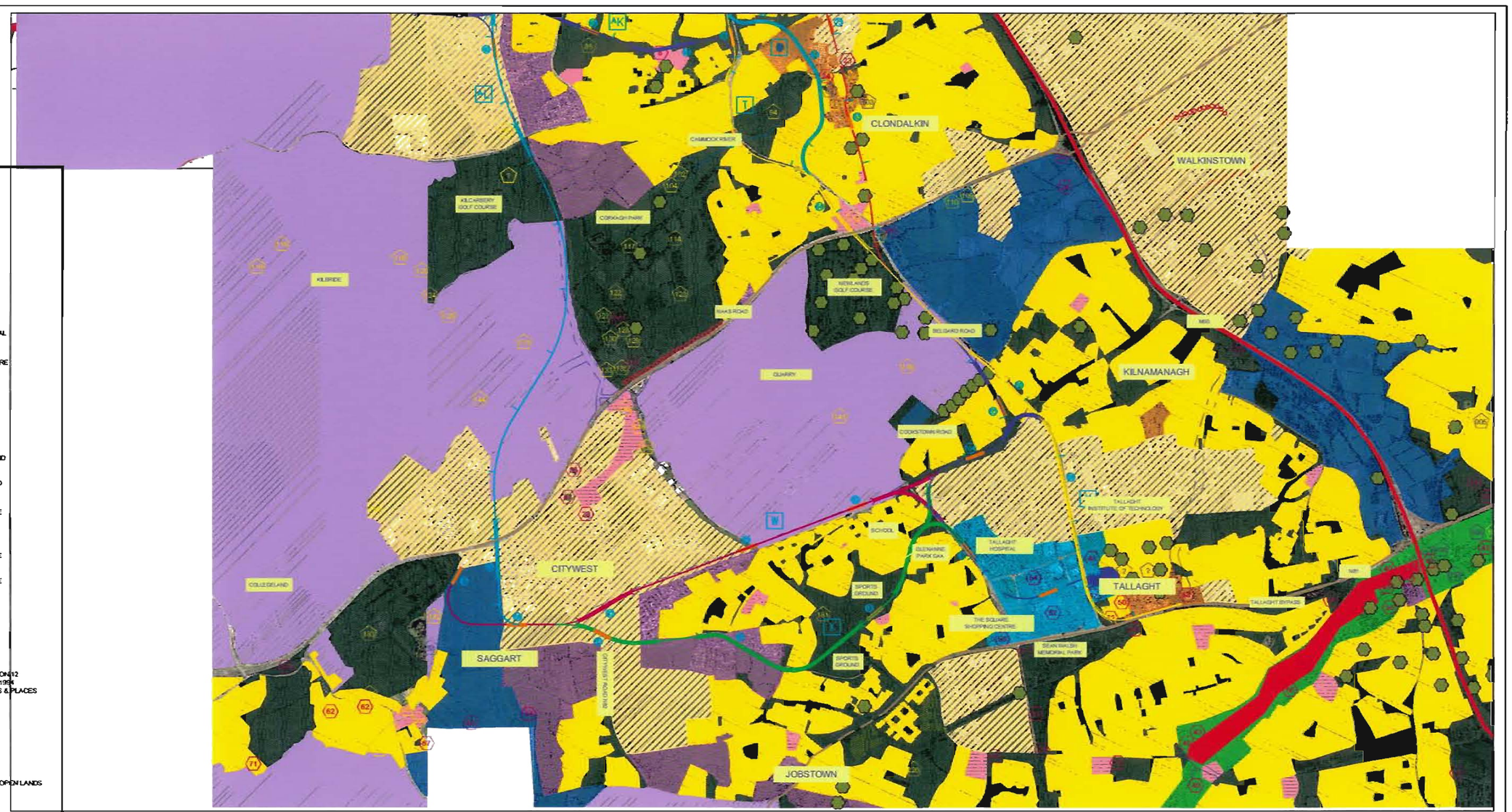
Project: DUBLIN METRO STUDY

Title: ENVIRONMENTAL CONSTRAINTS SHEET 1 OF 2

Scale	Drawn	Checked	Authorised	
NTS	CP			
	Date 19/03	Date	Date	

Drawing Number: FIGURE 3.1

Rev



KEY

- DISTRICT CENTRE FACILITIES
- TO PROVIDE FOR INDUSTRIAL AND RELATED ISSUES.
- TO PROVIDE FOR INDUSTRIAL AND RELATED ISSUES.
- LOCAL CENTRE FACILITIES
- RESIDENTIAL COMMUNITIES
- NEW RESIDENTIAL COMMUNITIES - SUBJECT TO THE PROVISION OF THE NECESSARY SOCIAL AND PHYSICAL INFRASTRUCTURE.
- TO PROTECT AND IMPROVE RURAL AMENITY AND TO PROVIDE FOR THE DEVELOPMENT OF AGRICULTURE
- GREEN BELT
- MAJOR TOWN CENTRE ACTIVITIES
- TO PROTECT AND IMPROVE HIGH AMENITY AREAS
- TO PROTECT AND/OR PROVIDE FOR A BURIAL GROUND
- TO PROTECT AND PRESERVE TREES AND WOODLAND
- TO PROVIDE FOR A GREEN BELT & TO PROVIDE FOR URBAN AND RURAL COMMUNITIES AND AGRICULTURE
- TO PROVIDE NATURAL HERITAGE AREAS (NHA's)
- PRESERVATION LISTINGS LIST 1. STRUCTURES TO BE PRESERVED
- PRESERVATION LISTINGS. LIST 2. STRUCTURES TO BE CONSIDERED FOR PRESERVATION.
- TO PROVIDE NATURAL HERITAGE AREAS (NHA's)
- TO PRESERVE VIEWS
- LOCAL OBJECTIVE (SEE WRITTEN STATEMENT)
- RECORDED MONUMENTS PROTECTED UNDER SECTION 12 OF THE (NATIONAL MONUMENTS) (AMENDMENTS) ACT 1994 FOR DETAILS SEE DUCHAS- RECORD OF MONUMENTS & PLACES
- MOTORWAY PROPOSALS
- ROAD PROPOSALS - LONG TERM
- ROAD PROPOSALS - FIVE YEARS
- TO PROTECT & PROVIDE FOR INSTITUTIONAL USE IN OPEN LANDS
- ROUTE SECTIONS
- STATION IDENTIFIERS
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED STATION
- M50
- OTHER ROADS

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Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 3.1-2

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

Project: DUBLIN METRO STUDY

Title: ENVIRONMENTAL CONSTRAINTS SHEET 2 OF 2

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 3.1

Rev

- List 2 - Structures to be considered for preservation.

3.12 The locations of all structures in List 1 and List 2 are shown on The Constraints Map Figure 3.1. Clondalkin has a historic village and any Metro alignment through this area would, realistically, need to be routed underground in this area to reduce impacts and to maintain amenity.

3.13 Lucan is a historic and architecturally rich village, situated on the River Liffey. To reduce human impacts it is proposed to route the Metro underground near Lucan. There are several structures in the Lucan area which are worthy of preservation or considered for preservation. They include items of architectural, artistic and historical interest listed below:

No.	Town	List	Description
010	Laraghcon	2	2 storey house terrace, Nos1-10 incl., Millbank Cottages
011	Laraghcon	2	Castle Site
014	Laraghcon	2	Chimney to former Hills Mills, Lucan
022	Lucan	2	Bridge and Bridge Site , Lucan Bridge
018	Laraghcon	2	Power Station
020	Lucan and Pettycanon	2	Weir, Salmon pass, sluice gates and fishery site.
032	Lucan and Pettycanon	2	2 storey school, C of I National School, Main Street, Lucan
060	Cooldrinagh	2	Enclosure Site
035	Lucan and Pettycanon	2	Gothic style church with steeple, St. Andrews Church, Main St. Lucan
034	Lucan Demesne	2	Monuments ,lodges, demesne walls and gates, Lucan House (Residence for Italian Ambassador)
036	Lucan Demesne	2	Bridges and piers of Old Bridge, Coldblow Bridge
038	Lucan	2	Victorian Style House Terrace

051	Lucan and Pettycanon	2	Bridge, Griffeen Bridge
046	Lucan and Pettycanon	2	Public House with red brick facade
055	Lucan and Pettycanon	2	House, Canonbrook House
061	Lucan and Pettycanon	2	2 storey house, Primrose Hill House
021	Laraghcon	2	2 storey house terrace, Nos. 1-20 incl., Weirview Cottages
001	Lucan Demesne	1	Three storey house, including interior, Lucan House (Residence for Italian Ambassador)

Environmental Management Systems (EMS)

3.14 EMS integrates all environmental disciplines to produce a more cost effective and efficient approach to environmental management. This framework would help ensure that all environmental mitigation measures and Government body (i.e. OPW & EPA) procedures/guidelines are implemented correctly.

3.15 EMS would incorporate the following: -

- Reuse of spoil material i.e. balancing cut and fill. Due to amount of tunnelling a detailed plan for cut and fill will have to be discussed at the detail design stage.
- Construction Management Plan which would consist of traffic management, noise, dust, vibration control measures
- Health & Safety procedures
- Pollution prevention and control procedures

Construction Impacts

3.16 In addition to the impacts on people outlined above, a number of specific ecological factors need to be considered during the construction phase, including:

- Soil and geology, the nature of which will influence the construction method

- Water - run-off of suspended solids and accidental spillage's into watercourses, disruption of flow in streams and ditches etc.

- Air quality - dust and traffic related emissions such as sulphur dioxide, black smoke and nitrogen oxide

3.17 Detailed consideration will need to be given to minimising the impacts of construction when building the rail crossing over the River Liffey and Grand Canal.

Environmental Constraints Relating to the Route Options

3.18 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 South Dublin County Development Plan 1998. A series of site visits were carried out to verify mapped environmental constraints, note general vegetation and assess landscape character, visual amenity and principal views. Environmental constraints for the study area are shown on Figure 3.1. Key emerging environmental issues within the study area are:

- visual impacts from elevated structures

- impacts on cultural heritage sites

- noise impacts on residential properties

- physical constraints requiring property acquisition and demolition, and

- diversions of public utilities.

Summary

3.19 Key observations on environmental issues can be summarised as follows:

3.20 Options running via Liffey Valley Centre would result in disruption to the Natural Heritage Area within the river valley and may affect groups of protected trees. Also this route would be highly visible from properties on the western side of the valley. However, the opportunity would exist to design a more aesthetically pleasing structure to screen the existing M50 road crossing, thus potentially enhancing the landscape of this area.

3.21 Options running adjacent to Hermitage Golf Course would cause a new visual intrusion into the Liffey Valley Special Amenity area at the point where the Amenity Area is widest. Such a route would also disrupt existing preserved views into the Liffey Valley from Lucan Road (N4). However a proposal does exist for a future road crossing at this point as this location does avoid the Natural Heritage Areas within the river valley.

3.22 Low level crossings in Lucan to the west of the study area would pass close to a large number of cultural heritage sites, undulating landscape and protected woodlands. In order to pass over the river and existing roads, the railway would need to be elevated causing intrusion on the village setting of Lucan town centre.

3.23 Of the four potential crossings of the Liffey River, it is considered that a bridge adjacent to the existing M50 would have least environmental impact on the receiving environment.

3.24 Sites of cultural interest and residential areas are likely to be the main constraints on alignments passing through the town centres of the study area i.e. Lucan, Clondalkin and Tallaght. If elevated structures cannot be mitigated, they may be sunken into bored tunnel within urban areas. This would mitigate noise and visual impacts and avoid disruption to sites of cultural heritage. A route passing under Clondalkin town centre in bored tunnel would minimise impacts on the receiving environment in this area.

3.25 Specific local environmental impacts are included in the text descriptions of the proposed alignment options in Chapter 5.

4. DEMAND RELATED ISSUES

4.1 As with Phase 1, this stage of the study is adopting a multi-criteria approach to assess the relative merits of alternative alignments through the study area, and the 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. The results of this analysis are set out in Chapter 9. However, a review of available DTO model data has been undertaken to assess the broad level of potential Metro patronage within the Phase 2 study area, a commentary on which follows. The DTO model zone system was improved by disaggregating zones throughout the Phase 1 and Phase 2 corridors for the Phase 1 study, and this improved model has also been used for the Phase 2 study. The number of zones within the Phase 1/ Phase 2 study corridor has been doubled in the disaggregation process. The improved model allows alternative alignments to be modelled and analysed with a greater degree of confidence although it should be borne in mind that the inherent limitations of the DTO model still constrain its ability to predict demand at the detailed local level.

4.2 The following alignments have been modelled in detail:

- Option 2/ 6 – route JOQV – eastern alignment via Liffey Valley Centre, Ronanstown, Fonthill Road, central Clondalkin (tunnelled route), thence to Tallaght via Cookstown Road/Cookstown Way;
- Option 2/10 – route JOTV – as 2/6 above but with a surface alignment through west Clondalkin;
- Option 2/ 12 – route KOQV – central alignment between Porterstown and Fonthill Road, then as Option 2/ 6 i.e. Ronanstown, Fonthill Road, central Clondalkin (tunnelled route) to Tallaght via Cookstown Road/Cookstown Way; and
- Option 2/20 – route LPTV – western alignment via Lucan, Griffeen, Fonthill Road, west Clondalkin (surface route) to Tallaght via Cookstown Road/Cookstown Way

4.3 The choice of alignments allows the central, eastern and western alignments to be compared and also the patronage effects of serving central Clondalkin via a tunnel or a surface alignment around Clondalkin to be assessed.

4.4 The following data was extracted from the AM peak DTO model:

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

4.5 This analysis confirmed that the DTO model, with some zonal disaggregation, can assist in distinguishing demand between alternative local route options.

4.6 The following commentary sets out a summary review of levels and patterns of demand forecast for the study area between Blanchardstown and Tallaght for each of the options tested using the modified DTO model.

4.7 The DTO's trip attraction and generation model (TAGM) was used to determine the future trip demand on the study corridor. The TAGM has been developed, by the DTO, from surveyed data, statistical information, economic growth forecasts and the county council development plan data.

Trip Distribution Patterns

4.8 A matrix of forecast Metro trip movements has been constructed from the DTO model to show the range of distances travelled by Metro users travelling through the Phase 2 corridor. The following areas have been identified for analysis:

- New development area north-east of Blanchardstown;
- Blanchardstown;
- Castaheany;
- Ronanstown;
- Lucan;
- Clondalkin;
- Tallaght;
- The Airport; and
- City centre (via the metro and heavy rail).

4.9 The results are presented in matrix format in Table 4.1 to Table 4.4 highlighting forecast 2016 AM peak Metro trips within the Phase 2 corridor, trips travelling between the corridor and the city centre, the airport and the new development area. The city centre has been defined as the area lying within the canal boundary.

4.10 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 zone. Conversely, reading down each individual column gives total number of trips to a particular zone 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 zone (intra-zonal trips).

4.11 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.

Table 4.1 – Option 2/6 JOQV 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		5		2	4	29	26	2	101
Blanchardstown	251	956		983		437	2522	622	1295	98	7163
Castaheany											0
Ronanstown	272	1030		129		282	2619	464	478	32	5305
Lucan											0
Clondalkin	70	59		185		10	226	81	96	118	845
Tallaght	199	558		1315		587	651	249	1125	144	4828
Airport	158	421		185		39	177				980
City via Metro	1237	1357		273		281	3880				7028
City via Rail	50	66		89		21	59				284
Total	2237	4481	0	3163	0	1659	10137	1444	3020	393	26535

Trips Remaining within Phase 2 Corridor	12144	46%	Phase 2 Corridor to City Centre Trips	1993	8%
Trips Remaining within Western Orbital Corridor	13385	50%	City Centre to Phase 2 Corridor Trips	4602	17%

Table 4.2 – Option 2/10 JOTV 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				996
City via Metro	1406	1494		371		497	6476				10244
City via Rail	52	68		84		32	55				292
Total	2437	4662	0	2676	0	2761	12725	1462	4194	170	31087

Trips Remaining within Phase 2 Corridor	12481	40%	Phase 2 Corridor to City Centre Trips	2365	8%
Trips Remaining within Western Orbital Corridor	13728	44%	City Centre to Phase 2 Corridor Trips	7516	24%

Table 4.3 – Option 2/12 KOQV 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		3	3	2	4	29	26	2	101
Blanchardstown	228	674		554	424	440	2540	530	1292	97	6778
Castaheany											0
Ronanstown	161	1167		19	13	210	2080	317	62	0	4029
Lucan	99	416		9	0	70	569	147	304	5	1618
Clondalkin	74	60		178	17	10	228	81	97	121	867
Tallaght	202	551		1249	80	593	682	249	1146	147	4897
Airport	161	422		89	103	40	178				992
City via Metro	1228	1348		91	133	285	3920				7006
City via Rail	51	66		16	2	22	59				216
Total	2205	4737	0	2208	774	1670	10261	1353	2927	370	26504

Trips Remaining within Phase 2 Corridor	12704	48%	Phase 2 Corridor to City Centre Trips	1881	7%
Trips Remaining within Western Orbital Corridor	13640	51%	City Centre to Phase 2 Corridor Trips	4528	17%

Table 4.4 – Option 2/20 LPTV 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				887
City via Metro	0	2608	324		498	538	6827				10795
City via Rail	0	102	1		70	31	54				259
Total	10	4580	2161	0	2495	3279	13636	1494	5524	344	33522

Trips Remaining within Phase 2 Corridor	13729	41%	Phase 2 Corridor to City Centre Trips	3644	11%
Trips Remaining within Western Orbital Corridor	14220	42%	City Centre to Phase 2 Corridor Trips	8018	24%

4.12 The total number of metro trips captured in the analysis range from 26500 to 33500. The two alignments under Clondalkin capture 26500 trips and the two alignments above ground around Clondalkin capture 31000 (eastern) and 33500 (western) trips. All of the options show a significant number of trips travelling between the corridor and the city centre via the metro and heavy rail options. The model predicts the metro is carrying a high number of trips amounting to some 10000 trips into the city centre in the AM peak hour. However, it should be borne in mind that the DTO model assumes a substantial congestion charge applies, hence securing a higher mode share to public transport than would otherwise be the case.

4.13 One of the differences in the options is the servicing of Lucan, Ronanstown and Clondalkin along the corridor between Blanchardstown and Tallaght. Table 4.5 below summarises the trip ends within the key areas within the corridor.

