NTA DART EXPANSION PROGRAMME

NTA DART EXPANSION PROGRAMME FUTURE PATRONAGE MODELLING

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June 10, 2020

National Transport Authority

TPF-053

NTA DART EXPANSION PROGRAMME

Project No:	TPF-053
Document Title:	NTA DART EXPANSION PROGRAMME FUTURE PATRONAGE MODELLING
Document No.:	1
Revision:	1
Document Status:	Final Draft
Date:	June 10, 2020
Client Name:	National Transport Authority
Client No:	TPF-053
Project Manager:	Paul Hussey
Author:	Claire Stephens
File Name:	Draft - DART Expansion Programme - Future Patronage Modelling Assessment Report v1.docx

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
V0.6	22/05/2020	Working Draft for client review	CS	PH	IB	DK
V1.0	09/06/2020	Final Draft	CS	PH	IB	DK

DART Expansion Programme

Reference number TP 053-0

10/06/2020

NTA DART EXPANSION PROGRAMME FUTURE PATRONAGE MODELLING – ASSESSMENT REPORT

SYSTRA Jacobs NTA Údarás Náisiúnta Iompair National Transport Authority Iarnród Éireann Irish Rail

DART EXPANSION PROGRAMME

FUTURE PATRONAGE MODELLING ASSESSMENT

IDENTIFICATION TABLE	
Client/Project owner	NTA
Project	DART Expansion Programme
Study	Future Patronage Modelling Assessment
Type of document	Report
Date	10/06/2020
File name	Draft - DART Expansion Programme - Future Patronage Modelling Assessment Report v1.docx
Framework	NTA TPS Framework
Reference number	TP 053-0
Confidentiality	Confidential
Language	English
Number of pages	26

APPROVAL					
Version	**Name**		**Position**	**Date**	**Modifications**
V0.6	Author	Claire Stephens	Associate	13/05/2020	Working Draft for client review
	Checked by	Paul Hussey	Associate	22/05/2020	
	Approved by	Ian Byrne	Director	22/05/2020	
V1	Author	Claire Stephens	Associate	04/06/2020	Final Draft
	Checked by	Paul Hussey	Associate	08/06/2020	
	Approved by	Ian Byrne	Director	09/06/2020	

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1. INTRODUCTION

1.1 Overview

1.1.1 As part of the **DART Expansion Programme Options Assessment Study**, undertaken in 2018, a train service specification was developed for the expanded DART network.

1.1.2 As the various elements are now progressing into the preliminary design stage, the NTA commissioned SYSTRA and Jacobs to consider the likely future demand on the expanded DART network by undertaking strategic transport modelling using the preferred option (Scheme Bundle 6, TSS Option 2). This modelling will be used to determine the potential and likely future demand on the expanded DART network in the medium and long term.

1.1.3 This report details the outputs of the strategic modelling arising from the assessment on potential and likely future demand.

1.2 Background

1.2.1 In 2018, the NTA commissioned SYSTRA and Jacobs to undertake an extensive transport modelling and appraisal assessment of the DART Expansion Programme, which is a key infrastructure measure which forms part of the Government's Project Ireland 2040[1] - National Planning Framework (NPF) and National Development Plan (NDP) 2018-2027 and the National Transport Authority's (NTA) Greater Dublin Area (GDA) Transport Strategy[2].

1.2.2 The project sought to identify a lower cost alternative to the proposed DART underground tunnel component of the DART Expansion Programme. It did this in the context of the importance of the DART Expansion Programme as identified in the GDA Transport Strategy and following on from the NTA recommendations on the deferral of the DART Underground Project in 2015. It also sought to deliver transport user benefits which were as close as possible to those delivered by the original DART Underground scheme and to maintain all other elements of the DART Expansion Programme.

1.2.3 As part of this study, detailed timetable modelling of the preferred Bundle 6 option was undertaken under TP-062 and a 'Greater Dublin Area Timetable Modelling – Review Paper' was produced providing a capacity analysis and a proposed Train Service Specification (TSS) for the wider rail network across the GDA.