Table 4.5 – Summary of Trip Ends within Corridor

Location	**2/20 West**		**2/10 East**		**2/12 Central**		**2/6 East**	
	Around Clondalkin				**Under Clondalkin**			
	From	**To**	**From**	**To**	**From**	**To**	**From**	**To**
Northern Section								
Blanchardstown	1610	1427	5124	2669	4860	2901	5148	2637
Castaheany	3191	1743	- -	-	-	-		-
Sub Total	*4801*	*3170*	*5124*	*2669*	*4860*	*2901*	*5148*	*2637*
Central Section								
Lucan	4609	1799	-	-	1162	536	-	-
Ronanstown	0	0	3050	2037	3650	2011	4331	2617
Sub Total	*4609*	*1799*	*3050*	*2037*	*4812*	*2547*	*4331*	*2617*
Southern Section								
Clondalkin	1610	2655	2135	2176	568	1324	550	1317
Tallaght	3196	6588	3374	6025	3356	6103	3311	6022
Sub Total	*4806*	*9243*	*5509*	*8201*	*3924*	*7427*	*3861*	*7339*

4.14 Only option 2/20, and to a lesser extent option 2/12, along the western and central alignments attract trips from Lucan. Option 2/20 totally avoids Ronanstown, so no trips are recorded to/from this area, although it passes through the Castaheany area unlike the other alignments. Generally all of the options have similar numbers of trips at all locations, although it would appear the underground route through the centre of Clondalkin attracts fewer trips than the alignment via west Clondalkin. There also appears to be an emphasis on trips leaving the northern areas of the corridor and on trips arriving at the southern areas.

4.15 Table 4.1 to Table 4.4 also show that the predominant travel demand is within the study area in the AM peak. The options show that 41% to 48% of the trips captured in the analysis remain in the Phase 2 corridor, 17% – 24% travel to the city centre and 7% - 11% travel from the city centre to the Phase 2 corridor.

4.16 Other key areas analysed show in all options a number of trips between the Phase 2 study area and the airport (up to around 800 trips to the airport and 350-400 trips from the airport) and the development area north east of Corduff, although the numbers are not significant (about 500-600 inward trips during the morning peak hour).

Metro Link Flows

4.17 Figure 4.1 shows the 2016 forecast Metro link flows through the Phase 2 corridor between Blanchardstown and Tallaght, representing a 2016 AM peak hour. The figure also gives flow levels through Tallaght itself. Table 4.6 below summarises the flows through the corridor for all options tested.

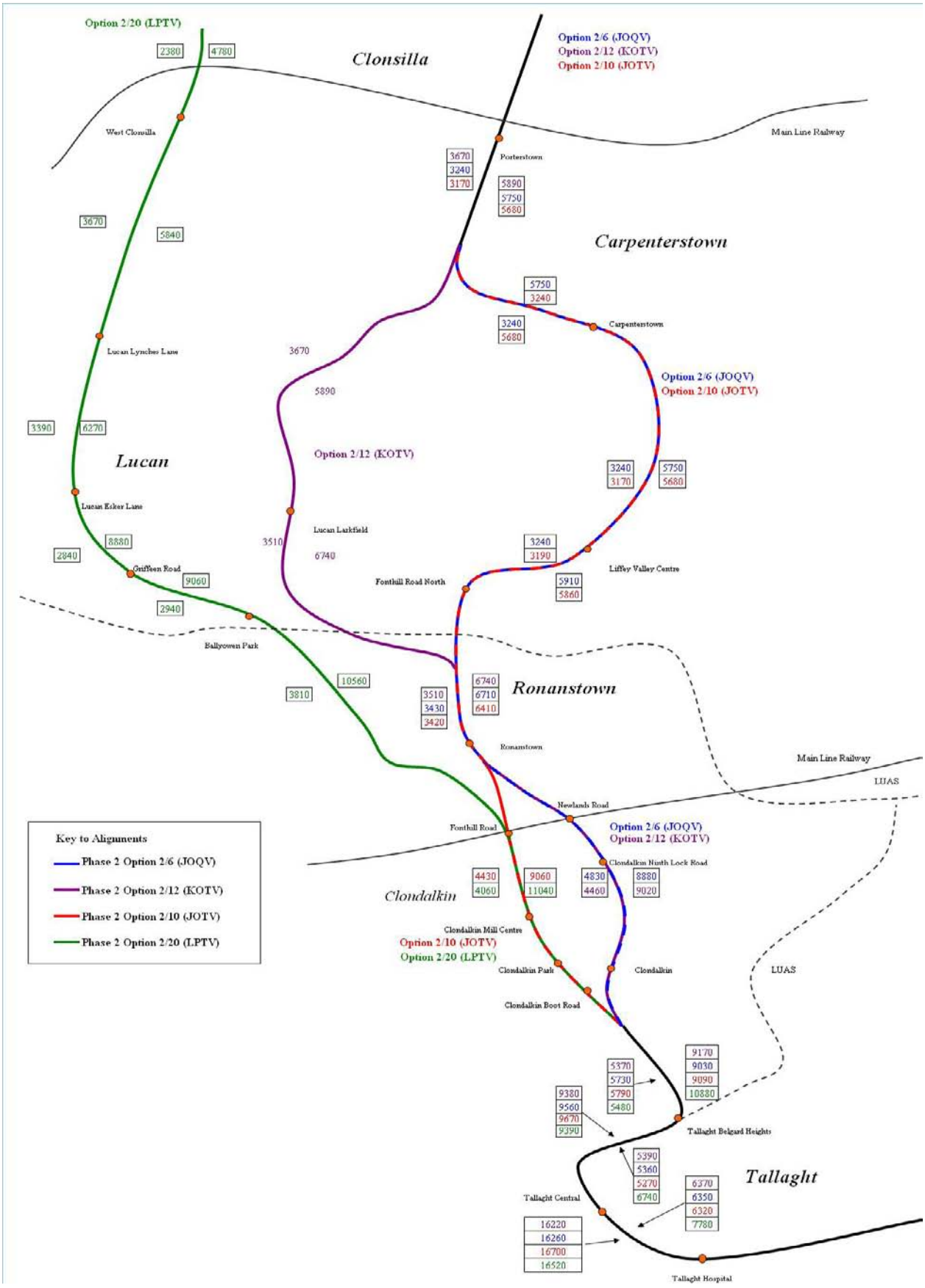
Table 4.6 – AM Peak Metro Flow Summary

Link	2/6 East	2/10 East	2/12 Central	2/20 West
Clondalkin	*Underground*	*West (Surface)*	*Underground*	*West (Surface)*
Section between Blanchardstown and Ronanstown				
Northbound 3240		3240	3670	3390
Southbound 5750		5680	5890	6270
2 way flow	8990 8920		9560	9660
Section through Clondalkin				
Northbound 4830		4430	4460	4060
Southbound 8880		9060	9020	11040
2 way flow	13710 1349	0	13480	15100
Section south of Clondalkin				
Northbound 5730		5790	5370	5480
Southbound 9030		9090	9170	10880
2 way flow	14760 1488	0	14540	16360

4.18 The aggregate flows show that Option 2/20 (western alignment around Clondalkin) is attracting the greatest number of users, with the service peaking at 16360 between Clondalkin and Tallaght. All of the alignments attract similar numbers of trips in total,

with the flows in the three sections compared in the above table. The southbound flows are generally double the northbound flows throughout the Phase 2 corridor during the morning peak, highlighting the importance of Tallaght as a trip attractor.

Figure 4.1 – Metro Flows – 2016 AM Peak



Summary

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

- There is significantly less travel demand generated among study area residents than attracted to the study area by businesses and employers, though this is entirely a function of the assumptions used for data input to the TAGM. For instance, although there is growth in the number of generated employment trips from residential areas, it is less than the total growth in employment trips attracted to the corridor. The attracted growth is double the generated growth in the Blanchardstown, Clondalkin and Tallaght areas, but less so in the Lucan area. In terms of education trips, there is a growth in trip generators in Blanchardstown and Lucan, but a decline in Clondalkin and Tallaght. There is also a negative educational trip attraction growth in all locations. Overall this results in a net inward flow to the study area during the AM peak;
- Some 14000- 19000 trips are forecast to be made on the metro to, from or within the Phase 2 study area in the AM peak one hour in 2016;
- There is a significant demand for peripheral movements, which, in total across all parts of the study area, represents almost half of all the trips captured in the analysis;
- The dominant peripheral movements are to areas to the south, particularly Tallaght, though there is a significant travel demand to and from the Blanchardstown area;
- Demand for trips to new development areas in the north-east of the study area adjacent to the N2 and between the airport and the corridor is not significant;
- There are moderate flows to and from the airport, although representing less than 10% of total trips
- The total number of trips captured through the central belt of the Blanchardstown – Tallaght corridor, where the routes differ the most are broadly the same, with the western alignment attracting the most;
- The pattern of movements suggests that the Metro is serving both local and strategic needs;

4.20 The passenger flow forecasts from the DTO model suggest that patronage levels are likely to be in the order of 5,000 – 6,000 passengers per hour (pph) in the peak direction in the northern part of the Phase 2 study area (north of Ronanstown and Lucan), and up to around 10,000 pph in the central and southern part of the study area, i.e. between Ronanstown/Lucan and Tallaght. A service running at 5-minute headway's using 4-car trains would offer capacity of up to roundly 10,000 pph, hence trains would be running at capacity through much of the Phase 2 study area at peak times.

4.21 It is assumed that RPA will re-visit the demand forecasts in due course as planning progresses.

5. SYSTEM DESIGN PARAMETERS AND ALIGNMENT PROPOSALS

5.1 This section outlines the alignment proposals developed in Phase 2. Each of the routes is described in turn and each of the descriptions includes reference to specific local environmental impacts needing to be considered. Route options for Citywest are described in a separate addendum.

General System Design

5.2 The Phase 2 alignment proposals have been developed using the same general design criteria as for Phase 1, broadly summarised as follows:

- The railway would be built to light metro standards, with a maximum gradient of 6% , and absolute minimum track radius of 100 metres. However, the tightest curvature has generally been limited to 150 metres radius to give the appropriate allowance for transitions to be applied with some tightening of the curved elements

- The Metro would be fully segregated from pedestrian and vehicular traffic although consideration could be given to the possibility of crossing lightly trafficked roads at-grade to reduce cost if required

- High levels of accessibility should be provided to major existing and proposed developments, although having due regard to the need to the impact of unduly circuitous routings on 'through' passenger journey times. Key objectives considered in the process of option development include Lucan, Liffey Valley Centre, Clondalkin and The Centre in Tallaght

- Alignment proposals should seek to minimise adverse environmental impacts as far as possible, particularly in the very sensitive Liffey Valley

- Other sensitive areas such as cultural heritage sites, graveyards and sites of archaeological interest should be avoided as far as possible

- Trains will be formed of four 30-metre single-articulated cars with an overall train length of up to 120 metres, and capacity of between 800 and 900 passengers

- Trains will generally be driven on line of sight except in tunnels (although an allowance has been included to cover signalling costs in any event)

- The applicable standards are 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).

- Standard railway safety design principles and international best practice are assumed throughout

Constraints

Geological Considerations

5.3 To the south west of central Dublin the lithology typically comprises 1 to 3 metres of superficial deposits overlying the bedrock Calp Limestone. These superficial deposits will consist of water bearing alluvial sands and gravel with some clay. The limestone is hard, although the surface layer might be weathered, and will be permeable.

5.4 The study area to the west of the M50 around Clondalkin and Tallaght falls into this pattern with the depth of superficial deposits shallower in the north and deeper in the south. To the south of Tallaght there is a possibility of buried channels around the basin of the river Dodder but these would need to be proven by boreholes etc.

5.5 This has major implications for tunnelled construction because the lithology comprises two extreme tunnelling conditions - cut and cover construction would involve two different strata, the problems of which could be avoided by deep level bore construction but at huge cost of deep level station construction**.** Otherwise, cut and cover tunnelling is relatively straight forward in engineering terms but highly disruptive in terms of construction impact and environmental disturbance.

5.6 In summary, these factors point to route choice being based upon preferred method of construction in accordance with the following broad guidelines:

- Surface routes should be adopted as far as possible

- Cut and cover would be the likely preferred method of tunnel construction along wide main roads, with temporary traffic diversions during the construction phase. This form of construction would be likely to require two stage excavation for the soft and hard ground and pumping out of water, possibly leading to settlement and building damage

- Deep bored tunnels to provide maximum flexibility, and minimum settlement at the surface, with stations built on vacant sites as far as possible. However, the costs would be extremely high – typically [text deleted] per route-km for tunnels and [text deleted] per underground station

Interfaces with Phase 1

5.7 Two basic alignments were identified at the southern end of the Phase 1 study area, through Porterstown and Clonsilla, both of which offer the opportunity of creating an interchange with the Maynooth railway line. Accordingly these have been used as the potential starting points for Phase 2 alignments, identified in this study as Route segments 10 and 11 respectively.

5.8 Three alternative proposals have been prepared for interchange with the Maynooth line at Clonsilla (dependent on the line of approach from the north (i.e. via Castaheany or the Blanchardstown Road corridor).

Castlethorne Development Issues at Porterstown

5.9 Discussions were held with Castlethorne Construction during Phase 1 in relation to their proposed residential development around the main line railway at Porterstown. These proposals include a Metro station located generally to the south of the proposed new main line station, and the proposed metro alignment was adjusted in discussion with Castlethorne's consultants to ensure full compatibility with the development scheme. From there, the proposed Metro alignment proceeds southwards, over Luttrellstown Road and towards the River Liffey. This alignment is designed to follow the corridor of the new distributor road on the east side of Lucan as proposed in the South Dublin County Council Development Plan.

Alignment Proposals

5.10 The study area can be divided broadly into four sub-areas for the purpose of describing route alignments:

- Porterstown – Ronanstown via central Liffey crossing, or eastern Liffey crossing via Liffey Valley Shopping Centre
- Clonsilla – Ronanstown via Lucan and Griffeen Valley Park
- Clondalkin
- Tallaght

5.11 Taken together, some 24 combinations of alignments through these areas have been identified for the purposes of costing and evaluation. The route alignments are illustrated in Fig. 5.1.

5.12 The route options have been combined into two sets, the first of which serves the Liffey Valley Centre, the Quarryvale/Neilstown/Rowlagh area, Clondalkin and Tallaght (Route group 10); the second set serves the Lucan area before rejoining the routes through Clondalkin to Tallaght (Route group 11).

Liffey Valley Corridor

5.13 Three alignments have been developed for the Liffey Valley corridor, based on the current or proposed transportation corridors.

- Route segment J uses the M50 corridor and serves the Liffey Valley Centre
- Route segment K follows the proposed transportation corridor from Porterstown via the east side of Lucan.
- Route segments L & M cross the River Liffey at Lucan, L crossing to the east of the existing road bridge and M to the west.

N4 to Kildare Line Corridor

5.14 Three alignment corridors have been developed between the N4 and the Kildare Railway Line, two via North Clondalkin and one from Lucan.

- Route segment N follows Neilstown Road and then crosses to Fonthill Road.
- Route segment O follows Fonthill Road
- Route segment P connects the Lucan route to Fonthill Road via Griffeen Road and Ballyowen Park

Clondalkin Corridor

5.15 Three alignment corridors have been developed to serve Clondalkin.

- Route segment Q is a tunnelled alignment under the town centre of Clondalkin.
- Route segment R is an elevated alignment serving the Mill Centre and passing through Moyle Park.
- Route Segment T follows Fonthill Road (R113) round the western side of the town.

Tallaght

5.16 All routes follow the western side of Belgard Road from the N7 Naas Road to the north side of Tallaght. Two alignments corridors were developed through Tallaght to the town centre.

- Route segment U follows Belgard Road, either elevated or tunnelled.
- Route segment V follows the proposed LUAS alignment through Belgard Heights and along Cookstown Way passing Tallaght Hospital and thence in tunnel to "The Square".

Gníomhaireacht Um Fháil Iarnród

Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 5.1-1

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

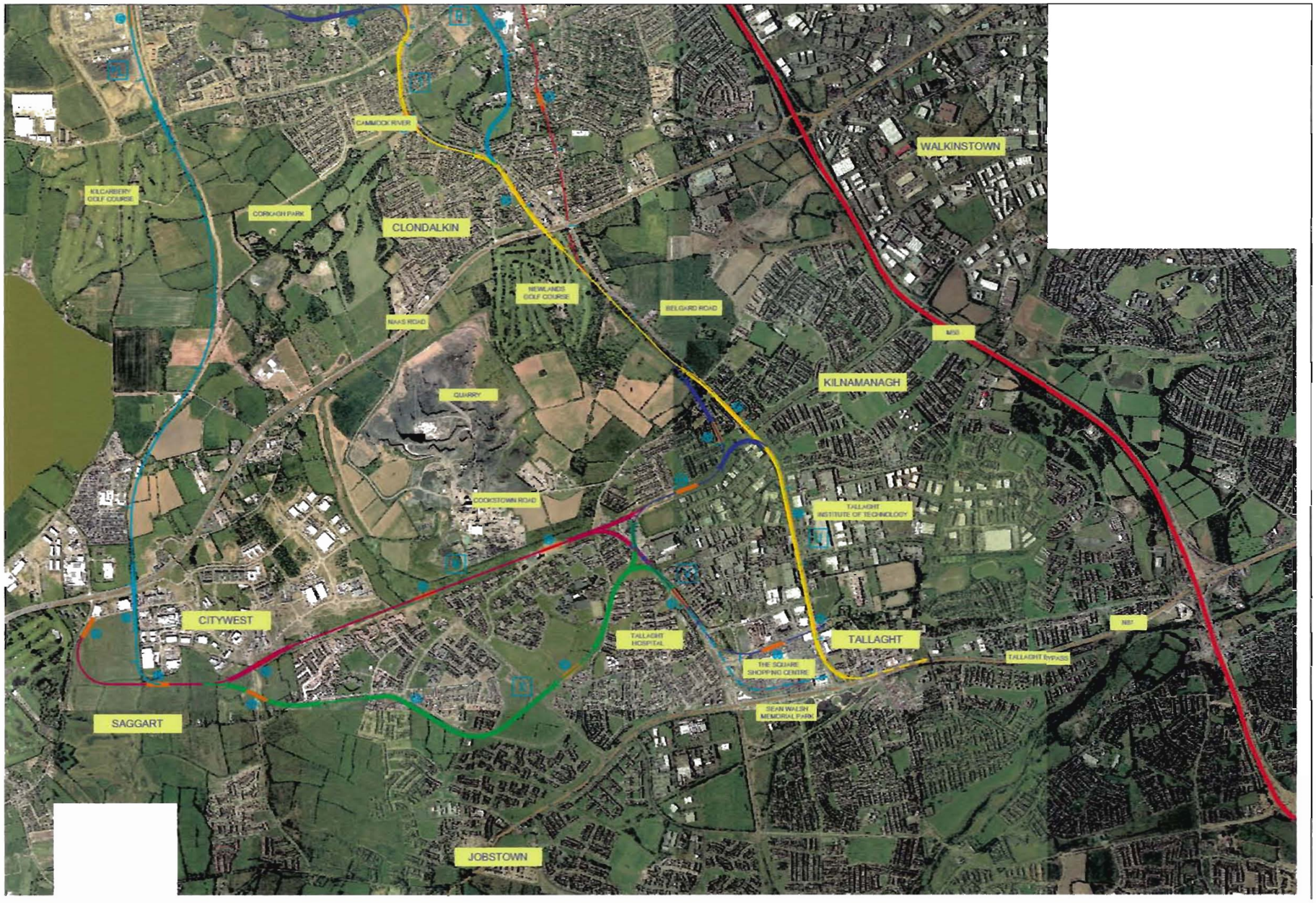
Project: DUBLIN METRO STUDY

Title: ROUTE OPTIONS
SHEET 1 OF 2

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 5.1

Rev



N

KEY

- M50
- OTHER ROADS
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED STATION
- K ROUTE SECTIONS
- 51 STATION IDENTIFIERS

Gníomhaireacht Um Fháil Iarnród

Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 5.1-2

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

Project: DUBLIN METRO STUDY

Title: ROUTE OPTIONS SHEET 2 OF 2

Scale	Drawn	Checked	Authorised	
NTS	CP Date 19/03	Date	Date	

Drawing Number: FIGURE 5.1

Rev

5.17 The options are defined as follows:

Option 2/1 10JNRU

Option 2/2 10JNRV

Option 2/3 10JNTU

Option 2/4 10JNTV

Option 2/5 10JOQU

Option 2/6 10JOQV

Option 2/7 10JORU

Option 2/8 10JORV

Option 2/9 10JOTU

Option 2/10 10JOTV

Option 2/11 10KOQU

Option 2/12 10KOQV

Option 2/13 10KORU

Option 2/14 10KORV

Option 2/15 10KOTU

Option 2/16 10KOTV

Option 2/17 11LPRU

Option 2/18 11LPRV

Option 2/19 11LPTU

Option 2/20 11LPTV

Option 2/21 11MPRU

Option 2/22 11MPRV

Option 2/23 11MPTU

Option 2/24 11MPTV

Description of Routes

10J: Porterstown to Liffey Valley Centre via M50 Corridor

A new interchange station with the main line will be provided at Porterstown. The line will proceed southwards at-grade along the new estate road, curving eastwards to follow the north side of Luttrellstown Road, on the south side of the Carpenterstown developments. The route will require the demolition of 12 terraced bungalows known as Mountain View Cottages and one new house on Luttrellstown Heath. This is proposed as a location for a station serving Carpenterstown. Having passed the east end of the housing development the line would rise up bridging over Lutrellstown Road curving southwards to the west side of the M50.

The line would cross the River Liffey valley on an elegant bridge immediately to the west of the M50 motorway bridge and at the same level as the road. Having crossed the river valley, the line would rise steeply between the slip road from the N4 and the school, passing over the N4 and onto the plateau on which the Liffey Valley Centre is located. The line will need to be elevated across the centre access roads and car parks to avoid interference with road based transport. A station is proposed adjacent to the central entrance to the Centre. The line continues elevated towards Quarryvale district and route segments N & O.

Environmental Constraints

Route J passes to the south of Carpenterstown adjacent to some protected trees before crossing the river on a high level crossing adjacent to the existing M50 bridge. The bridge crossing the river will pass over a Natural Heritage Area with protected trees and will enter into the Liffey Valley Special Amenity Area (1990). Close to the Liffey Valley there are three (List 2) protected structures and a further six are under consideration for this protection

Liffey Valley Shopping Centre is on embankment in relation to the adjacent N4 and as a result the elevated Metro structure across the N4 will have a visual impact on the surrounding environment. Palmerstown is the nearest residential area to the elevated route option at the Shopping Centre. Existing screen planting along the western boundary of the residential area would reduce visibility of the structure. However the pupils and staff of Brooklawn school immediately west of the existing M50 bridge would experience a high degree of visual intrusion from the elevated railway structure as it passes through their school grounds.

The new railway bridge will screen views of the existing M50 road bridge from other properties in the west of the river valley. The opportunity exists for an enhanced bridge design which could improve the west facing façade of the proposed combined transportation route crossing the Liffey.

Noise impacts resulting from the Metro will be dependent on baseline noise levels in individual areas. However properties close to the M50 i.e. houses on Strawberry Beds Lower Road and on Old Lucan Road could require noise abatement as a result of the Metro at location J.

10K: Porterstown to Fonthill Road via Lucan East.

This alignment is provisional and is subject to confirmation of the proposed road alignment over the Liffey Valley so as to form a new integrated transport corridor.

A new interchange station with the main line will be provided at Porterstown. The line will proceed southwards at-grade along the new estate road, rising to bridge over Luttrellstown Road. The line crosses farmland at-grade before bridging over a local road and the R109 Lower Lucan Road and the River Liffey on an elegant structure. The line curves westwards to the south of the Luttrellstown golf course and then southwards along the western side of the Hermitage golf course. This alignment is following the route of a road proposed in the South Dublin County Council Development Plan.

The line would rise to bridge over the Lucan Road and follow the east side of Ballyowen Road over the N4. The line would pass through the Larkfield area of Lucan before curving eastwards to join route segment O on the Fonthill Road. A station is proposed at Larkfield to serve the new and proposed housing developments.

Environmental constraints

On the approach to the Liffey route K would pass through a sensitive area comprising three (List 2) structures and an area of protected trees. The bridge crossing the Liffey would avoid the Natural Heritage Areas within the Liffey Valley but would encroach upon the scenic value of the area. Scenic value is an important part of the designation of the Liffey Valley Special Area Amenity Order 1990. There are five. (List 2) protected structures along the Liffey Valley which, could be affected by route K.

North of the Lucan Bypass Route K would pass through an area that includes protected trees and one (List 2) protected structure. The route passes over the Lucan Bypass and passes in an easterly direction through residential (Larkfield) and industrial areas between Ballyowen Road and Fonthill Road. This route passes close to residential properties where the principal impacts will be visual and noise. There are no protected views or scenic vistas from this area, therefore the degree of visual intrusion which could result is restricted. However, if the Metro is on viaduct local views will be maintained under the structure and access between area will not be severed. Noise impacts resulting from the Metro will be dependent on baseline noise levels in individual residential areas

11: Clonsilla to Lucan

A new interchange station with the main line will be provided at Clonsilla. The line would proceed southwards elevated and bridging over the R121 Clonsilla Road and then crossing farmland at grade towards Lucan. The line would bridge over the R121 Tinkers Hill and to the south of the Fort Lucan Adventureland. This would be a possible location for a station to serve Fort Lucan and the adjacent leisure facilities, if enough demand can be demonstrated. The line follows the top of the Liffey valley escarpment until the western end of the builder's merchant depot by Clanaboy House.

Environmental constraints

Route Option 11 from Clonsilla passes in a southerly direction across rural landscape designated as High Amenity and Green Belt/Sensitive in the Fingal County Council Development Plan (1999). As the alignment approaches the river the route enters the Liffey Valley Special Amenity Area (1990) and would require removal of some of the mature trees in the area.

L: Lucan East

The line curves southwards to cross the R109 Lower Lucan Road at the western end of the Builders Merchant depot, and then across a car park between two workshop units before crossing the River Liffey on an elegant bridge. Once across the river, the line continues southwards over the flood plain and then goes into tunnel under The Old Hill. The ground is rising steeply at this point and an at-grade or elevated alignment would not be possible within the design specification. The line would proceed in tunnel under the Lucan Road and between

the Lucan Heights and Esker Lawns areas and under the N4 Lucan Bypass before rising up between Esker Lane and Griffeen Road. A new underground station is proposed adjacent to the N4 serving both sides of the road with entrances at Beech Grove and Esker Lane.

Environmental Constraints

Route L crosses the Liffey east of the existing Lower Lucan Road bridge. South of the river route L passes across a Proposed Natural Heritage Area and enters into the area designated as Liffey Valley Special Area Amenity Order (1990) which includes scenic landscape and protected trees. South of the Proposed Natural Heritage Area it is proposed that the route enters into bored tunnel to pass under a school, a residential area and to the east of a cemetery before passing under the N4/Lucan Bypass. South of the N4 route L, still in tunnel, passes under another cemetery and through a residential area including protected trees before meeting up with option M at grade.

M: Lucan West

The line continues on top of the escarpment at grade until it bridges over Barnhill Cross Road. It curves round on elevated structures over the flood plain of the river, crossing the River Liffey on an elegant bridge. The line passes through the grounds of Lucan House bridging over the Lucan Road about 250 metres from the town centre. A station is proposed in the car park of a public house on the road. The line continues to curve south eastwards towards Adamstown Road, but will affect some new blocks of flats and other housing before reaching the road. Having bridged over Adamstown Road, the line continues on viaduct or embankment through Vesey Park along the river Griffeen and then bridging over the N4 Lucan Bypass, Lynche's Lane and Griffeen Road, rejoining the line of route segment L by the north end of Griffeen Park.

Environmental Constraints

Lucan is a historic and architecturally rich village, situated on the River Liffey. There is one (List 1) and 17 (List 2) protected structures in the Lucan area, including items of architectural, artistic and historical interest.

Route M curves round the grounds of Lucan Demesne which, includes Lucan House (currently the residence for Italian Ambassador). Lucan House is a listed building (List 1);

the demesne includes 18 monuments, lodges, gates and other artefacts that are also listed (List 2). Route M also passes through groups of mature trees within the demesne which are protected. Removal of these trees would alter the character of the area.

N: Liffey Valley Centre to Ronanstown via Neilstown Road

The line crosses the Liffey Valley Centre access road and curves southwards over Quarryvale Park and to the west side of the school. A station is proposed just south of the school entrance over Greenfort Avenue to serve the Quarryvale area and school. This alignment is elevated, although it would affect several houses in the area on Greenfort Lawns, Gardens, Park, Avenue and Greenfort Drive.

The line would bridge over Coldcut Road and continue on viaduct along the west side of Neilstown Road as far as the south side of the Rowlagh Park area. A station is proposed to serve the Rowlagh and Neilstown area. The line would bridge over to the east side of Neilstown Road to avoid the school and the local shopping centre, bridging over the Lucan Newlands Road and the Kildare Line to join route O on Fonthill Road. An interchange station is proposed by the Kildare Line to connect with the proposed Fonthill Station.

Environmental Constraints

Route N passes close to three (List 2) structures and in the southern portion passes through several areas of protected trees just north of the Grand Canal.

O: Liffey Valley Centre to Ronanstown via Fonthill Road

The line crosses the Liffey Valley Centre access road and westwards onto Quarryvale Park, then rising up to bridge over Fonthill Road and curving southwards. The line continues on viaduct along the west side of Fonthill Road, remaining elevated due to the number of side roads. A station is proposed to serve the retail/business parks on this road as well as the Quarryvale and the northern part of the Rowlagh housing estates.

The line continues southwards, crossing the Kildare Line and the Grand Canal. A station is proposed to serve Ronanstown, Rowlagh and Ballyowen Park areas, and the proposed developments to the west of Fonthill Road. An interchange station is proposed by the Kildare Line to connect with the proposed Fonthill Station.

Environmental Constraints

The route will cross the Grand Canal, which is an important Natural Heritage Area (NHA). Several houses on Shancastle Park and Shancastle Drive will have to be demolished as the metro route curves across the north western corner of Quarryvale into Fonthill Road there. Just south of the Canal there is one (List 2) protected structure. Route O passes down Fonthill Road where a section of open space comprising tree and grass separates the route from adjacent residential properties. However, in spite of the open space, noise and visual impacts are still likely to arise, the main visual impact being obstruction of west facing views into Ballyowen Park.

For route option O, significant visual impacts could arise when the Metro comes to the surface and passes over the Grand Canal and Kildare railway on new bridge structures. The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy. The Grand Canal Natural Heritage Area (NHA) comprises the canal channel and the banks on either side of it (DUCHAS, 2001). Minimising disruption to protected species living within the Canal will be a key environmental issue. Due to the heritage importance of the canal any structure crossing this feature should be sympathetic to both the environment of the canal below and to the style and materials associated with canal water edge development. From the Kildare railway to the Grand Canal there are two (List 1) protected structures and five (List 2) structures which may require an intensive archaeological brief during construction.

P: Griffeen Park to Ronanstown

The line runs eastwards along the north side of Griffeen Road, rising up to bridge over Griffeen Way, and then proceeds along an existing embankment, the route of an old road but now an access to a builder's yard. This embankment would require widening towards the estate road Castle Riada Avenue to allow for both the metro line and the access road. A station is proposed at this location to serve the recently build Esker Meadows, Castle Riada, Griffeen and Moy Glas residential estates.

The line continues on embankment, bridging over the new Ballyowen Road onto the continuation of the embankment towards Ballyowen Park. This section of embankment would also need to be widened towards the Abbeywood estate as it also carries a road leading

to Glenvale and Foxborough Road. The line would follow the north side of this road before rising up and bridging over to the south side where there is undeveloped land connected to a Training and Education Centre and School. A station is proposed at this point to serve the educational and adjacent residential estates. The line would rise to bridge over a road on an alignment between the school and a new church, skirting around the south side of the Foxdene estate to join route segment O on Fonthill Road.

Environmental Constraints

Route P passes through the residential area of Griffeen, Castle Riada and Abbeywood along a linear route which may have archaeological potential i.e. Roman Road, (although DUCHAS have no information on this feature). Route P passes to the north of a Training and Education Centre and a school before crossing an open undeveloped landscape area which includes some protected trees. The route may be elevated through the residential area which, will result in visual impacts. There are no protected views or scenic vistas from this area therefore the degree of visual intrusion which, could result is restricted. However, if the Metro is on viaduct local views will be maintained under the structure and access between areas will not be severed. Noise impacts resulting from the Metro will be dependent on baseline noise levels in individual residential areas. Mitigation measures should be considered where noise levels result in an increase of 3dB(A)L10 (18 hour).

Route Option P will also pass through Griffeen Valley Park /Griffeen River and Clondalkin Park. From the Liffey Valley to the Grand Canal the route will pass by new residential communities and district centre facilities, particularly near Lucan Road and North of Ronanstown The Metro may cause severance within these residential areas and access should be maintained particularly to district centre facilities.

Q: Ronanstown to Naas Road via Clondalkin centre (Tunnel)

The line diverges from route segment O by Ronanstown, bridging over Fonthill Road and along the south side of Lucan Newlands Road. The line would descend into tunnel in the area of open land with the portal to the north of the Kildare Line. An underground interchange station is proposed that would link into the proposed Fonthill Road station on the Kildare Line. The line would continue in tunnel under the Kildare line and the Grand Canal towards the centre on Clondalkin. An underground station is proposed adjacent to the Mill Centre in

Clondalkin and another is proposed under the town centre. The line would continue in tunnel along the line of New Road and under the N7 Naas Road and rise up to grade on the west side of Belgard Road in the grounds of the Newlands Golf Course.

Environmental Constraints

Line Q is in bored tunnel, therefore environmental constraints would be limited to disruption of the area around the portals and station construction suites. In the north the portal would be close to some protected trees in James Connolly Park; in the south the portal would disrupt the north east corner of Newlands Golf Course which also includes groups of protected trees. . The issue of spoil disposal would need to be addressed at the detailed design stage as discussed in Chapter 3 (para. 3.18).

R: Kildare Line to Nass Road via Clondalkin

This is an elevated route through Clondalkin. The line would continue from the Kildare line interchange station, over the Grand Canal and then curve eastwards over Fonthill Road towards Dunawley Avenue. The line would continue elevated through the Dunawley estate and curve southwards over the R113 Nangor Road to the Mill Centre. An elevated station is proposed in the car park of the Mill Centre that would serve Clondalkin village. The line would continue on viaduct bridging over the Old Nangor Road and behind the houses on the west side of Tower Road to the grounds of Moyle Park College. The line would curve westwards across the playing fields of the college to St Johns Road and thence bridging over the R113 joining route segment T.

Environmental Constraints

Route R passes adjacent to the Mill Shopping Centre and through the grounds of Moyle Park College. The route will pass close to two listed monuments and will cause severe disruption to the College sports pitches and general severance to the school grounds. Visual and noise impacts would also occur.

T: Kildare Line to Naas Road via R113

The line would continue along the west side of Fonthill Road from the interchange station with the Kildare Line, over the Grand Canal and then descend to grade adjacent to the Alpine Heights estate. A station is proposed at this point to serve the residential areas to the north of

Nangor Road. The line would rise to bridge over Nangor Road and the estate road Cherrywood Villas. The line would descend to grade by Cherrywood Grove, potentially affecting some of the houses on the south east corner of the estate. The line would continue at grade along the west side of the R113 with a station opposite Clondalkin Park to serve the adjacent residential areas. This route crosses some estate roads that may require bridging or, if traffic is low, a signalised grade crossing may be acceptable. Revisions to the road network may also be possible to preserve access and avoid at-grade crossings.

The line would rise up to bridge over Boot Road and curve towards Rockfield Drive. A station is proposed on Rockfield Drive to serve the adjacent residential and business areas. This would however result in the demolition of the houses on the east side of the road. The line would bridge over the Newland's Cross (Naas Road) on the west side of the new Bewleys Hotel, descending to grade in the grounds on the Newlands golf course. The line would then continue at grade along the west side of Belgard Road to Tallaght. There are some entrances to properties that would need to be accommodated. Two fairways of the golf course would be affected.

Environmental Constraints

Route T generally follows the R113 road and would cross the Cammock River in Corkagh Demesne. There are no protected trees within this area or in the adjacent Clondalkin Park, Therefore impacts on the landscape would be minimal. However route T would pass close to residential properties on the R113 the residents of which would experience severance, visual and noise impacts. Due to road access on the R113 it is likely that the Metro would be elevated along this stretch. Severance can be mitigated under an elevated structure and noise abatement can be applied where noise levels result in an increase of 3dB(A) L10 (18 hour). However visual intrusion will be high due to the absence of other tall structures and buildings. The visual impact cannot be fully mitigated although architectural treatment to the superstructure can reduce its perceived size and scale within the urban setting.

U: Tallaght Belgard Road

The line would rise up to become an elevated route above Belgard Road to the centre of Tallaght. There are too many side roads onto Belgard Road to consider an at-grade alignment, thus the alternatives for this route segment would be elevated, in tunnel or in a retained open

crossing. An elevated option is shown as this would be less costly, but with significant construction and visual impacts. Three elevated stations are proposed, at the north end to serve Kingswood Heights and Belgard Heights, one by Colbert's Fort to serve the business areas and one by Blessington Road to serve "The Square" and Tallaght village centre. This line would connect into the line from Dublin City Centre which is yet to be determined. South of the station by Blessington Road the alignment would curve eastwards as it descends on the east side of Belgard Road through an area of open land on the corner with the N81. This would affect the housing adjacent to this open area resulting in some demolition. The alignment would descend, initially in retained cutting, until deep enough to form the tunnel portal. Thereafter it is assumed that the route would be in "cut and cover" tunnel beneath the N81 towards central Dublin. An alternative location for the alignment to descent into tunnel could be along the open land on the east side of Belgard Road that leads to the RTC in Tallaght. This option would require in the order of 600 metres additional tunnel, an underground station and the demolition of some properties. This would result in an additional cost in the order of [text deleted]. Alignment options in Tallaght have been discussed in outline with South Dublin County Council and it is clear the Council is concerned to avoid unnecessary development blight. This may force adoption of an alternative underground alignment, the need for which will have to be reviewed in more detail with key stakeholders at an early stage.

Environmental Constraints

Route U will pass over Naas Road and cause a degree of visual intrusion for residents in south facing properties of Clondalkin. South of Naas Road the route will sever the north east corner of Newlands Golf Course and pass close to areas of protected trees along the eastern boundary of the course. Following Belgard Road the route would pass through residential areas of Belgard Heights and Kingswood Heights before passing through a large industrial area between Colbert's Fort and Mayberry Park. Whilst residents of the housing area are likely to experience severance, noise and a degree of visual intrusion, impacts for workers within the industrial areas will be minimal. Impacts which arise from noise and vibration from the Metro would need to be considered in detail in the project EIS. Residential land use should be treated as noise sensitive, while general business use is relatively noise tolerant.