1.3 Purpose of this Report

1.3.1 This report summarises the outcomes of a strategic modelling assessment of the DART Expansion Scheme Bundle 6, TSS Option 2 with potential and likely future demand tested in the medium and long term.

[1] Project Ireland 2040 is the Government's overarching planning policy initiative for development up to 2040. It was published along with its associated documents the National Planning Framework to 2040 and the National Development Plan 2018-2027 in February 2018.

[2] The Transport Strategy for the Greater Dublin Area, 2016-2035 was prepared and published by the National Transport Authority in 2016

1.3.2 The scenarios were tested in the NTA East Regional Model (ERM) to understand the latent demand on the rail line corridors under a number of different background schemes and growth assumptions.

2. ASSUMPTIONS

2.1 Introduction

2.1.1 This chapter provides a summary of the assumptions used for the different scenarios modelled.

2.2 Approach

2.2.1 The preferred Bundle 6 TSS Option 2 from the DART Expansion Programme Options Assessment Study has been tested in the ERM and is the basis for this study in terms of train service specification, capacities and train service running times between stations. For information, the revised TSS for Bundle 6 TSS Option 2 is shown in Figure 1 overleaf, with the service plan shown in Appendix A.

2.2.2 It is acknowledged that TSS Option 1, from the above study, may be implemented as the preferred TSS due to the more balanced distribution of train service patterns within the city centre from each line. In any case, it is not anticipated that an alternative city centre distribution would affect the ultimate latent demand on each line which is the purpose of the modelling exercise undertaken as part of this report.

2.2.3 An ultimate demand assessment of Bundle 6 TSS Option 2 was modelled by undertaking unconstrained capacity runs on top of a variety of Do Minimum options.

2.2.4 For this study, it was agreed to use the NTA's East Regional Model (ERM) to test the multi-modal impacts of the proposed DART TSS.

2.3 Model Forecast Years

2.3.1 Two forecast design years have been used to assess the medium and long term demand, as follows:

- The opening year for the scheme is assumed to be 2028 – this represents the medium term demand; and
- The design year (opening year +15 years) is assumed to be 2043 which represents the long term demand.

2.4 Land Use Forecasts

2.4.1 The NTA have defined a 2040 National Planning Framework (NPF) planning sheet, based on 2016 Census data, regional growth projections and their knowledge of Local Authority development plans. Population, employment and education attractions are located in areas that are likely to be developed between now and 2040.

2.4.2 From that 2040 NPF planning sheet, the NTA has also produced planning sheets for both 2028 and 2043, reflecting where the growth is more likely to be located in these two years. These planning sheets were used to model the transport demand for 2028 and 2043.

2.4.3 The growth for internal goods and special zones has been derived by using a 71% increase over a 2012 base, for both 2028 and 2043. Inter-regional trips were derived from the RMSIT[3].

2.5 Do Minimum

2.5.1 A number of Do Minimum (DM) model runs have been developed upon which the unlimited capacity DART Expansion TSS scenarios can be tested. These are categorised below, as three distinct scheme bundles, or four (DM) model runs:

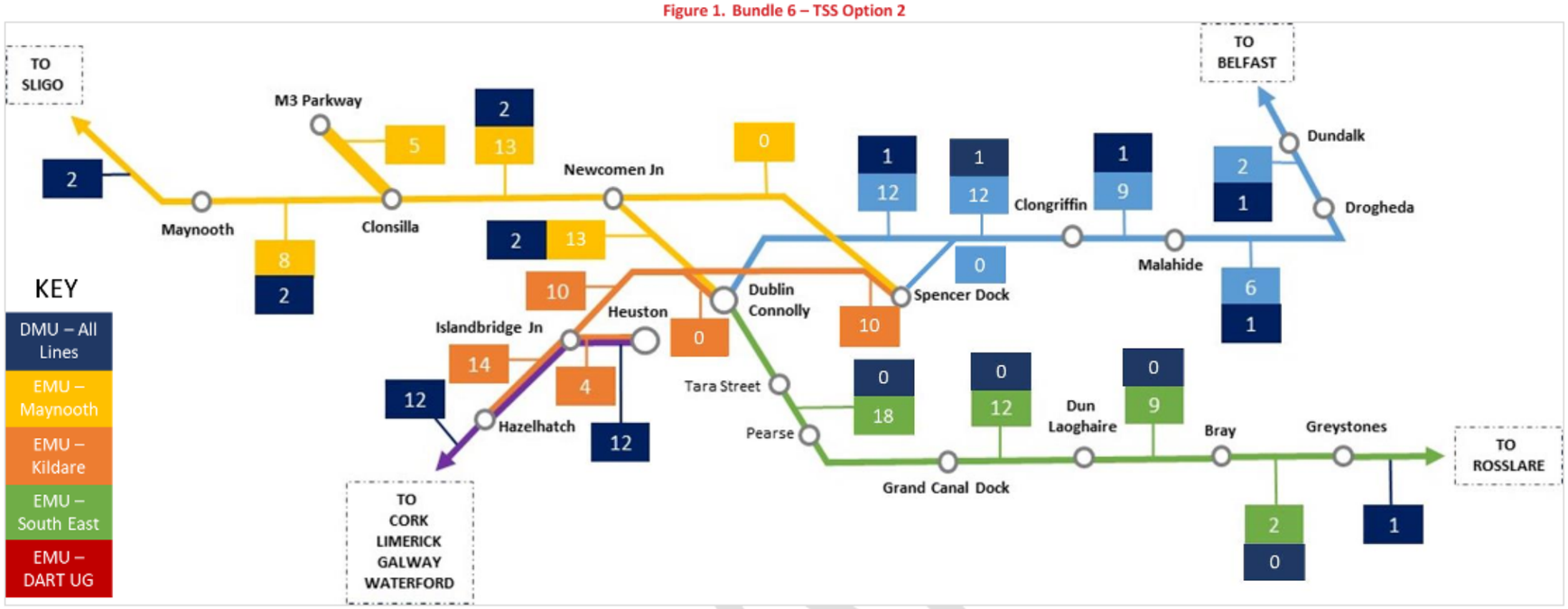
- **Bundle 1** – 2028, 2043 Committed Schemes only;
- **Bundle 2** – 2028 National Development Plan (NDP) Schemes; and
- **Bundle 3** – 2043 GDA Strategy network.

2.6 Do Something

2.6.1 In addition to the Do Minimum model runs, and to understand the 'potential' rather than the 'realistic' demand for travel across the DART network, the frequencies on lines were increased to a minimum of 16 trains per hour per direction (tphpd) with no capacity constraint. This enables an understanding of the possible ultimate demand for travel on the DART network in 2028 and 2043.

[3] RMSIT – 'Regional Modelling System Integration Tool' which forms part of the NTA Regional Modelling System

Figure 1. Bundle 6 – TSS Option 2



3. METHODOLOGY

3.1 Introduction

3.1.1 In total, six scenarios have been tested, which are detailed in Table 1 below.

Table 1. Scenarios Modelled

SCENARIO	DESCRIPTION
Scenario 1	2028 Do Committed Schemes only
Scenario 2	2043 Do Committed Schemes only
Scenario 3	2028 NDP Schemes
Scenario 4	2043 Strategy Schemes
Scenario 5	2028 Unlimited Rail
Scenario 6	2043 Unlimited Rail

3.1.2 Each scenario builds off the latest available BusConnects Core Bus Corridor (CBC) model runs, which have recently been developed, with the necessary changes implemented to the rail network for each scenario (which will be discussed in detail in the following sections). The output TSS for each scenario is also provided for reference.

3.2 Scenario 1 – 2028 Do Committed Schemes only

3.2.1 For the purposes of this assessment, Scenario 1, 2028 Do Committed Schemes only, is based on the existing transport network but with the addition of the proposed BusConnects network re-design routes and services.

3.2.2 The appropriate rail lines were updated to include Bundle 6 TSS Option 2 train services.

3.3 Scenario 2 – 2043 Do Committed Schemes only

3.3.1 Scenario 2, 2043 Do Committed Schemes only, is the same transport network as per Scenario 1 but with a higher level of transport demand growth as derived from the NTA's 2043 planning sheet demand. The rail network in this scenario also represents Bundle 6 TSS Option 2.