V: Tallaght Cookstown Way

This route follows the proposed alignment of the LUAS line to Tallaght. If this route were adopted, it is proposed that the LUAS would be realigned to follow Belgard Road as a street running tram. Again, SDCC and other key stakeholders should be consulted if such a diversion were to be considered further. It should be noted that no allowance has been included in our costings for the diversion of LUAS along Belgard Road if route V were to be adopted for the metro. In very broad terms, the cost of such diversion could be expected to be in the order of [text deleted] per km.

The line would rise to cross The Avenue and descend by the Old Belgard Road and The View. A station is proposed to serve Belgard Heights, the Cookstown Industrial estate residential areas on the east side of Belgard Road. The line would continue westwards along the open land reserved for the LUAS to the Cookstown Road roundabout where it would curve southwards to follow the east side of Cookstown Way to Tallaght Hospital. This alignment would cross Second Avenue at its junction with Cookstown Way and consideration should be given to whether this road could be closed. Access is available into this industrial estate from Belgard Road which may be able to be improved. However some access may still be required off Cookstown Way requiring an at-grade crossing. If this is not acceptable, a bridge may be required.

An additional chord connection is proposed between route segments V and U near Belgard Heights. For the options using this section of route segment V between routes segments W and U, an additional station by Belgard Heights is proposed to serve this northern section of Tallaght. It is anticipated that this station would act as an interchange with the LUAS. The chord line would rise up east of this station to bridge over the LUAS and curve southwards to join the alignment of segment U adjacent to some business premises along the Belgard Road.

A station is proposed adjacent to the hospital also serving the residential areas to the west of Cookstown Way. The line would descend into tunnel at CIE's 6 acre site and curve eastwards under the car park on the north side of "The Square". An underground station is proposed under this car park to serve "The Square" and adjacent business and Council offices. The line is pointing eastwards to link in with the line from Dublin City Centre which is yet to be determined.

An alternative would be for the line to pass to the south of "The Square" in Tallaght in tunnel with an underground station beneath the south car park parallel to the N7. The line would link with the line from Dublin City Centre which is yet to be determined.

Between the hospital and the station by "The Square", the line would be in tunnel. As there is little or no development above the line of this section of tunnel, it could be in "cut and cover" tunnel. With this form of tunnelling, an excavation is made from ground level and the structure of the tunnel is formed within the excavation. The excavation is then backfilled around the structure and the land returned for use. This form of tunnelling is typically used for shallow underground metros that follow the alignments of existing roads or under undeveloped land

Where the tunnel passes beneath developed land, bored tunnelling is generally used. With this form of tunnelling a tunnel boring machine (TBM) will cut the tunnel through ground, with a shield, or the structure of the TBM retaining the ground until the tunnel lining can be placed. The lining retains the ground permanently and is typically made of cast iron in difficult areas or reinforced concrete rings. There is a possibility of ground settlement above bored tunnel, depending on the ground conditions. Where such settlements would cause distress to buildings or structures above the tunnel, techniques such as compensation grouting can be used to limit such settlements to acceptable values. In some sensitive situations where tunnelling could affect the water table or be subject to water ingress, Earth Pressure Balanced TBMs may be required. Other techniques such as ground freezing and compressed air are also used in difficult situations. This form of tunnelling tends to be used for deep level metros that need to go under developed land.

If the ground conditions are suitable, the New Austrian Tunnelling Technique (NATM) is used as it avoids the need for an expensive TBM. NATM is also used for tunnels of unusual shapes, such as in stations and crossover tunnels.

Environmental Constraints

Route V passes through Belgard Heights and would disrupt a row of protected trees on the northern boundary of the housing area. The route then passes through a future road corridor coming close to a large covered reservoir that would be sensitive to impacts arising from the construction of the railway. The route then passes down Cookstown Way adjacent to the

Tallaght Hospital where patients and staff would be sensitive to noise and visual impacts. South of the hospital the route turns to enter into Tallaght town centre. In the vicinity of the town centre there are ten (List 1) listed buildings and construction of the Metro under ground will not affect these sites of cultural interest. However, an intensive archaeological brief will be required during construction.

5.18 The key locations served by each of the routes in the following table:

Option	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12
Route	10JNRU	10JNRV	10JNTU	10JNTV	10JOQU	10JOQV	10JORU	10JORV	10JOTU	10JOTV	10KOQU	10KOQV
Carpenterstown	•	•	•	•	•	•	•	•	•	•		
Liffey Valley Centre	•	•	•	•	•	•	•	•	•	•		
Fort Lucan												
Lucan Centre												
Lucan Ballyowen Road											•	•
Lucan Esker Lawns												
Griffeen Park / Ballyowen Park												
Quarryvale/Neilstown	•	•	•	•								
Ronanstown	•	•	•	•	•	•	•	•	•	•	•	
Fonthill Road Retail					•	•	•	•	•	•		
Kildare Line	•	•	•	•	•	•	•	•	•	•	•	
Clondalkin Mill Centre	•	•			•	•	•	•			•	•
Clondalkin Centre					•	•					•	•
Tallaght Belgard Heights	•	•	•	•	•	•	•	•	•	•	•	
Tallaght Cookstown Industrial area	•		•		•		•		•		•	
Tallaght Hospital		•	•	•	•	•	•	•	•	•	•	
Tallaght "The Square"	•	•	•	•	•	•	•	•	•	•	•	

Option	2/13	2/ 14	2/15	2/ 16	2/17	2/ 18	2/19	2/ 20	2/ 21	2/ 22	2/23	2/ 24
Route	10KORU	10KORV	10KOTU	10KOTV	11LPRU	11LPRV	11LPTU	11LPTV	11MPRU	11MPRV	11MPTU	11MPTV
Carpenterstown												
Liffey Valley Centre												
Fort Lucan					•	•	•	•	•	•	•	•
Lucan Centre									•	•	•	•
Lucan Ballyowen Road	•	•	•	•								
Lucan Esker Lawns					•	•	•	•				
Griffeen Park / B allyowen Park					•	•	•	•	•	•	•	•
Quarryvale/Neilstown												
Ronanstown	•	•	•	•								
Fonthill Road Retail												
Kildare Line	•	•	•	•	•	•	•	•	•	•	•	
Clondalkin Mill Centre	•	•			•	•			•	•		
Clondalkin Centre												
Tallaght Belgard Heights	•	•	•	•	•	•	•	•	•	•	•	
Tallaght C ookstown Industrial area	•		•		•		•		•		•	
Tallaght Hospital		•		•		•		•		•		•
Tallaght "The Square"	•	•	•	•	•	•	•	•	•	•	•	

Implications for Utilities

General

5.19 The following paragraphs summarise the utility interfaces which, will need to be considered within the study area.

Electricity

5.20 High voltage 110KV and 220KV grid lines cross the proposed alignments at several locations. Route segments N, O, P and Q cross the east-west route through Ronanstown. Route segments N and Q are elevated and there would be a conflict with these lines; the power lines would probably have to be placed under ground for options using these segments. Route segments O and P are at grade, but may require some alterations to the sag of the overhead lines, again suggesting the power lines would have to be placed under ground.

5.21 Route segments R and T cross the east-west route by Dunawley Way. Route segment R is elevated and would again suggest the power lines need to be placed under ground for this option. Route segment T is at grade, but the power lines may need to be raised to provide adequate clearance.

5.22 Route segments U and V cross the east-west route to Citywest. Route segment U is elevated again requiring the power lines to be placed under ground for this option. Route segment V is at grade, but the power lines are parallel to the proposed alignment, and the extent to which this creates significant interference issues between the power lines and the metro system requires further investigation.

5.23 The routes are also crossed by 38KV lines at various locations. Route Segment J is crossed by power lines where it runs along the north side of Luttrelstown Road to the south west side of Carpenterstown. The track will be at grade and the power lines may need to be raised. Route segment N through Quarryvale crosses an east-west route where it bridges over Coldcut Road, and as the track is elevated at this point the power lines would probably need to be placed under ground. Route segment O through Ronanstown crosses power lines south of the bridge crossing the Maynooth railway and, again being elevated at this point, the power lines would need to be

similarly buried. Route Segments L & M are elevated through Lucan and cross power lines north of the River Liffey by the Lower Lucan Road (R109). These too would therefore probably need to be placed under ground.

Gas Mains

5.24 A new 914 mm diameter 70 Bar gas main has been laid adjacent to and crossing the alignment of route segment 10 at Porterstown. The alignment will be elevated at this point, having crossed both the Royal Canal and the Maynooth railway line. The exact alignment of the metro line would be adjacent to the east side of the proposed estate road, with the gas main to the west. However, it is expected that the gas main may need to cross or run alongside the track of route segment K over a length of 500m where they cross Luttrellstown Road.

5.25 South of Lucan Road (N4) the gas main follows the line of Ballyowen Lane, which crosses the metro alignment between Larkfield and Fonthill Road.

5.26 The main continues southwards along Ballyowen Road and crosses under the alignment of route segment P. The metro alignment is elevated on embankment either side of the road, which it crosses on a bridge.

5.27 Accordingly the interfaces with this major gas main are limited, and generally where they are over a short length and at separate grades. There may be a need for the main and the railway to be parallel for a length south of Porterstown; however, the detailed alignment design will need to ensure that these are not coincident.

5.28 Wherever a steel gas pipeline is in the vicinity of a DC electrically powered railway, measures must be taken to give protection against stray traction current leakage, to guard against the possibility of electrolytic corrosion of the gas pipe.

Water Mains

5.29 Large water mains cross the proposed alignments in several locations. Where the tracks are elevated this should not cause difficulties provided that the columns avoid the water mains. Where the tracks are at grade, there may be a need to divert or sleeve the water mains for protection and facilitate future maintenance. Where the tracks are near tunnel portals, the water mains will need to be diverted. If these mains are made

from steel, they may require protection against stray leakage currents from the DC traction system proposed for the metro for the same reasons as for gas mains.

Water mains cross under elevated sections route segments O, N, Q, R, T, U, V, W and X. However, route segment T around Clondalkin crosses a 24 inch main at grade south of Naas Road (N7) and route segment V through Tallaght crosses and runs beside 1200 mm and 750 mm diameter mains by Belgard Heights. Depending on how deep these mains are located, they may require relocation or to be sleeved over parts of their length.

Tunnelled Route Q under Clondalkin crosses an 18 inch and a 24 inch main near the portal south of Naas Road (N7). In this case the mains would have to be diverted. Our costings include allowances for minor service diversions but further work would be required to quantify the cost of diversions on this scale.

Foul Sewers

5.30 All routes cross both foul sewers and surface water drains along their length and, like the water mains above, should not be affected where the tracks are elevated, foundations permitting. However, for at-grade crossing and depending on the depth, some diversions or sleeves may be required.

Route segment K crosses a 1200 mm surface water drain by Ballyowen Road in the Larkfield district of Lucan. Route segment T around Clondalkin crosses 525 and 675 mm surface water drains by St Johns Road. Route segment V through Tallaght crosses a 450 mm surface water drain by Belgard Heights and two 525 mm surface water drains by Second Avenue.

5.31 A 750 diameter foul sewer would be affected by route segment L to the south of the tunnel portal by Griffeen Road. Route segment V crosses a 1050 mm surface water drain near The Square in Tallaght where the alignment is in tunnel. As this area is not developed, cut and cover tunnelling could be employed and thus this drain would required diversion or support.

The tunnel section of route segment L through Lucan crosses several surface water drains and sewers in the Lucan Heights, Beech Grove and Esker Lane areas. This

tunnel would be bored by TBM, and only deep drains and sewers would be directly affected. Drains and sewers near ground level might be subject to subsidence depending on the ground conditions.

Summary Observations

5.32 Overhead high voltage power grid routes constitute the main potential impact on utilities. Diversion of the 110KV and 220KV lines will be expensive. WESB advise that, where power lines are to be diverted, a new sub-station will be required at each end at a cost of some [text deleted] each, plus a further [text deleted] per pylon to be relocated. In very broad terms, the cost of diverting pylons could be expected to be in the order of [text deleted] plus a further [text deleted] per km. In addition, such diversions could have major programme implications requiring early planning.

5.33 A large steel gas pipeline crosses or runs parallel to the proposed alignments on route segments K and P requiring protection against stray traction leakage currents. In addition to the main utilities noted above, there will be a multiplicity of local water, gas, electrical and telecommunications plant in the streets that will require diversion. Early planning will be required for these diversions to minimise costs and disruption to the services and the construction programme.

Interchanges

5.34 In addition to provision of rail-Metro interchange with the Maynooth line at Porterstown or Clonsilla, and with the Kildare Line at Fonthill Road, suitable interchange facilities with buses and LUAS are required. Meetings were held with the two principal bus operators in the Stage 2 study area, and a range of locations considered for potential interchanges relative to emerging proposed metro alignments and the bus network.

5.35 Bus Eireann in particular were supportive of the principle of providing an interchange facility, which permitted passengers to benefit from the opportunities for travel presented by the proposed Metro, and avoid the need to travel to the City centre.

5.36 Both operators are keen for an interchange facility to be located in the Tallaght Town Centre area. There is no consensus to an exact location at present, but clearly it should

be in an accessible location integrated with a range of other facilities and with links to/from surrounding generators of demand.

5.37 Bus Eireann and Dublin Bus are also keen for an interchange facility to be located in the Liffey Valley development, again conveniently located to integrate bus services with the Metro services and the major generators of demand. Bus Eireann have advised that the N4 represents one of their busiest routes in the country, linking Galway and a number of other destinations with Dublin.

5.38 Areas in Clondalkin and Lucan were also considered. However, the view of Bus Eireann was that these areas were constrained by the capacity of the existing road network, that they were located too far from the radial routes on the N4 and N7 currently and would therefore not be attractive as potential interchange locations. Although Dublin Bus currently operates an extensive network of services in the Clondalkin and Lucan areas shown on Fig. 2.1, significant improvements to the current road network would be required to make these areas attractive to Bus Eireann services.

Rolling Stock Requirements

5.39 Although not required by the brief, we have carried out a broad assessment of the rolling stock requirement attributable to the section of the western orbital route between Porterstown and Tallaght on a similar basis as for Phase 1. The options considered above are estimated to involve a peak vehicle requirement in the region of 8-10 trains, assuming the same five-minute peak headway. This is equivalent to approximately 36-44 cars allowing for 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.

5.40 Outline construction costs are discussed in Chapter 6.

Catchment Analysis

5.41 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. As for Phase 1, it is not possible to forecast the

absolute levels of patronage on the Metro in the absence of a detailed demand forecasting model, and we have therefore carried out a comparative analysis of population and employment within the catchment area of stations along each of the alignments.

5.42 The methodology for calculating residential catchment is similar for phases 1 and 2. It is based on the analysis carried out by both Fingal and South Dublin County Councils to ascertain the existing numbers of dwellings already built, those with outstanding planning permission and identification of any additional areas for potential infill development. A factor for average household size was applied to the number of dwellings in each category to estimate total population.

5.43 In the absence of employment data from SDCC, however, the basis of calculating employment catchment differs from the methodology adopted in Phase 1. The Phase 1 methodology involved calculating the gross floor area that could be developed from the total zoned area and applying factors for number of employees per sq metre. In Phase 2 the methodology was slightly different in that SDCC factors for numbers of employees per hectare were applied to the total zoned areas. Whilst the method is robust for the purpose of comparing alignments in the Phase 2 study area, the numbers are not directly comparable with those developed in Phase 1.

5.44 The immediate job and population catchments (at 2016) within 500m and 800m of stations on the alternative alignments are given in Table 5.1 below.

5.45 Table 5.1: Catchment Analysis – Phase 2 Study Area

Option	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**2/8**
Route	**10JNRU**	**10JNRV**	**10JNTU**	**10JNTV**	**10JOQU**	**10JOQV**	**10JORU**	**10JORV**
Population 500m	29000	33600	31100	35600	28300	32900	31300	35900
800m	74700	80900	77700	83900	63800	70000	73900	80100
Employment 500m	16900	17100	16300	16500	18500	18700	16900	17100
800m	33800	31200	30700	28100	33600	31000	32200	29600

Option	**2/9**	**2/10**	**2/11**	**2/12**	**2/13**	**2/14**	**2/15**	**2/16**
Route	**10JOTU**	**10JOTV**	**10KOQU**	**10KOQV**	**10KORU**	**10KORV**	**10KOTU**	**10KOTV**

Population 500m	33400	37900	24700	29200	27700	32200	29700	34300
800m	76900	83100	57600	63800	67800	73900	70700	76900
Employment 500m	16300	16500	12900	13100	11200	11400	10700	10900
800m	29100	26500	27600	25000	26200	23600	23100	20500

Option	**2/17**	**2/18**	**2/19**	**2/20**	**2/21**	**2/22**	**2/23**	**2/24**
Route	**11LPRU**	**11LPRV**	**11LPTU**	**11LPTV**	**11MPRU**	**11MPRV**	**11MPTU**	**11MPTV**
Population 500m	30000	34600	32100	36600	34400	38900	36500	41000
800m	73500	79700	76500	82700	78800	85000	81800	88000
Employment 500m	11400	11600	10800	11000	11400	11600	10800	11000
800m	25700	23100	22600	20000	25700	23100	22600	20000

Residential Catchment Analysis

5.46 A high level analysis of Table 5.1 shows that routes via Liffey Valley Centre (Route 10) or via Lucan (Route 11) serve broadly similar populations.

5.47 For Route 10, alignments via Liffey Valley Centre (Route J) have generally larger catchment populations of residents than alignments via the more direct central Liffey route K (about 6,200 additional people within an 800-metre catchment area of stations). In Lucan, the more westerly alignment (Route M) serves around 5,300 more people than the more easterly route L.

5.48 Within Ronanstown, there is little to choose between alignments running via Fonthill Road (Route O) and Neilstown Road (Route N) although the 800-metre catchment population of Neilstown Road is slightly higher.

5.49 In Clondalkin, of the two surface alignments, the more westerly following Fonthill Road (route T) has a larger catchment population than the more easterly via Moyle Park (route R), serving about 3,000 additional people living within 800 metres of a station. The greater penetration afforded to Central Clondalkin via the tunnelled alignment (Route Q) does not increase the residential catchment compared with the surface routes, indeed the 800-metre residential catchment for the tunnelled route

appears to be significantly lower (in the order of up to 5000) than for either of the surface routes.

5.50 In Tallaght, the more westerly alignment (Route V) via Cookstown Way (as currently proposed for LUAS) serves a significantly larger number of residents (6,200 more) than by following Belgard Road to Tallaght Centre (Route U).

5.51 Overall, Option 2/24 (Route 11MPTV) running via West Lucan, Griffeen Park, West Clondalkin, Belgard Road and Cookstown Road performs best in terms of population catchment with roundly 88,000 people living within an 800m. radius of stations.

Employment Catchment Analysis

5.52 In terms of employment a rather different picture emerges with the more easterly alignments via Liffey Valley Centre performing generally significantly better than more central or western routes.