3.4 Scenario 3 - 2028 NDP Schemes

3.4.1 Scenario 3, 2028 National Development Plan (NDP) Schemes, is based on the full build out of all schemes contained within the NDP. This includes for example, the full roll out of BusConnects CBCs as well as MetroLink.

3.4.2 The Rail network in this scenario represents Bundle 6 TSS Option 2 also.

3.5 Scenario 4 - 2043 Strategy Schemes

3.5.1 Scenario 4, 2043 Strategy Schemes, is based on the full build out of all schemes contained within the Greater Dublin Area (GDA) Strategy including LUAS line extensions to Lucan, Finglas and Bray.

3.5.2 The appropriate rail lines were updated to include Bundle 6 TSS Option 2 train services.

3.6 Scenarios 1-4 Train Service Specification

3.6.1 The TSS are identical for scenarios 1-4, and are shown in **Error! Reference source not found.**, and summarised below. The service plan for these scenarios can be found in Appendix A.

3.6.2 As per the approach taken as part of the original DART Expansion Option Assessment Report (from which the Bundle 6 Option 2 TSS were derived), the inter-peak period headways for DART services are assumed to be two thirds (2/3s) of the AM and PM peak headways and half the capacity provided.

3.7 Scenario 5 - 2028 Unlimited Rail

3.7.1 Scenario 5, 2028 Unlimited Rail, captures the potential latent demand on each line, in the context of the 2028 NDP and used the model run from Scenario 3 as its starting point.

3.7.2 The rail services were then changed to represent increased frequencies and unlimited capacities, using the assumption that there will be a minimum 16 trains per hour per direction on each line. The 16 tphpd assumption was applied within the DART area i.e. within Drogheda on the Northern Line, inside Maynooth on the Sligo line, inside Hazelhatch on the Cork / Kildare DART Line and inside Bray on the South East Line.

3.8 Scenario 6 - 2043 Unlimited Rail

3.8.1 Scenario 6, 2043 Unlimited Rail, captures the potential latent demand on each line, in the context of 2043 and all other GDA Strategy schemes in place. It is based on Scenario 4 as its starting point.

3.8.2 Like scenario 5, the rail services were then changed to represent the increased frequencies and unlimited capacities, again using the assumption that on each line within the DART area there will be a minimum 16 tphpd .

3.9 Scenarios 5 and 6 Train Service Specification

3.9.1 The TSS for Scenarios 5 and 6 are shown below in Figure 3, with the service plan included in Appendix A.

3.9.2 In summary, the following elements are changed in Scenarios 5 and 6 (compared to Scenarios 1-4):

- Northern Line: Drogheda to Bray new service (8 tpdph);
- Northern Line Drogheda to GCD increased frequency of 8 tpdph;
- Northern Line Malahide to Bray service removed;
- Northern Line Clongriffin to Dun Laoghaire service removed;

- Maynooth & M3 Parkway Line: Maynooth to Connolly service removed;
- Maynooth & M3 Parkway Line: Maynooth to GCD service increased frequency of 8 tpdph;
- Maynooth & M3 Parkway Line: Maynooth to Bray service increased frequency of 8 tpdph; and
- Kildare Line: Hazelhatch to Docklands service increase frequency of 4 tpdph.

3.9.3 In addition to the frequency and service changes, all DART services have an unlimited seating capacity and crush capacity[4].

[4] Crush Capacity is the physical capacity of the service which is assumed to be 1,382 passengers for an 8-car DART configuration.

Figure 2. Scenarios 1-3 TSS

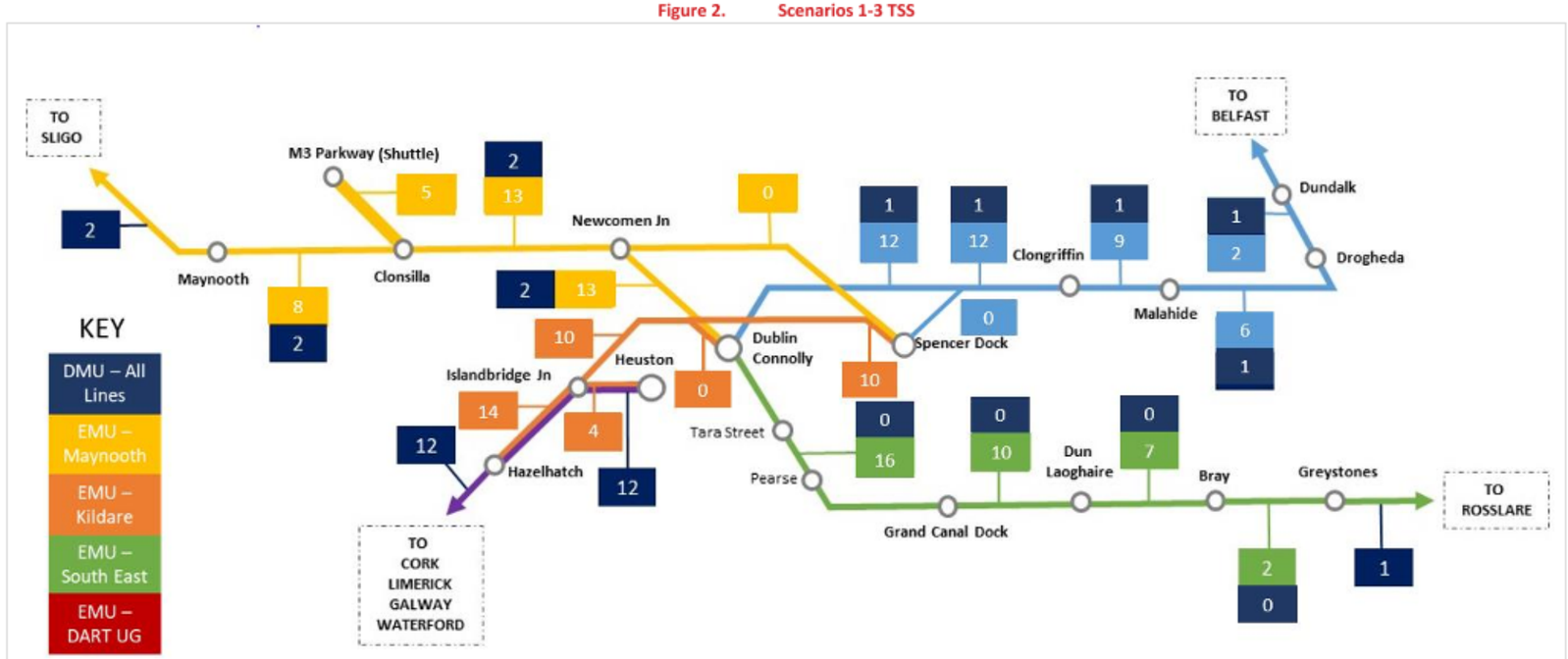
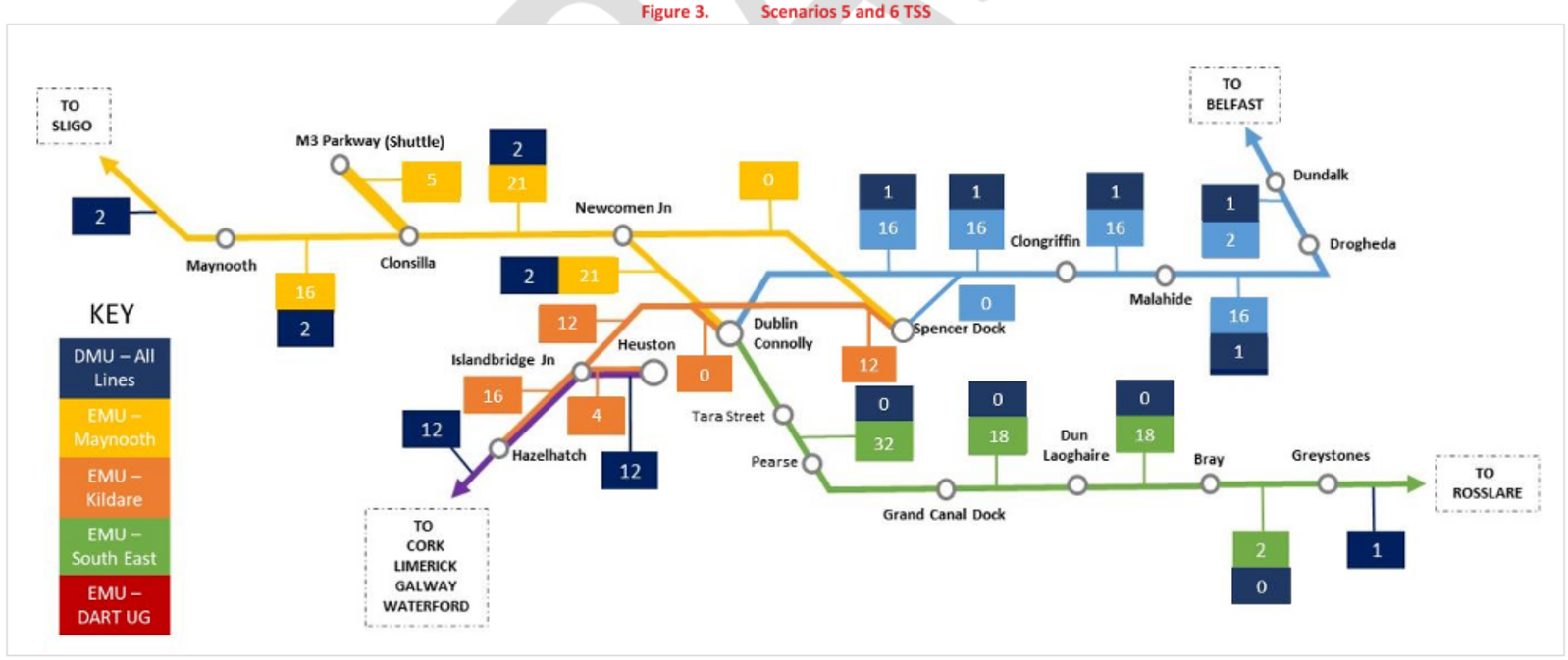