5.53 Within Ronanstown, routes via Neilstown Road (Route N) serve employment locations better than otherwise similar alignments running via Fonthill Road (Route O), with around 1,600 additional jobs being within 800 metres of Neilstown Road than via Fonthill Road. In Clondalkin, the Moyle Park alignment (Route R) serves rather more (3,100) potential employees than the westerly alignment (Route T). The employment catchment for the tunnelled alignment through Central Clondalkin (Route Q) is slightly higher than for Route R via Moyle Park (about 1400 additional jobs within 800 metres of stations) and rather significantly higher than for the more westerly route round Clondalkin (Route T) (about 4500 more jobs within 800 metres).

5.54 In Tallaght, a rather different picture emerges compared with the residential catchment analysis, with Belgard Road (Route U) serving significantly more (2,600) employees than routes running to Tallaght Centre via Cookstown Road (Route V).

5.55 Overall a route serving Liffey Valley Centre, Ronanstown (Neilstown Road), west Clondalkin (Moyle Park) and Belgard Road to Tallaght Centre performs best in terms of employment catchment served. Options 1 (Route JNRU) and 5 (Route JOQU) serve the highest number of employees overall.

Overview

5.56 In addition to jobs and population, the trip generating potential of the shopping centre at Liffey Valley Shopping Centre and of Tallaght Square need to be taken into account.

5.57 The net effect of starting the Eastern routes at Clonsilla instead of Porterstown is to reduce the residential catchment population within 800 metres of stations by approximately 6,800 people. This would involve construction of approximately 1 km of infrastructure at additional capital cost, and require additional operating resources due to increased distance. Hence there seems little point in considering this further unless it is decided that Phase 1 alignments should start at Clonsilla rather than at Porterstown, e.g. to form a logical alignment towards Castaheany.

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

5.59 While contributing to the overall assessment, however, the broad demand characteristics set out above are not, in themselves, conclusive. This is because:

- From a demand perspective, alternative alignments will also need to be assessed in the context of city-wide objectives and priorities;
- Work has been undertaken very recently using the DTO model, modified such that it is capable of representing travel demand at a more disaggregate level locally. This in turn enables demand for the Metro system to be assessed on the basis of a close representation of the generalised costs of the alternative modes available to meet travel demands. The results of that analysis have already been outlined in Chapter 4.

6. CAPITAL COSTS

Scope

6.1 The approach adopted to costing, and the underlying assumptions, have been similar to those adopted for Phase 1. 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.

6.2 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.

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

- Track works – 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 Liffey 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 – five generic station types have been considered. These include simple station halts at either high or low level (at grade), identical to those considered in the Phase 1 study, as well as new station types for high level modal interchange, underground modal interchange and non-modal underground stations. These at-grade "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 in addition to the facilities provide for the at-grade stations. The high level multi modal station will have three additional escalators, two additional lifts and a footbridge over and above the facilities provided for the simpler high level station. The underground station costs have been based upon the costs for comparable stations on other metro systems. In a similar approach to the high level modal interchange stations, the underground modal interchange stations are broadly similar to those for the non-modal interchange stations except for the addition of further escalators and lifts. Indicative costs for station buildings have been included. From these unit rates, it is then possible to assess indicative costs from the defined requirements.

- Tunnels – Where the route of the Metro is shown on the alignment as under ground we have used unit rates for shield TBM bored tunnels, and a number of assumptions have been made to determine an indicative cost. These include the following:

  - A single machine will cut both of the twin (single track) bores
  - Cross passages will be constructed at 500m intervals
  - Combined vent/access shafts at 1500m intervals
  - No railway crossovers have been assumed throughout the tunnels.

Qualifications and assumptions

6.4 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.

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

6.6 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

6.7 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

6.8 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.

6.9 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.

6.10 No allowance has been made for a multi-modal interchange at Porterstown or Clonsilla.

6.11 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.

6.12 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

6.13 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.

6.14 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. The costs in respect of the underground stations and tunnels envisage that tunnelling will be through lime stone rock and sufficiently deep that alluvial deposits can be avoided. No allowance has been made in respect of the additional works that would be required if alluvium were to be encountered.

Exclusions

6.15 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 1Q 2001 (price base not updated in order to maintain consistency with phase 1 works

Specific Items

- Diversion of major utilities or services (allowance has been made for minor diversion works)
- Abnormal foundations and obstructions that may arise following a detailed site and ground exploration survey.

- Contingency / Risk allowances have been excluded

6.16 Land Acquisition costs have been based on unit rates provided by LRPO, and have currently been included for the tunnel sections. RPA advice will be sought to clarify this assumption.

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

6.18 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]
Tunnelling costs		
Per metre of twin-track tunnel		[text deleted]
Ramps		
Per metre of twin-track section (including track works)		[text deleted]
Bridges – Standard		
40 – 1940 metre span	Over twin tracked bridge sections (including t rack works)	[text deleted]
Bridges - Signature		
300 – 490 metre span	Extra Over - on Bridge/Track/Tunnelled Costs	[text deleted]
Stations		
At Grade		[text deleted]
High Level		[text deleted]
High level modal interchange		[text deleted]
Underground		
Underground modal interchange (see para. 6.3)		[text deleted]

[text deleted] deleted]

6.19 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 A.

6.20 Our costing include an allowance for minor utility diversion works only. Major utility diversions w ould ne ed t o be t he s ubject of more de tailed a ssessment, a nd no allowance is made in our costing for such major diversions.

6.21 At RPA's request, we have made further additions to reflect:

- Rolling stock 'attributable' to study area (partly dependent on alignment choice, and a function of route length, maximum line speed etc.)
- 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.)

6.22 On this basis, the total costs including the above global allowances are also shown in Table 6.2:

Table 6.2: Summary of Total Capital Costs

Option	Reference	Route distance (km)	Number of Stations (see key below)					Cost € millions (rounded) including stations			
			AG	HL	HLI U	G	UGI	Construction	Total costs including client costs, rolling stock, VAT etc. Central L	ow (-10%)	High (+40%)
2/1	10JNRU 12.8		1	9	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/2	10 JNRV	13.6	3	6	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/3	10JNTU 12.7		3	7	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/4	10JNTV 13.5		5	4	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/5	10JOQU 12.8		1	6	1	1	2	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/6	10JOQV 13.5		3	3	1	2	2	[text deleted]	[text deleted]	[text deleted	[text deleted]
2/7	10JORU 13.1		1	9	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/8	10JORV 13.9		3	6	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/9	10JOTU 13.0		3	7	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/10	10JOTV 13.8		5	4	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/11	10KOQU 12.2		1	4	1	1	2	[text deleted]	[text deleted]	[text deleted]	[text deleted]

Option R	eference	Route distance (km)	Number of Stations (see key below)					Cost € millions (rounded) including stations			
									Total costs including client costs, rolling stock, VAT etc.		
			AG	HL H	LI	UG	UGI	Construction	Central	Low (-10%)	High (+40%)
2/12	10KOQV 13.0		3	1	1	2	2	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/13	10KORU 12.5		1	7	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/14	10KORV 13.3		3	4	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/15	10KOTU 12.4		3	5	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/16	10KOTV 13.2		5	2	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/17	10LPRU 13.3		2	7	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/18	10LPRV 14.0		4	4	2	2	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/19	10LPTU 13.2		4	5	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/20	10LPTV 13.9		6	2	2	2	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/21	10MPRU 14.3		2	9	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/22	10MPRV 15.0		4	6	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/23	10MPTU 14.2		4	7	2	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/24	10MPTV 14.9		6	4	2	1	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/25	11 - 10	1.0	0	0	0	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/26	VW 4.8		4	1	0	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2/27	VX 5.5		3	2	0	0	0	[text deleted]	[text deleted]	[text deleted]	[text deleted]

AG = at-grade HL = high level HL = high level interchange UG= underground
UGI = underground interchange

7. CITYWEST

Introduction

7.1 During the course of Phase 2, LRPO requested the consultants to examine the opportunities for an extension of the Metro to Citywest, located to the west of Tallaght. It was agreed with LRPO that, for ease of presentation, Citywest options would not be integrated into the main schemes. Accordingly, this chapter sets out a free-standing review of alternative alignments to Citywest, and associated costs and impacts.

South Dublin County Development Plan 1998

7.2 The Citywest Business Park is located in south west Dublin, north east of the built-up areas of Saggart and Fortunestown.

7.3 The Citywest Business Park is zoned Objective E 'To provide for industrial and related uses' in the development plan zoning maps. A stretch of land located to the north east of Citywest Bridge is designated Objective LC 'To protect, provide for and/or improve Local Centre Facilities'. This stretch of land is located within the expanse of that area zoned objective E. Land located to the south west of Citywest business park is zoned GB 'To preserve a "Green Belt" between development areas'. Land located within the Fortunestown area has been zoned Objective A1 'To provide for new Residential Communities in accordance with approved Action Area Plans'.

7.4 There are a number of specific local objectives within the study area, including:

- Providing for the extension of LUAS to Citywest
- Providing that any development in the Kingswood village be structurally and aesthetically to the highest standard and that local centre uses are appropriate in the village area
- Facilitating the early provision of a road link from the Brownsbarn interchange through the Citywest Business Campus to Kingswood Village.

Local Planning Issues

7.5 The Citywest Business Park is located to the northeast of Saggart in South County Dublin. There has been extensive industrial and residential development in this area over recent years.

7.6 Planning applications in this area chiefly relate to industrial development and residential development. Gross floor area for planning applications granted for industrial development and related uses totals 83,527 sq. m. These applications have been granted but the schemes to which they relate have not yet been fully implemented.

7.7 There are currently 4000 employees working in Citywest. The target employment is 8000, which will be reached over the next 5 to 10 years. Planning applications for residential development totals 1004 dwellings. These are located within the Fortunestown area, and have similarly not yet been fully implemented.

7.8 Route alignments 'W' and 'X' (described below) do not impact on any residential or industrial development in the study area. There are two areas of land designated for potential residential development as per the Dwelling Survey undertaken by South Dublin County Council. This survey identifies land allocated for future residential development, not necessarily within the scope of the current development plan. These areas are located north of Blessington Road and south of alignment 'X'. They would be served by station no's. 82 and 84.

Route Descriptions

7.9 The Citywest extension options connect into route segment V with a delta junction giving access both northwards and to Tallaght. Whether the chords to Citywest are single or double lines will depend on the service requirements. If only single line chords are required, there will be a need for follow-on crossovers clear of the single turnout junctions. If double line chords are required, the junctions will be traditional double junctions, either with diamond crossings or turnouts and crossovers.

7.10 Route segment W diverges from route segment V at the north end of Cookstown Way and proceeds directly to Citywest just south of the quarry and north of the Cookstown area.

7.11 Route segment X diverges from route segment V just to the north of Tallaght Hospital on Cookstown Way and follows the Cookstown Road and Fortunestown Way to Citywest.

7.12 The options are defined as follows:

Option 2/26 VW

Option 2/27 VX

7.13 The proposed route alignments are illustrated in the plan attached as Fig.7.1.

Definition of how best to serve Citywest operationally was outside the scope of the study, and has consequently not been addressed at this stage.

7.14 Route Descriptions

W: Citywest direct

7.15 This line diverges from route segment V at the north end of Cookstown Way and Belgard Heights. The north chord diverges westwards and rises up to bridge over Cookstown Way and Cookstown Road just south of the roundabout where they meet. This north chord can be used to access Tallaght via route segment U along Belgard Road using the south east chord between route segments V and U by Belgard Heights. The south chord diverges northwards from route segment V by the north west corner of Tallaght Hospital. The line rises up adjacent to Cookstown Way before curving westwards and bridging over that road and Cookstown Road, and then junctions with the north chord on the viaduct before descending to grade.

7.16 The line continues at grade in a west south west direction towards Citywest with stations near the north part of Fettercairn Road and on the St Aidan's Halting Site by Kilmartin Drive at the north end of Cheeverstown Road. The line then rises to bridge over Citywest Road with Citywest Station on the east side of the road, near Fortunestown and south of the business park before descending to grade, and

N

KEY

- M50
- OTHER ROADS
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED STATION
- K ROUTE SECTIONS
- 51 STATION IDENTIFIERS

Gníomhaireacht Um Fháil Iarnród
Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 8.1

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

Project: DUBLIN METRO STUDY

Title: CITY WEST ROUTE OPTIONS

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 8.1

Rev

continues westwards along the south side of the current business park development with a station located at the south west corner. Finally, the route curves northwards terminating at a station located adjacent to Garter Lane near the Naas Road (N7). This station serves future developments on the west side of Citywest and existing developments north of Naas Road, accessed via Garter Lane.

Environmental Constraints

7.17 Route W is a continuation of Route V, and runs between Newlands quarry, (North) and Fettercairn Road (South) in a straight south westerly direction towards the upper part of Citywest Road. This route then passes through a future road corridor, described in South Dublin Development Plan (1998) as a Five Year Road Proposal.

7.18 Newlands Quarry may impose geotechnical constraints on the alignment such as the potential risk of unstable ground conditions. There are no existing roads along this section; therefore it is assumed that the alignment will be at grade. Residents on the Fettercairn Road would be sensitive to noise and visual intrusion during the construction and operational phases of the Metro.

7.19 West of Newlands Quarry the Metro passes through land zoned as industrial. Additionally, the line travels close to land zoned for future residential development. At present this land is grassland with no ecologically sensitive areas.

7.20 The Metro passes over a small stream between Fortunestown and east of Citywest Road. The Metro will cut across the stream at two points. The construction phase will have an impact on the water quality of the stream and mitigation measures to prevent pollution of the water course will be required. There are no protected trees or listed buildings in close proximity to this proposed route and the overall environmental impact will be minimal.

X: Citywest via Cookstown Road and Fortunestown Way.

7.21 The line diverges from route segment V between Second Avenue and the north end of Tallaght Hospital. As the location for the divergence is constrained, it is expected that route segment V will need to be raised onto viaduct to facilitate the junctions.

Accordingly the line will be on viaduct between the north end of the station by Tallaght Hospital and the curve between Belgard Heights and Second Avenue.

7.22 The north chord diverges above Second Avenue and bridges over Cookstown Way onto an area of open land. The south chord diverges near the north west corner of Tallaght Hospital bridging over Cookstown Way and junctioning with the north chord on viaduct.

7.23 The line continues on viaduct curving southwards towards, and bridging over, Cookstown Road at a skew passing by the south of the Glenanne Park sports stadium, descending to grade on the sports ground with a station by the Community and Shopping Centre near the Whitebrook Park estate. The line then rises up to bridge over Cheeverstown Road and continues on viaduct bridging over the junction of Fortunestown Way and Glenshane Drive, along the south side of Fortunestown Way, then descending to grade after Sundale Green. A station is proposed adjacent to the shopping and community centre by Sundale Park. This section could be at grade with alterations to the road access to the Sundale Estate and Shopping Centre. However it would then create distinct severance issues.

7.24 The line continues at grade to Fortunestown where it rises up to bridge over Fortunestown Lane curving northwest towards Citywest. It then crosses Citywest Road with a station on the bridge over the road before descending to grade and curving westwards to join the route W alignment before the station on the south west corner of the Business Park.

Environmental Constraints

7.25 Route X is a continuation of Route V. This route passes through a sports ground north of Birchwood Close before reaching Cookstown Road. The route would then follow Cookstown Road until Glenanne Park (GAA Grounds). Route X would cut across this high amenity area resulting in land severance and disruption to the use of the sports facility.

7.26 This route would then pass through a future road corridor close to two schools, a community centre and residential area (Lanndale Lawns) and link up with Cookstown

Road. This residential community will be sensitive to the impacts of the Metro during the construction and operational phases, in particular noise and visual intrusion.

7.27 In total there are five schools within the greater area and all would be impacted upon either directly or indirectly from Route X. These impacts would depend on proximity to the Metro line. The line continues in a southwesterly direction through sports grounds before reaching Cheeverstown Road. This would involve further land severance to local schools and associated impacts such as dust, noise and visual intrusion during the construction phase.

7.28 The route of the Metro will then pass over Cheeverstown Road resulting in visual impacts from the elevated structure for residents of Whitebrook Park and Rossfield Park.

7.29 Route X travels directly through the middle of the sports ground between Cheeverstown Road and Fortunestown Way. This would involve land-take from community schools, which would impact upon facilities for the local community. Noise and visual impacts would also result in this residential area.

7.30 The Metro route would then follow Fortunestown Way adjacent to Swiftbrook residential area, a school and shopping complex before reaching Citywest Road. There is one listed building (List 2) within the vicinity of Route X. A section of recreational land would be disrupted for this section of the route although there are no areas of ecological protection. Overall environmental impact will be moderate due to the disruption to community facilities such as schools and to residential properties in close proximity to the alignment.

Implications for Utilities

Electricity

7.31 Route segment W follows the alignment of the power lines to Citywest for a length in the order of 2½ km beyond the junction with route segment V. There could be significant interference issues between the power lines and the metro system over a significant length. The line passes to the south of a sub-station at Citywest. Any constraints on this alignment will need to be discussed with the Electricity Board.

These issues require further investigation and may result in the need to divert the power lines or place them underground adjacent to the railway.

Water Mains

7.32 Route segment W to Citywest crosses obliquely and then runs parallel to two 1200 mm diameter mains for a length of 1.5 km between Cookstown Road and Fortunestown. Route segment X crosses obliquely a 21 inch diameter main where it crosses Cookstown Road and a 600 mm diameter main where it crosses Cheeverstown Road. Further west the alignment crosses 24 in and 27 in mains where they cross Fortunestown Road and a 1200 mm main where it crosses Citywest Road. In all cases for route segment X the metro alignment is elevated at these crossings and so there should be minimal effects provided the piers of the viaduct are designed to avoid the mains.

Foul Sewers

7.33 Route segment W to Citywest crosses a 1050 mm and a 1350mm surface water drain between Cheverstown Road and Fettercairn Road, and a 450 mm and a 525 mm surface water drain by Citywest Road. Route segment X crosses a 750 mm diameter foul sewer where it crosses Cookstown Road and a 300mm diameter sewer alongside Fortunestown Road. Route segment X also crosses two 525 mm diameter surface water drains near Cookstown Way and crosses a 600 mm and 750mm diameter drain by Cheeverstown Road and the adjacent open land. In all cases for route segment X the metro alignment is elevated at these crossings and so there should be minimal effects provided the piers of the viaduct are designed to avoid the sewers.

Gas Mains

7.34 The 70 Bar Gas Main from the Porterstown area, noted in 5.24 - 5.26 above, terminates in the vicinity of Citywest, north of the proposed branch alignments. However, if it is continued further southwards, it may cross one of the proposed alignments.

Developments Served

7.35 Routes W and X would serve the following developments:

Route	W	X
Belgard Green	•	•
Cairn Wood	•	•
Fettercairn Road	•	
Cookstown Road		•
Fortunestown	•	•
Citywest Business Park	•	•

Catchment Analysis

7.36 The two route options for Citywest (routes W and X) have been compared in terms of residential and employment catchments served. The methodology adopted for assessing the catchment populations is the same as that adopted for the 'main' routes as described in Chapter 5.