Figure 3. Scenarios 5 and 6 TSS



4. MODELLING SCENARIO OUTPUTS

4.1 Introduction

4.1.1 This chapter provides a summary of the outputs of the modelling assessment for each of the scenarios described above.

4.1.2 The following model statistics are presented and discussed in this section:

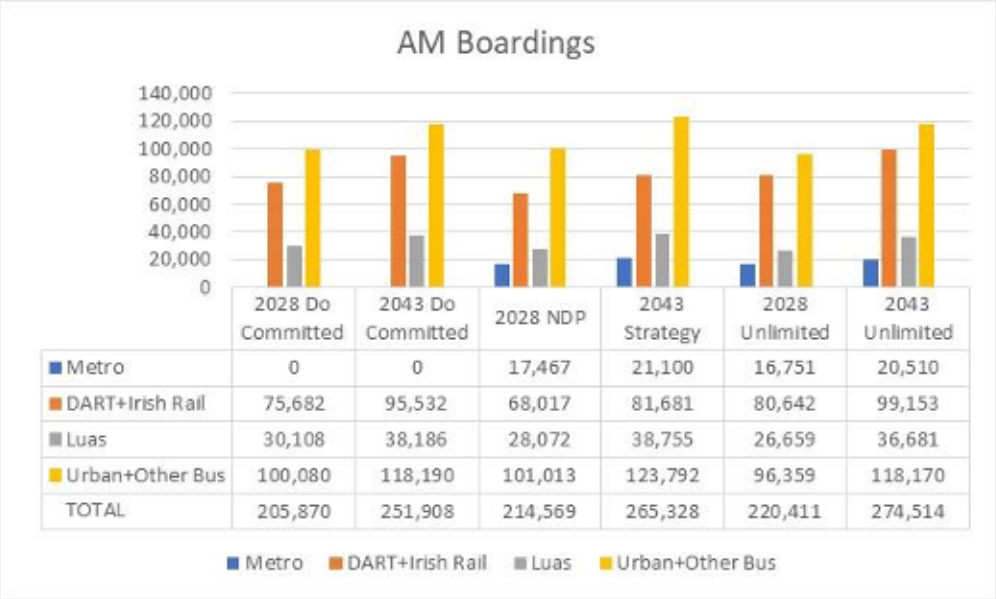
- Boardings by mode – AM peak and All Day (0700-1900); and
- Line profiles – for each line inbound for the AM peak hour.