7.37 Table 7.1 below compares the residential and employment catchments of the five stations on each of the two routes:

Table 7.1 Comparison of Catchment Populations of Citywest Metro Routes W and X

Option	2/26	2/27
Route Description	**W**	**X**
Residential catchment (500m)	8200	14000
Residential catchment (800m)	16500	27400
Employment catchment (500m)	10900	8600
Employment catchment (800m)	25800	23600

N.B. Route W includes station numbers 80, 81, 82, 86, 87
Route X includes station numbers 83, 84, 85, 86, 87.

7.38 This shows that route X would serve a significantly higher number of residents than Route W. Route W, however, has a slightly higher 800-metre employment catchment than route X.

Capital Costs

7.39 The capital cost of the two route options is summarised in Table 7.2 below; the scope of the cost estimates, assumptions, exclusions and caveats are as set out for the 'main' routes in Chapter 6. Full details can be found in **Appendix A.**

7.40 Assuming Citywest was linked to the rest of the metro network by a self-contained shuttle between Cookstown Road/Cookstown Way and the Citywest terminus, an extra 4-5 trains would be required for service, with an average end-to-end speed of around 34 kph between terminals (including station dwell times). We would however assume that, in practice, Citywest would be served by extension of an existing service in order to minimise the need for interchange and also to minimise operating costs (short shuttle services can be disproportionately expensive in terms of manpower and vehicle resources due to the relatively high proportion of time spent at terminals).

Table 7.2: Summary of Capital Costs – City West

Route	**W**	**X**
Route Length	4.8 km	5.5 km
	Costs (€ millions)	
Civil Engineering Costs	[text deleted]	[text deleted]
Electrical and Mechanical	[text deleted]	[text deleted]
Stations	[text deleted]	[text deleted]
Sub-To	[text deleted]	[text deleted]
Rolling Stock [text deleted] [text deleted]		
Sub-T	[text deleted]	[text deleted]
Contingency Allowance	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]
Allowance for Client Costs	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]
VAT on Rolling Stock	[text deleted]	[text deleted]
VAT on all remaining costs	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]
Allowance for Property Cos	[text deleted]	[text deleted]
Total	[text deleted]	[text deleted]
Likely cost range	**[text deleted]**	**[text deleted]**
	[text deleted]	**[text deleted]**

8. ADAMSTOWN

Introduction

8.1 Following a meeting with South Dublin County Council during the latter stages of Phase 2, LRPO requested the consultants to examine the opportunities for alternative more westerly alignments for the Metro to serve the Adamstown area of South Dublin. Adamstown, located between west Lucan and the railway line, is currently undeveloped, but is earmarked for major new development in the South Dublin Development Plan.

8.2 It was agreed with RPA that, for ease of presentation, Adamstown options would not be integrated into the main schemes for the purposes of reporting. As for Citywest, therefore, this chapter sets out a free-standing review of alternative alignments through Adamstown, together with an assessment of associated costs and impacts. The results are drawn together in the evaluation in Chapter 9 for the purposes of comparing routes along the main corridors.

Strategic Planning Issues

8.3 The Strategic Planning Guidelines for the Greater Dublin Area contain a specific strategy for the development of the Metropolitan area. There are three basic aims: to consolidate development; increase overall densities of development; and facilitate the provision of an enhanced public transport system.

8.4 It is considered that over time these aims will deliver a more compact urban form which reduce overall growth in demand for travel, in conjunction with the measures contained within the DTO Strategy "Platform for Change"

8.5 More specifically the Strategic Planning Guidelines refer to the need for consolidation of development in the Lucan/Clondalkin area and the development of a limited number of new areas contiguous to public transport. The Lucan/Clondalkin area is identified as a major centre for growth.

South Dublin County Development Plan 1998

8.6 The Development Plan includes some 222 hectares of land at Adamstown which is zoned "to provide for new residential areas in accordance with approved action area plans". It should also be noted that this area is covered by a specific local objective "to promote the provision of a railway station together with park and ride facilities (Adamstown)".

8.7 In the Lucan/Clondalkin area the development policy contained within the Plan seeks to encourage higher residential densities, particularly in proximity to public transport routes, and ensure that business and services with a high potential for public transport utilisation are sited in locations which are easily accessible by existing or future public transport.

8.8 In the Greater Lucan area there has been significant population growth in the period 1996 – 2000. In 1996 the population of the Greater Lucan area was 20,200; this increased to 29,500 in 2000 – a rise of approximately 50%. However, residential density in the Greater Lucan area has remained low. The area contains typical residential developments that are low in density, suburban in character and layouts that are not conducive to good accessibility to public transport. It is estimated that current residential density in the Greater Lucan area is approximately 15 dwellings per hectare (six dwellings per acre).

8.9 The Development Plan promotes sustainable development objectives including the need for mixed use developments to reduce the need to travel to access local goods and services, balanced development linking numbers of homes to numbers of jobs and a range of facilities, a more compact urban form, and increased use of public transport.

Adamstown Local Area Plan 2001

8.10 This Plan which was prepared by South Dublin County Council sets the framework for the future development of the Adamstown area which has a target population of approx. 20,000 people. The Plan identifies the nature and extent of buildings and uses that may be permitted, the amenities and facilities required and the services and infrastructure necessary to serve the development.

8.11 The proposals for Adamstown as set out in this Plan centre on the provision of a transport interchange on the Kildare line. Development is then proposed at a number of different density levels in a broad series of concentric zones centred on this transport interchange. The development is proposed to the north of the railway line, giving the proposed development a semicircular form with the transport interchange at the centre of the southern boundary defined by the railway line. To the north and east the development merges with the existing built-up area of greater Lucan.

Local Planning Objectives

8.12 Following a review of the planning register at South Dublin County Council offices, the following are the most significant planning applications located in the vicinity of the study area. These are highlighted on the supporting plan of planning and environmental constraints and are detailed as follows.

8.13 There have been two planning applications made for large-scale residential development within this area. The most recent of these was granted in December 2001 for 292 dwellings including a creche, car-parking facilities etc. This site is located between R120 and Haydens Lane, directly north of the railway line. The second application for residential development was granted in 1997 for 767 dwellings, located between the railway line and the Grand Canal in the vicinity of Griffeen Valley Park. This application has not been developed to date.

8.14 A planning application was granted for a Biotechnology Plant north of the Nangor Road and South of the Grand Canal. All other applications chiefly relate to extensions/alterations to existing developments.

8.15 An application was granted for the erection of a new GAA centre at Lucan-Sarsfield Football Club. This is located east of the R120 and directly north of the Grand Canal.

8.16 It should be noted that Alignment AI as described below cuts across the site for the proposed new GAA club at Lucan-Sarsfield. None of the other alignments impose on any of the applications described above.

Development of Alignment Options

8.17 The Adamstown study area can be divided broadly into seven sub-areas for the purpose of describing route alignments:

River Liffey crossing to Adamstown via:

- The Superquinn Centre on the Newcastle Road
- Dodsboro Road past the Tesco Store
- Celbridge Road and Tubber Lane Road

From Adamstown to a new industrial area near Nangor

Alternative route from Esker Meadows via Kishoge to Nangor

From Nangor to

- North Clondalkin on the Fonthill Road
- Citywest

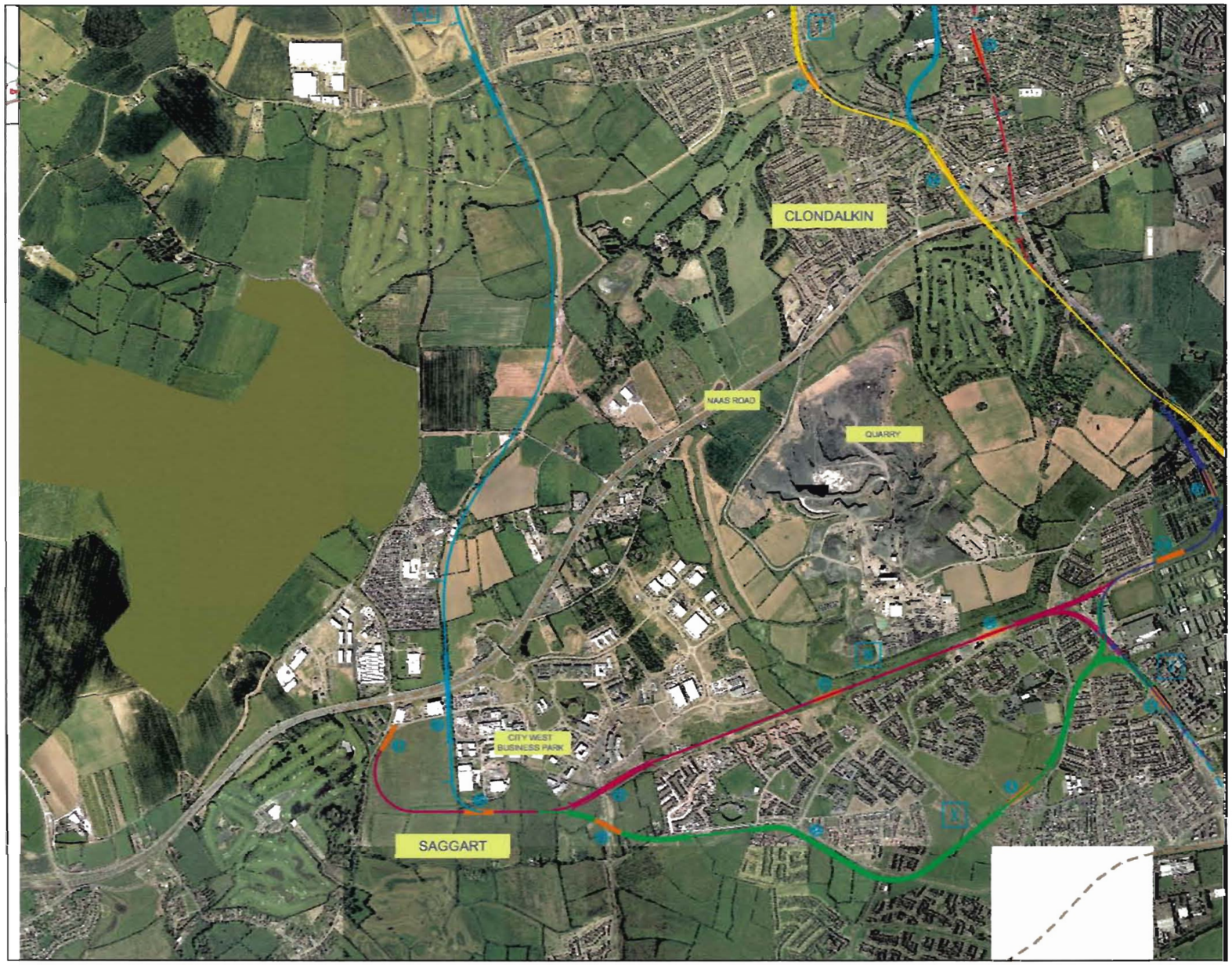
8.18 Taken together, some 11 combinations of alignments through these areas have been identified for the purposes of costing and evaluation. The route alignments are described below, including a commentary on the environmental impacts, and are illustrated in Fig. 8.1

River Liffey to Nangor via Adamstown and Grand Canal

Route Segment AA takes the line from route segment 11L over the River Liffey and under The Old Hill to Sarsfield Park where it links into segments AB, AC and AD.

Route Segment AD continues westwards through the centre of Lucan along the north side of the Lucan Road.

Route Segment AE is an alternative start point from route segment 11M under the River Liffey and the N4 to link into segment AG by the Celbridge Road and Lucal Golf Course.



N

KEY

- M50
- OTHER ROADS
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- ROUTE OPTION
- PROPOSED STATION
- K ROUTE SECTIONS
- 51 STATION IDENTIFIERS

Gníomhaireacht Um Fháil Iarnród
Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 9.1-1

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Purpose of issue	Auth	Date	Rev	Description	By	Date	Chk'd	Auth

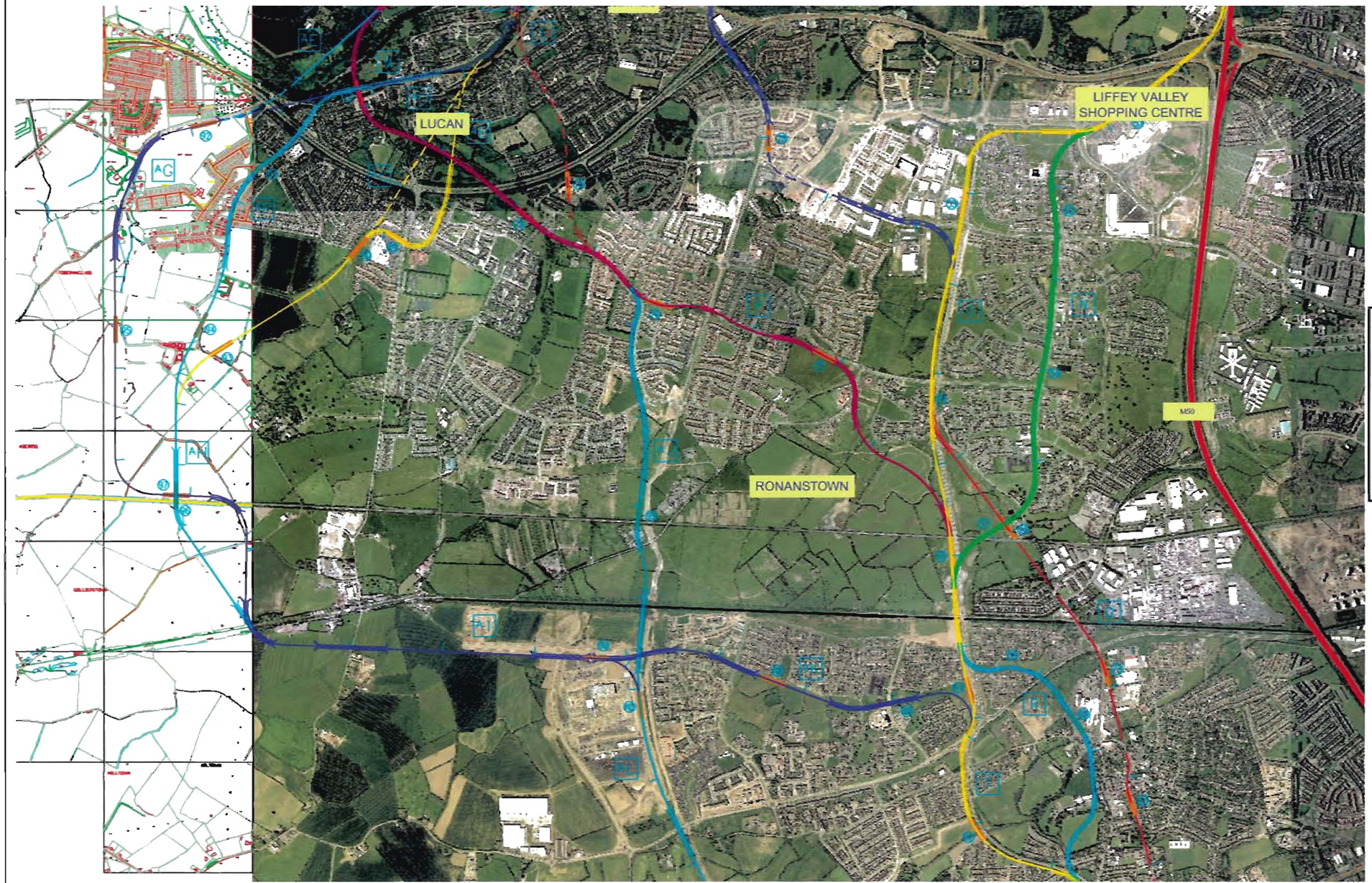
Project: DUBLIN METRO STUDY

Title: ADAMSTOWN
SHEET 1 OF 2

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 9.1

Rev



Gníomhaireacht Um Fháil Iarnród

Railway Procurement Agency

A3

AutoCAD File Ref. FIGURE 9.1-2

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Project: DUBLIN METRO STUDY

Title: ADAMSTOWN
SHEET 2 OF 2

Scale	Drawn	Checked	Authorised
NTS	CP		
	Date 19/03	Date	Date

Drawing Number: FIGURE 9.1

Rev

Three alignments have been developed for the Lucan to Adamstown area.

- Route segment AB uses the eastern corridor and serves the Superquinn Centre with a short tunnel to Vesey Park. Route segment AC uses an alternative route to the Superquinn Centre via a longer tunnel.
- Route segment AF follows the central corridor via the Dodsboro Road and also serves the Tesco Store.
- Route segments AG follows the western corridor via Tubbers Lane and passes the Lucan Golf Course.

From central Adamstown route segments AB, AC and AF combine and route segment AH and AG form an interchange with the Kildare railway line at a new station on the south side of the Adamstown development area. The route continues south-eastwards to the Grand Canal near the Lock Road bridge and then swing eastward as route segment AI to the new industrial area near Nangor.

Nangor to North Clondalkin(Fonthill Road)

Route segment AK continues eastwards through the residential areas north of the Nangor Road to the Fonthill Road where it joins route segment T

Nangor to the Citywest Business Campus

Route Segment AL swings southwards to the Citywest Business Campus crossing Nangor Road and along the route of a proposed new road to cross Naas Road and into Citywest connecting into route segment W.

Esker Meadows to Nangor via Kishoge

Route segment AJ is an alternative connection from south Lucan from route segment P via the Griffeen Road to Kishoge where there would be an interchange station with the Kildare railway line and then to the Nangor area

The options are defined as follows:

Option 2A/1 11L/A-ABHIK/TU

Option 2A/2 11L/A-ABHIL/WVU

Option 2A/3 11L/A-ACHIK/TU

Option 2A/4 11L/A-ACHIL/WVU

Option 2A/5 11L/A-ADFHIK/TU

Option 2A/6 11l/A-ADFHIL/WVU

Option 2A/7 11L/A-ADGIK/TU

Option 2A/8 11L/A-ADGIL/WVU

Option 2A/9 11M/A-EGIK/TU

Option 2A/10 11M/A-EGIL/WVU

Option 2A/11 11LP/A-JL/WVU (Kishoge)

Description of Routes

AA: River Liffey to Sarsfield Park

The line diverges from route segment L just to the south of Lower Lucan Road on viaduct and crosses the River Liffey ramping down to ground level for a station on the north side of The Old Hill. This station is close to two schools and near a third and would serve the residential areas on the eastern side of Lucan. The line would continue through a bridge under The Old Hill onto an area of green open land between Sarsfield Park and the Lucan Road.

Environmental Constraints

The Liffey Valley region has been zoned as Liffey Valley Special Area Amenity (SAAO) Order 1990 by the South Dublin Development Plan. Liffey Valley SAAO overlaps with Proposed Natural Heritage Area (NHA) (The NHA Sites are recognised for their Scientific Merits. Their statutory protection has not passed into law, but is currently at Green Paper Stage) and Objective G to protect and improve high amenity areas. All relevant authorities such as Fisheries Board, Dúchas (The Heritage Service) and Waterways Ireland will need to be contacted in relation to crossing the River Liffey due to its ecological sensitivity. There is one Preservation Listings 2 (Number 010) (Structures to be considered for preservation) within this study area. Other impacts include land take from Sarsfield Park, noise and visual

intrusion especially to local schools. This route would cut through three areas of protected and preserved trees and Woodlands.