4.1.3 The other peak hour modelled statistics are provided separately in the supporting Excel spreadsheet in Appendix B.

4.2 Boardings by Public Transport Mode

4.2.1 The number of people boarding for each public transport mode (Metro, DART/Irish Rail, LUAS and Urban Bus/Other Bus) are shown below for the AM peak hour and All Day in Figure 4 and Figure 5 respectively for all six scenarios.

Figure 4. AM Peak Boardings by Mode

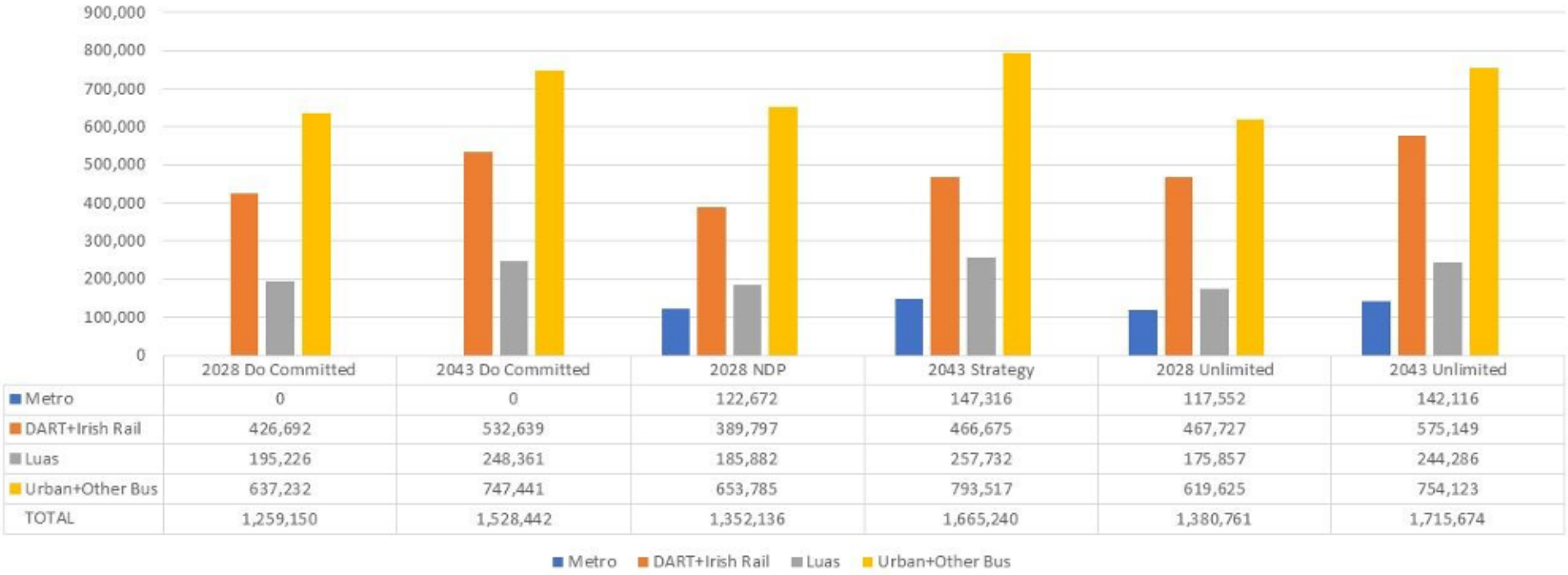


	2028 Do Committed	2043 Do Committed	2028 NDP	2043 Strategy	2028 Unlimited	2043 Unlimited
Metro	0	0	17,467	21,100	16,751	20,510
DART+Irish Rail	75,682	95,532	68,017	81,681	80,642	99,153
Luas	30,108	38,186	28,072	38,755	26,659	36,681
Urban+Other Bus	100,080	118,190	101,013	123,792	96,359	118,170
TOTAL	205,870	251,908	214,569	265,328	220,411	274,514

4.2.2 For the two unlimited scenarios, more boardings are forecast for the DART and Irish Rail modes when comparing this to without the unlimited frequencies and capacities. During the AM peak hour, Scenario 5 has 27% more boarders than Scenario 3 (2028) for DART only, whilst in 2043, Scenario 6 has 31% more boarders than Scenario 4.