AB Sarsfield Park to Central Adamstown via Superquinn Centre and Vesey Park

The line continues in tunnel under Lucan Road and Lucan Newlands Road emerging in Vesey Park. The line rises through Vesey Park onto a bridge over the N4 Lucan Bypass and on viaduct to the west of Cannonbrook Lawn and Cannonbrook Avenue and curves westwards over Esker Drive to the Superquinn Centre. An elevated station is proposed over the car park of the centre also serving a school, a college and several residential areas. The line curves south-westwards and descends to ground level towards the centre of the proposed Adamstown development areas where another station is proposed. The line through the proposed development area could be at a level to suit the road layout and landscaping to minimise intrusion and separation of the areas. This applies to all options through this area.

Environmental Constraints

Two Preservation Listings 2 (Number 055 & 059) (Structures to be considered for preservation) are within the study area. Vesey Park, which this route would pass through, has the following designations: - Objective G to protect and improve high amenity areas and seven areas of protected and preserved trees and woodlands. The route crossing of Griffeen River and tributary stream of River Liffey would require consultation with the relevant authorities i.e. Fisheries Board and Waterways Ireland. Topography in this area is steep in places, therefore short-term construction impacts will be great and may cause disruption to areas of protected trees within Vesey Park. South of the N4 the elevated structure will come in close proximity to residential areas (Esker Lawns, Beaumount Cottages and Cannon Brook), church and School between Newcastle Road and Lawn Avenue. These areas may suffer severance, noise and visual obstruction.

AC Sarsfield Park to Central Adamstown via Superquinn Centre and Tunnel

The line in this case is in tunnel straight to the Superquinn Centre avoiding Vesey Park and the length of viaduct by the Cannonbrook Estate. The line would surface adjacent to the west side of the Superquinn Centre behind Hillcrest Heights where at station would be located. The line would continue into Adamstown along the same route as segment AB.

Environmental Constraints

Construction of the northern portal of the tunnel may result in impacts to one preserved structure and nearby protected trees. Construction of the southern portal may result in disruption to the residential area around the shopping centre. Otherwise no impacts will result at the surface from the construction of the tunnel.

Adamstown Road at Vesey Park consists of steep to undulating topography with mature tree cover and enclosed by a wall. Hydrogeology within this area will require further investigation as the route intersects River Griffeen and a tributary of the River Liffey. Two Preservation Listings 2 (Numbers 061 & 053) (Structures to be considered for preservation) are within study area. Designations in this area include two areas of protected and preserved trees and woodland.

AD Sarsfield Park to Lucan Road (West, near junction with N4)

The line would rise up in Sarsfield Park to cross the town centre of Lucan to the north of the Lucan Road towards the grounds of Lucan House. This would require the demolition of several buildings around the Junction of Main Street and Lucan Road. A tunnelled alternative could be considered under Lucan Road, but requiring considerable disruption during construction. A station could be considered near the town centre area if shown to have sufficient demand, but being either elevated or underground, it would be costly. The line continues along the north side of the Lucan Road either on viaduct if linking into segment AF or falling to grade for segment AG.

Environmental Constraints

This route would involve the demolition of a church and graveyard on Lucan Road. The Metro would pass in close proximity to Lucan House. Part of this land would need to be acquired from the Italian embassy. This area also contains numerous Preservation Listing 2 namely 051, 052, 053 045, 058, three of which may be disrupted by the route. Designations in this area include two areas of protected and preserved trees and woodlands which may also be disrupted. This route is located in close proximity to Proposed National Heritage Area and Preserved Views. West of Lucan House this route passes Objective G (to protect and improve high amenity), protected woodland and runs parallel with the River Liffey.

The Metro in this area would substantially change the intimate and historic character of Lucan and have an unacceptable cultural and ecological impact.

AE Barnhill Cross Road to Lucan Road (West south of junction with N4)

This is an optional alignment diverging from route segment 11M near the bridge over Barnhill Cross Road and then falling across open land into tunnel under the River Liffey and onward under the Lucan Road and N4 Lucan Bypass. The line rises to ground level adjacent to the Celbridge Road in the grounds of the Lucan Golf Course and links into Route Segment AG.

Environmental Constraints

This route will pass through agricultural land, separated by mature tree hedgerows before descending into tunnel to pass under the River Liffey. Designations include a small area of Proposed Natural Heritage area, which will not be affected by tunnel. Preserved views, protected and preserved trees may be affected by the construction process. Tunnelling under the River Liffey would involve in-depth investigations into the hydrology and hydrogeology of the area to fully assess environmental impact to groundwater, surface water and ecology. This area also contains Preservation Listing 2 number 056. Impacts on residential areas may result from construction of the southern portal.

AF Lucan Road (West) to Central Adamstown via Dodsboro Road (Tesco)

The line swings south west on viaduct over the Lucan Road and the N4 Lucan Bypass and along Dodsboro Road adjacent to the Tesco supermarket. A station would be located near the junction of Dodsboro Road and Millstream Road serving the adjacent residential areas. The line continues southwards at grade towards the centre of the Adamstown development area with a station where it crosses Tandy's Lane.

Environmental Constraints

A viaduct over the N4 will produce visual intrusion and noise impacts for nearby residential areas and passing traffic.

The main designations within this area include two areas of protected and preserved trees & woodlands, one of which comes close to the proposed route. Future residential impacts include noise, severance and visual intrusion. North Dodsboro Road consists of wide road with embankments either side, which is predominately residential. South Dodsboro Road is much narrower and land use is predominately flat unused agricultural land separated by mature hedgerows. There are a few old farms located closely to route on the southern Dodsboro Road, which are surrounded by stone walls.

AG Lucan Road (West) to Grand Canal via Tubber Lane and Adamstown

The line descends into tunnel between the Lucan Road and the River Liffey heading south west under the Lucan Road and the N4 Lucan Bypass, emerging adjacent to the Celbridge Road in the grounds of the Lucan Golf Course. A station is proposed to serve the western side of Lucan just south of the tunnel portal.

The line continues at grade along the south side of Celbridge Road then bridges over Tubber Lane Road and curves southwards along the west side of this road. The alignment bridges over Tubber Lane Road and continues at grade southwards towards the Kildare railway line along the west side of the Adamstown development area with a station at a suitable location around the centre of this section. The route then curves eastwards at grade on the north side of the Kildare Line with an interchange station integrated with the proposed new station at Adamstown. The line rises and curves southwards bridging over the main line and continues at grade towards the Grand Canal.

Environmental Constraints

Visual intrusion and noise impacts will be severe when the Metro crosses Leixlip Road and Celbridge Road at grade. This route follows Celbridge Road and Tubber Lane Road, both of which separate Lucan Golf Course with hedgerows. The Metro will require land take from Lucan Golf Course. Future residential impacts include noise, severance and visual intrusion. The land use to the southern part of this study area is predominantly flat agricultural land.

AH Central Adamstown to Grand Canal

The routes for segments AB, AC & AF combine into segment AH at central Adamstown and continue southwards at grade towards the Kildare Line. The route rises to bridge over the

main line with an elevated interchange station over the site of the proposed station at Adamstown. The line descends and continues at grade south-eastwards towards the Grand Canal.

Environmental Constraints

There are no ecologically sensitive areas within this route north of Grand Canal. Future impacts on new residential areas from elevated structures will be low. Major impacts of the bridge crossing at Grand Canal include construction and visual intrusion. All relevant authorities, such as Dúchas (The Heritage Service) and Waterways Ireland, will need to be consulted. Currently this land is used for agriculture.

AI Grand Canal to Nangor Industrial Area

The routes for segments AG and AH combine into segment AI just north of the Grand Canal. The route rises to bridge over the Grand Canal ½ km west of the lock adjacent to Lock Road and curves eastwards before bridging this road. A station is proposed, located on the elevated section between the canal and the road if demand can be demonstrated. The alignment continues eastwards towards the Grange Industrial Estate, north of the Nangor Road bridging over side roads as required. A station is proposed on this segment within the industrial estate for options continuing eastwards onto segment AK.

Environmental Constraints

The Grand Canal has been designated a proposed Natural Heritage Area (NHA). This route will bridge over Grand Canal (The NHA Sites are recognised for their Scientific Merits. Their statutory protection has not passed into law, but is currently at Green Paper Stage). Despite being an artificial construction the Grand Canal's central channel has been colonised naturally by large numbers of animal and plant species, many of which are now extremely rare. Major impacts of the bridge crossing at Grand Canal include construction and visual intrusion. All relevant authorities, such as Dúchas (The Heritage Service) and Waterways Ireland, will need to be consulted. Work will need to be carried out in accordance with appropriate recommendations and guidelines. This area also contains three Preservation Listing 2 namely 081, 029, 082 all of which area close to proposed route but not directly on line. The remainder of this area is predominantly used for agriculture as the route follows the perimeter of the fields and no major severance will occur.

AJ Esker Meadows to Nangor Industrial Area via Griffeen Road

The line diverges from route segment P on viaduct south east of the junction between Griffeen Way and Road. The Line bridges over Griffeen Road and follows the west side thereof as it curves southwards to Griffeen Avenue. This section of line will severely affect the recently built housing on the west side of Griffeen Road, requiring demolition of many houses. If the alignment was located on the east side of the road a similar number of residences would be affected. Having crossed Griffeen Glen Drive the line continues southwards over Griffeen Avenue on viaduct over land that is currently not developed. The line descends to grade towards the Kildare Line which it crosses with an elevated interchange station on the site of the proposed new main line station at Kishoge. The line continues southwards, bridging over the Grand Canal and on viaduct over the industrial estate roads at Nangor.

Environmental Constraints

From Griffeen Road heading south, there will be some severe adverse impacts to residential areas including demolition, severance, noise disruption and visual obstruction. South of the existing residential area, impacts on future housing include visual obstruction, severance and noise impacts. The NHA at the Grand Canal crossing is the only ecologically sensitive area that will be affected by the proposed Metro route. All relevant authorities, such as Dúchas (The Heritage Service) and Waterways Ireland, will need to be consulted. Work will need to be carried out in accordance with appropriate recommendations and guidelines.

AK Nangor Industrial Area to Clondalkin (Fonthill Road)

The line bridges over estate roads and follows the alignment of a gap in development between the Kilcronan Estate and the Kilmahudrick Estate and bridging over the distributor road to the parklands south of Deansrath Park road. A Station is proposed at grade by the east end of the road Deansrath Park serving a considerable residential area and two schools. The line continues over the parklands to the south of Melrose Park road and Lindisfarne Grove before bridging over Lealand Road and the estate distributor road with an elevated station adjacent to Ashwood Road. The line descends to grade and curves southwards to join route segment T by the Fonthill Road near its junction with the Nangor Road

A very significant issue with this route is that it follows the route of elevated electrical power cables which would require relocation if it were to be adopted.

Environmental Constraints

This area contains One Preservation Listing 2, namely 086 which comes close to the route and may be disrupted. Two areas close to Lealand Road have protected and preserved trees and woodlands. This route would involve land take from school grounds and demolition of a church. This would have severe impact on users of these facilities, and other impacts including severance noise and visual obstruction. The same impacts would result to the residential properties to the immediate north of the proposed line.

AL Grange Industrial Area to City West

The line curves southwards along the west side of the Grange Industrial Estate north of the Nangor Road. A station is proposed at grade to serve the industrial estate and the west side of the residential area. The alignment continues southwards bridging over the Nangor Road and proceeds at grade along the west side of a proposed new road, crossing side roads as required. The route skirts the east side of the car distribution centre before bridging over the Naas Road into the Citywest Business Campus. An elevated station is proposed over an internal road and serving the expanding campus. The line descends and curves eastwards to join route segment W in the direction of Tallaght and Dublin City centre.

Environmental Constraints

In the northern section i.e. adjacent to the industrial area, no major impacts would result. However crossing the Nangor Road would cause visual intrusion and require landtake from the golf course. It must be noted that if the proposed metro route were aligned adjacent to the proposed 5-year road which links Nangor Road to Naas Road, environmental impacts on amenity and agriculture would be reduced. Crossing Naas Road would result in visual intrusion but no ecologically sensitive areas would be affected. This route would involve visual intrusion from bridging Nangor Road and severance to Kilcarbery Golf Course and Camac Valley Tourist Camping Park. The crossing of the Cammock River would involve consultation with the relevant authorities i.e. Fisheries Board and OPW. Land use around Baldonnell House consists of flat, good quality agricultural land, part of which would be severed by the proposed Metro.

Implications for Utilities

Electricity

8.19 Route Segments AG and AH both cross the line of EHT overhead power lines south of the Kildare line crossing. Route Segment AJ crosses two EHT overhead power lines, one by the Kildare railway line and the other by the Grand Canal. The height of these lines may need to be raised to ensure adequate clearance to the metro electrification equipment. Route segments AI and AK both run parallel to EHT overhead power lines for a total length of 3 km. As the power line share the same corridor that is available for the metro, these power lines would need to be diverted or placed underground. This may not be an economic solution and thus it may be concluded that these routes are not practical.

Water Mains

8.20 An elevated section of route segment AA crosses a water main by Lower Lucan Road. Route segments AB and AC both cross the line of a proposed water main that runs along Lucan Road near Sarsfield Park in Lucan. The metro is in tunnel for both segments. Route segments AG and AH cross a proposed 600 mm diameter delivery main adjacent to the Kildare railway line, both elevated at the point of crossing. Route

segment AG runs parallel to this main at grade for a length of 500 m, and some protection may be required along this section of route. Route segment AL crosses a proposed 700 m m main running along Nangor Road and another proposed main running along Naas Road. In both cases the metro is elevated and thus minimising any impact

Foul Sewers

8.21 An elevated section of route segment AA crosses a foul sewer adjacent to the river Liffey. Route segments AB and AC cross a 400 mm diameter rising main sewer under Vesey Park.

8.22 Both these routes also cross a 525 surface water drain running along the Lucan Bypass. AC is in tunnel and levels will need to be checked to ensure compatibility. An elevated section of route segment AJ crosses a 300 mm diameter foul sewer running along Griffeen Avenue and a 1500 mm diameter surface water drain slightly further north. The metro is elevated at these crossings thus minimising impacts. An elevated section of route segment crosses a 375 mm diameter surface water drain running along the Naas Road.

Gas

8.23 Part of route segments AJ and AL run parallel to a gas main. Where the proximity of the gas main is less than that required by the gas company, some finessing of the metro alignment may be required..

8.24 The routes through Adamstown would serve the following developments:

Option	**2A/1**	**2A/2**	**2A/3**	**2A/4**	**2A/5**
Route	**A-ABHIK**	**A-ABHIL**	**A-ACHIK**	**A-ACHIL**	**A-ADFHIK**
Sarsfield Park	•	•	•	•	•
SuperQuinn	•	•	•	•	
Cannonbrook Estate			•	•	
Lucan Main Street					•
Laraghcon Proposed Housing					
Lucan Tesco Supermarket					•
Westbury					•
Weston Park Estate					
Adamstwon Proposed Major Development	•	•	•	•	•
Proposed Adamstown Station	•	•	•	•	•
Grange Castle Business Park	•	•	•	•	•
Esker Meadow					
Castle Riada Estate					
Giffeen Estate					
Clondalkin			•		•
Citywest	•	•		•	

Option	**2A/6**	**2A/7**	**2A/8**	**2A/9**	**2A/10**	**2A/11**
Route	**A-ADFHIL**	**A-ADGIK**	**A-ADGIL**	**A-EGIK**	**A-EGIL**	**A-JL (Kishoge)**
Sarsfield Park	•	•	•			
SuperQuinn						
Cannonbrook Estate						
Lucan Main Street	•					
Laraghcon Proposed Housing				•	•	
Lucan Tesco Supermarket	•					
Westbury	•					
Weston Park Estate		•	•	•	•	
Adamstown Proposed Major Development	•	•	•	•	•	
Proposed Adamstown Station	•	•	•	•	•	
Grange Castle Business Park	•	•	•	•	•	•
Esker Meadow Estate						•
Castle Riada Estate						•
Griffeen Estate						•
Clondalkin		•		•		
Citywest	•	•	•		•	•

Catchment Analysis

8.25 The immediate job and population catchments (at 2016) within 500m and 800m of stations on the alternative alignments are given in Table 8.1 below.

Table 8.1: Catchment Analysis – Adamstown

Option	2A/1	2A/2	2A/3	2A/4	2A/5
Route	11L/A-ABHIK/TU	11L/A-ABHIL/WVU	11L/A-ACHIK/TU	11L/A-ACHIL/WVU	11L/A-ADFHIK/TU
Population 500m	37400	35200	37400	35200	39100
800m	78500	74900	78500	74900	78000
Employment 500m	14700	33500	14700	33500	14200
800m	29600	62100	29600	62100	28400

Option	2A/6	2A/7	2A/8	2A/9	2A/10	2A/11
Route	11l/A-ADFHIL/WVU	11L/A-ADGIK/TU	11L/A-ADGIL/WVU	11M/A-EGIK/TU	11M/A-EGIL/WVU	11LP/A-JL/WVU (Kishoge)
Population 500m	36800	36900	34600	34500	32200	23600
800m	74400	68700	65000	64800	61100	52900
Employment 500m	33000	14100	32800	14100	32800	29600
800m	60900	28700	61200	28700	61200	55100

Residential Catchment

8.26 Table 8.1 shows that Options 2A/1 and 2A/3 (routes A-ABHIK/TU and A-ACHIK/TU) appear to serve the highest number of residents, closely followed by Option 2A/5 (route A-ADFHIK/TU). Option 2A/11 (running via Kishoge) performs relatively poorly in terms of population living within the 800-metre catchment areas of stations.

Employment Catchment

8.27 Options 2A/2, 2A/4, 2A/6, 2A/8 and 2A/10 all perform similarly in terms of employment catchment within 800 metres of stations, in particular serving the larger employment areas of Citywest; the other routes via Fortunestown serve significantly less employment.

Capital Costs

8.28 The capital cost of the route options through Adamstown is summarised in Table 8.2 below (the scope of the costings, assumptions, exclusions and caveats associated with the estimates are as set out in Chapter 6). Full details can be found in Appendix A.

Table 8.2: Summary of Total Capital Costs

Option	Reference	Route distance (km)	Cost € millions (rounded) including stations			
				Total costs including client costs, rolling stock, VAT etc.		
			Construction	Central	Low (-10%)	High (+40%)
2A/1	11L/A-ABHIK/TU	8.7	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/2	11L/A-ABHIL/WVU	11.5	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/3	11L/A-ACHIK/TU	8.5	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/4	11L/A-ACHIL/WVU	11.2	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/5	11L/A-ADFHIK/TU	8.7	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/6	11L/A-ADFHIL/WVU	11.5	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/7	11L/A-ADGIK/TU	9.5	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/8	11L/A-ADGIL/WVU	12.3	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/9	11M/A-EGIK/TU	8.5	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/10	11M/A-EGIL/WVU	11.3	[text deleted]	[text deleted]	[text deleted]	[text deleted]
2A/11	11 LP/A-JL/WVU (Kishoge) v	6.9	[text deleted]	[text deleted]	[text deleted]	[text deleted]

9. EVALUATION OF OPTIONS

Evaluation Framework

9.1 Phase 2 options have been the subject of a framework evaluation approach similar to that adopted in Phase 1, i.e. set up in the form of a simple spreadsheet with scores from 1 to 5 (very poor to very good) being awarded to a range of attributes, and weightings (discussed and agreed with RPA) applied to each of the attributes. A number of the weightings have, however, been changed compared with Phase 1; in particular, a significantly higher weighting has been assigned to environmental impacts in Phase 2, reflecting the likely much greater sensitivities in the Phase 2 study area, e.g. the crossing of the Liffey River.

Main Study Area

9.2 Table 9.1 below summarises the scores awarded and the weightings applied for each of the 24 options considered in the 'main' study area, culminating in unweighted and weighted total scores for each option.

Table 9.1: Evaluation Framework for Option Assessment (Phase 2 Study Area)

			Score (out of 5)							
Criterion		**Option**	**2/1**	**2/2**	**2/3**	**2/4**	**2/5**	**2/6**	**2/7**	**2/8**
		Weight	**10JNRU**	**10JNRV**	**10JNTU**	**10JNTV**	**10JOQU**	**10JOQV**	**10JORU**	**10JORV**
Ease of Construction/ Time to implement	**5**		4	3	5	4	1	1	4	3
Capital Cost	**5**		4	3	4	4	1	1	4	3
Residential catchment area	**4**		3	4	4	4	2	3	3	4
Employment catchment area	**3**		2	2	2	1	2	2	2	1
Environmental Impact	**5**		3	3	4	3	5	4	4	3
Serving New Development	**3**		3	4	3	3	3	4	3	4
Impact on through journey times	**1**		4	4	4	4	4	4	4	3
Safety (Level of Segregation)	**2**		5	4	5	4	5	4	5	4
Total Unweighted Score			28 27		31 27		23	23	29	25
Weighted Score			**96**	**91**	**110**	**95**	**72**	**72**	**101**	**87**

		Score (out of 5)							
Criterion	**Option**	**2/9**	**2/10**	**2/11**	**2/12**	**2/13**	**2/14**	**2/15**	**2/16**
	Weight	**10JOTU**	**10JOTV**	**10KOQU**	**10KOQV**	**10KORU**	**10KORV**	**10KOTU**	**10KOTV**
Ease of Construction/Time to implement	**5**	5	4	2	1	4	4	5	5
Capital Cost	**5**	4	4	2	2	4	4	5	5
Residential catchment area	**4**	3	4	1	2	2	3	3	3
Employment catchment area	**3**	1	1	1	1	1	1	1	1
Environmental Impact	**5**	4	3	4	4	3	2	3	2
Serving New Development	**3**	3	3	3	4	3	4	3	3
Impact on t hrough journey times	**1**	4	4	5	5	5	4	5	4
Safety (Level o f Segregation)	**2**	4	3	5	4	5	4	4	3
Total U nweighted Score		28	26	23	23	27	26	29	26
Weighted Score		**101**	**93**	**71**	**71**	**90**	**89**	**102**	**94**

		Score (out of 5)							
Criterion	**Option**	**2/17**	**2/18**	**2/19**	**2/20**	**2/21**	**2/22**	**2/23**	**2/24**
	Weight	**11LPRU**	**11LPRV**	**11LPTU**	**11LPTV**	**11MPRU**	**11MPRV**	**11MPTU**	**11MPTV**
Ease of Construction/Time to implement	**5**	3	3	4	4	3	3	4	4
Capital Cost	**5**	3	3	4	4	4	3	4	4
Residential catchment area	**4**	3	4	3	4	4	4	4	5
Employment catchment area	**3**	1	1	1	1	1	1	1	1
Environmental Impact	**5**	3	3	4	3	3	2	3	2
Serving New Development	**3**	3	4	3	4	3	4	3	4
Impact on through journey times	**1**	4	4	4	4	3	3	4	3
Safety (Level of Segregation)	**2**	4	3	3	2	4	3	3	2
Total Unweighted Score		24 25		26	26 25		23	26	25
Weighted Score		**81**	**86**	**94**	**94**	**89**	**80**	**93**	**92**

9.3 The results of this framework approach suggest that each of the routes has its own advantages and disadvantages. Options 2/3 (route 10JNTU) performs best in terms of both weighted and unweighted scores, running via Liffey Valley Centre, Neilstown, west Clondalkin and Belgard Road into Tallaght. Routes 2/7, 2/9 and 2/15 (routes 10JORU, 10JOTU and 10KOTU) perform equally well to one another although rather less well than Option 2/3. Options 2/5, 2/6, 2/11, 2/12 and 2/22 are in the bottom five in terms of weighted scores. The other options perform variably depending upon the application of weightings to the various attributes.

Adamstown

9.4 Table 9.2 below summarises the scores awarded and the weightings applied for each of the 11 options considered through the Adamstown area.

Table 9.2: Evaluation Framework - Adamstown

		Score (out of 5)				
Criterion	**Option**	**2A/1**	**2A/2**	**2A/3**	**2A/4**	**2A/5**
	Weight	**A-ABHIK**	**A-ABHIL**	**A-ACHIK**	**A-ACHIL**	**A-ADFHIK**
Ease o f C onstruction/Time to implement	**5**	5	3	4	2	4
Capital Cost	**5**	4	4	4	4	4
Residential catchment area	**4**	4	3	4	3	4
Employment catchment area	**3**	1	5	1	5	1
Environmental Impact	**5**	2	2	3	2	1
Serving New Development	**3**	4	3	4	3	4
Impact on through journey times	**1**	2	1	3	2	2
Safety (Level of Segregation)	**2**	3	4	4	5	3
Total Unweighted Score		25	25	27	26	23
Weighted Score		**94**	**90**	**97**	**88**	**84**

		Score (out of 5)					
Criterion	**Option**	**2A/6**	**2A/7**	**2A/8**	**2A/9**	**2A/10**	**2A/11**
	Weight	**A-ADFHIL**	**A-ADGIK**	**A-ADGIL**	**A-EGIK**	**A-EGIL**	**A-JL (Kishoge)**
Ease of Construction/ Time to implement	**5**	3	4	1	4	3	3
Capital Cost	**5**	4	4	4	4	4	4
Residential catchment area	**4**	3	3	2	2	2	1
Employment catchment area	**3**	5	1	5	1	5	4
Environmental Impact	**5**	1	2	1	3	2	2
Serving New Development	**3**	3	3	3	3	3	3
Impact on through journey times	**1**	1	2	1	3	1	3
Safety (Level of Segregation)	**2**	4	4	5	4	5	4
Total Unweighted Score		24 23		22	24	25	24
Weighted Score		**85**	**84**	**73**	**86**	**88**	**81**

9.5 Table 9.2 above shows that, within the range of alternative routes considered through Adamstown, Option 2A/3 (route 11L/A-ACHIK/TU) performs best, running via Lucan, Sarsfield Park, (tunnel to) Superquinn, central Adamstown, interchange with Kildare Line at proposed Adamstown station, Nangor industrial area, thence to Clondalkin (Fonthill Road) and on to Tallaght via Belgard Road. The worst performing routes are those via Kishoge and Citywest (Option 2A/11) and that via west Lucan, Grange industrial area and Citywest (Option 2A/8).

9.6 The most meaningful comparison, however, is at the higher strategic level between the main corridors, i.e. either following an easterly alignment via Ronanstown or a westerly alignment via Adamstown. Ranked in descending order of weighted scores it is significant that, of all the options considered, only two of the routes via Adamstown fall in the top half, the other nine Adamstown routes falling in the bottom half.

9.7 Based on the approach adopted and agreed with the RPA, it would appear that Options 2/3 (route 10JNTU - Liffey Valley Centre, Ronanstown, west Clondalkin and Belgard Road) and 2A/3 (route 11L/A-ACHIK/TU) - Lucan, Sarsfield Park, (tunnel to) Superquinn, central Adamstown, Nangor industrial area and Clondalkin (Fonthill Road) perform best.

9.8 Following discussion with RPA, however, it was agreed that a route via Ronanstown was to be preferred to running via Neilstown, and that accordingly Option 2/9 (route JOTU) should be adopted as the shortlisted eastern route. This differs to Option 2/3 only insofar as it follows Fonthill Road instead of Neilstown Road.

9.9 It was also agreed in discussion with RPA that Option 2A/3 – the best performing of the Adamstown routes - should be adopted as the preferred western route for carrying forward to consultation.

9.10 RPA also requested that the alignment via Kishoge (Option 2A/11) be carried forward for consultation although we would point out that this route performed poorly in the evaluation.

9.11 The conclusions will need to be reviewed and updated in the context of emerging consensus on Phase 1 and following more detailed review of Phase 2 options by RPA and other key stakeholders.

10. CONCLUSIONS

10.1 Our conclusions from the analyses can be summarised as follows:

Main Study Area

- A rail-based system is likely to be suited to meet the likely levels of demand, forecast at around 10,000 passengers per hour at the peak loading point in the peak direction. However, it should be noted the model includes a substantial congestion charge in the suburbs as well as in the city centre, which will have the effect of increasing public transport's forecast mode share. Passenger numbers could be expected to be significantly reduced in the event that complementary demand management/traffic restraint measures were not implemented

- Nearly half of trips are internal to the study area, the remainder travelling to or from either the city centre (predominant), airport or other destinations

- The Metro is serving local transport needs as well as catering for longer distance movements

- High interchange flows are forecast between the Metro and both the Maynooth and Kildare suburban railway lines in the vicinity of Porterstown and Clondalkin

- Tallaght is the largest single attractor of trips in the morning peak

- Prior to detailed assessment and a decision on an Emerging Preferred Route it would be worth considering preserving the availability of the void 6 acre site, presently owned by CIE at the LUAS entry to Tallaght, or at the very least preventing dense long-term development taking place. This site is furthermore affected by route option V, where the alignment would descend into a tunnel towards the Square.

- A number of feasible alignments have been identified through Lucan, Ronanstown, Clondalkin and Tallaght, most of which can be achieved with only relatively limited tunnelling in Lucan, Clondalkin and in Tallaght

- An underground route would almost certainly be the only feasible way of providing a high level of accessibility to Clondalkin town centre, and is also likely to be required in Tallaght where the routes would link into the route via Kimmage to the city centre

- There would be major environmental impacts associated with all the alignments but the Liffey Valley crossing will be particularly sensitive. From this point of view, an easterly crossing adjacent to the M50 motorway would appear to be preferable. A central crossing would cause the most significant severance for the valley.

- Although there would not appear to be any insurmountable problems with utilities, inevitably some significant diversions will be required. The extent and cost of such works would need to be the subject of more detailed study, and no allowance for major utility diversion works has been included in our assessment of capital costs

- Westerly alignments via Lucan or more easterly alignments via Liffey Valley serve similar residential populations in the northern part of the study area. There is little to choose between options via Fonthill Road or Neilstown Road in Ronanstown but the population catchment is slightly higher along the Fonthill Road corridor in Clondalkin

- There is a higher employment catchment associated with more easterly alignments via Liffey Valley Centre than western routes via Lucan

- In Tallaght, there is a significantly higher residential catchment for alignments running via Cookstown Road rather than via Belgard Road into Tallaght centre; in employment terms, however, the Belgard Road corridor has a slightly higher employment catchment than Cookstown Road

- In terms of population catchment, there would appear to be no merit in considering a tunnelled alignment through Clondalkin with the associated high capital costs and construction impacts. The village could be reached by a reasonable 5 minutes walk from Route T. However, a tunnelled route does provide access to and from a greater number of jobs in the Clondalkin area

- Porterstown is a better starting point than Clonsilla for central and eastern alignments through the study area, but either is suitable for interchange between the Metro and the Maynooth Line of the suburban railway

- Clonsilla should not be considered as an alternative to Porterstown for central or easterly alignments within the study area

- Overall route lengths between Porterstown/Clonsilla and Tallaght range from 12.2 to 15 kilometres depending on route choice, offering end-to-end journey times of 17- 22 minutes and average service speeds of around 37- 43 kph (including station dwell times)

- Construction costs are likely to be in the broad range [text deleted]., i.e. much larger than for Phase 1 routes, principally due to the generally longer distances compared with many of the Phase 1 routes, and also due to the need for tunnelling in a number of areas and/or greater use of elevated structures

- Some 8-10 trains would be required to provide a service at 5-minute intervals within the Phase 2 study area. The cost of rolling stock, including allowance for spare vehicles) would be in the order of [text deleted].

- 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] at –10%/+40% levels of certainty

Citywest

- Two potential feasible alignments have been identified to link Citywest with the 'main line' Metro route at Tallaght, one direct via Cookstown Road and one via Cookstown Way and Fortunestown Road. The route lengths are 4.8 km and 5.5 km respectively

- Both routes could form delta junctions such that Citywest can be served from Clondalkin in the north/east or from Tallaght town centre (or both)
- There are no insurmountable environmental problems with either route
- Route X has a significantly greater residential catchment than route W although the employment catchment of route W is somewhat higher
- Journey time between Tallaght Hospital and the Citywest terminus could be expected to be in the order of 9-10 minutes via routes W and X respectively, an average service speed of around 33-34 kph
- It is clearly not particularly meaningful to assess rolling stock requirements for the Citywest branch in isolation. However, viewed as an incremental addition to the network, Citywest would require an estimated 4-5 trains over and above the fleet requirement for the rest of the system
- Capital construction costs are estimated to be in the order of [text deleted] for route W, and much higher at [text deleted] for route X. However, route W runs close to overhead power lines over a significant length of the route, the effects of which require more detailed investigation. The cost estimates do not include any allowance for diversion of power cables at this stage, nor the cost of diverting LUAS via Belgard Road in the event that route X (Cookstown Road/Cookstown Way) were to be adopted for the metro RPA advises the cost of diverting LUAS could be expected to be in the broad order of [text deleted] per kilometre
- The overall capital costs including allowances for rolling stock, contingencies, client costs and VAT could be expected to be in the broad order of [text deleted] to [text deleted] for route W and [text deleted] to [text deleted] for route X (-10%/+40% in both cases)

Adamstown

- Eleven potential alignments have been identified through Adamstown; the route lengths range from roundly 16 to 21 km. The routes would include between 10 and 13 stations.

- There are a number of potentially major environmental problems with several of the routes, and in particular in the Lucan area
- Options 2A/1 and 2A/3 (routes A-ABHIK and A-ACHIK) appear to serve the highest number of residents, closely followed by Option 2A/5 (route A-ADFHIK).
- Options 2A/2, 2A/4, 2A/6, 2A/8 and 2A/10 perform best in terms of employment catchment within 800 metres of stations
- End to end journey time is estimated to be in the order of 25-29 minutes for most options, or about 23 minutes for Option 2A/11. These times are generally 4-5 minutes longer than for the routes via Ronanstown/Clondalkin
- Most options would require 11-13 trains to run a five minute service (10 trains for Option 2A/11
- Capital construction costs are estimated to be in the broad range [text deleted] excluding diversion of overhead power cables and/or LUAS for metro options along Cookstown Road
- The overall capital costs including allowances for rolling stock, contingencies, client costs and VAT could be expected to be in the broad order of [text deleted] to [text deleted] (-10%/+40%)

10.2 Our initial assessment of the performance of the preferred routes along each of the two corridors is summarised in the following table, based on a score of 1 to 5. However, notwithstanding that the option performed poorly in the evaluation framework, RPA requested that the route via Kishoge (Option 2A/11) be carried forward into the consultation process at present. Accordingly, our assessment of its performance in relation to the other shortlisted alternatives is included in the tabulation for the purposes of comparison. Clearly this possibility will need re-assessment at a later date.

		Option 2/9	Option 2A/3	Option 2A/11
Route		**10JOTU**	**11L/A-ACHIK/TU**	**11LP/ A-JL/WVU (Kishoge)**
Criterion	**Weight**			
Ease of Construction/Time to implement	**5**	5	4	3
Relative Capital Cost	**5**	4	4	4
Residents within 800 metres	**4**	3	4	1
Employment within 800 metres	**3**	1	1	4
Environmental Impact	**5**	4	3	2
Serving New Development	**3**	3	4	3
Through Journey Times	**1**	4	3	3
Safety (Level of Segregation)	**2**	4	4	4
Total Score (Unweighted)		28	27	24
Total Score (Weighted)		**101**	**97**	**81**

10.3 The key passenger objectives served by each of the routes are summarised below:

	Option 2/9	Option 2A/3	Option 2A/11
Route	**10JOTU**	**11L/A-ACHIK/TU**	**11LP/ A-JL/WVU (Kishoge)**
Carpenterstown	•		
Liffey Valley Centre	•		
Ronanstown	•		
Fonthill Road Retail	•		
Fonthill Road station	•		
Sarsfield Park (Lucan)		•	
SuperQuinn		•	
Cannonbrook Estate		•	
Adamstown Proposed Major Development		•	
Adamstown Station		•	
Grange Castle Business Park		•	•

Esker Meadow Estate					•
Castle Riada Estate					•
Griffeen Estate					•
Clondalkin					•
Citywest					•
Clondalkin		•		•	
Tallaght Belgard Heights	•		•		
Tallaght Cookstown Industrial area	•		•		
Tallaght Hospital	•		•		
Tallaght "The Square"	•		•	•	

Next Steps

10.4 Clearly the conclusions are presently based on the study team's assessment of the relative merits of the alternatives and its judgement on the relative importance of each of the attributes of individual schemes. RPA may wish to revisit the conclusions in the light of discussions with key stakeholders and also following more detailed analysis of the relative patronage (and hence revenue) impacts of the alternatives.

10.5 It is envisaged that Public Consultation for the Orbital metro in West Dublin will be carried out with Phase 1 simultaneously – probably later 2002.

A

Appendix

Adamstown Costs

WS Atkins

emental Cost analysis	2A/1 11L/A-ABHIK/TU €	2A/2 11L/A-ABHIL/WVU €	2A/3 11L/A-ACHIK/TU €	2A/4 11L/A-ACHIL/WVU €	2A/5 11L/A-ADFHIK/TU €	2A/6 11I/A-ADFHIL/WVU €	2A/7 11L/A-ADGIK/TU €	2A/8 11L/A-ADGIL/WVU €	2A/9 11M/A-EGIK/TU €	2A/10 11M/A-EGIL/WVU €	2A/11 11LP/A-JL/WVU (Kishoge) €
Civil Engineering Costs	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Park & Ride Facility	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Sub-Total	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Client Costs [text deleted]	€ 36,669,864	€ 36,721,872	€ 37,862,220	€ 36,601,488	€ 37,249,080	€ 36,727,548	€ 37,022,700	€ 37,051,740	€ 35,949,012	€ 35,427,480	€ 37,527,072
Sub-Total	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
VAT on remaining costs 12.50%	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Allowance for Property Costs [text deleted] per km	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[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]	[text deleted]	[text deleted]	[text deleted]	[text deleted]	[text deleted]
Likely cost range -10%	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**
to +40%	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**	**[text deleted]**

B

Appendix

Figures

LIST OF FIGURES