During the All Day period (0700-1900), Scenario 5 (2028 unlimited) is forecast an additional 29% more boarders than in the 2028 NDP schemes, whilst this is an additional 33% in 2043.

Figure 5. All Day (0700-1900) Boardings by Mode



	2028 Do Committed	2043 Do Committed	2028 NDP	2043 Strategy	2028 Unlimited	2043 Unlimited
Metro	0	0	122,672	147,316	117,552	142,116
DART+Irish Rail	426,692	532,639	389,797	466,675	467,727	575,149
Luas	195,226	248,361	185,882	257,732	175,857	244,286
Urban+Other Bus	637,232	747,441	653,785	793,517	619,625	754,123
TOTAL	1,259,150	1,528,442	1,352,136	1,665,240	1,380,761	1,715,674

4.3 Passenger Loading Profiles by Rail Line

4.3.1 The number of passengers on each rail line are shown below in Figure 6 to Figure 9 for 2028, and Figure 10 to Figure 13 for 2043. For the four lines shown (Northern Line, Kildare Line, Maynooth Line and Southern Line), each graph shows the number of passengers on each train at each stop for all of the three scenarios modelled (taking into account boardings and alightings) alongside the crush capacity, and 85% of the crush capacity. The crush capacity is taken from the 2028 NDP schemes/2043 GDA Strategy (the capacities being the same in both cases).

4.3.2 All boardings and alightings for each stop, alongside full AM and PM peak hour, inbound and outbound rail line profiles are provided separately in the supporting Excel spreadsheet in Appendix C.

4.3.3 For the Northern, Maynooth and Southern Lines in 2028, the unlimited scenario forecasts higher passenger volumes due to the increased frequency and unlimited capacities modelled on these services.

4.3.4 The peak loading on the Northern line occurs at Connolly Rail, in 2028 for the unlimited scenario, with an additional 5,600 (+34%) passengers than that forecast with the NDP schemes and standard headways and capacities. In 2043, at Connolly Rail an additional 7,900 (+43%) passengers than are forecast with the GDA Strategy and the standard TSS capacities. In the unlimited scenario, the demand exceeds both the crush capacity and the 85% crush capacity for a significant part of the line (from Balbriggan to Connolly Rail) in 2028 whilst in 2043, the demand in the unlimited scenario significantly exceeds the crush capacity for this section of the line.

4.3.5 On the Maynooth line, the peak loading happens at Pelletstown, where in the 2028 unlimited scenario, there is an additional 2,100 (+20%) passengers forecast over those in the NDP scenario. In 2043, there is an additional 2,700 (+21%) passengers forecast over those in the GDA Strategy. In 2028, the demand in the unlimited scenario is higher than the 85% crush capacity between Ashtown and Glasnevin, whilst in 2043 this demand is higher than the crush capacity between Navan Road Parkway and Drumcondra.

4.3.6 For the Southern line, this peak loading occurs at Booterstown, with an additional 1,300 (+25%) passengers forecast in the 2028 unlimited scenario over the NDP scenario. In 2043, the unlimited scenario forecasts an additional 1,600 (+29%) passengers over the GDA Strategy scenario.

4.3.7 The Kildare line, however, shows a different trend to the other lines, with only a slight increase in passengers compared to 2028 NDP/2043 GDA Strategy schemes, and less passengers than the Do Committed schemes scenario. The 2028 Committed schemes doesn't include for Bus Connects Core Bus Corridor measures, therefore more passengers may be using the rail services over the 2028 NDP schemes (where it is included), hence this shift away from rail in these scenarios for this line. The results indicate that the proposed TSS for the Kildare line provides sufficient capacity to service future demand requirements.

Figure 6. 2028 Northern Line – Southbound AM Peak

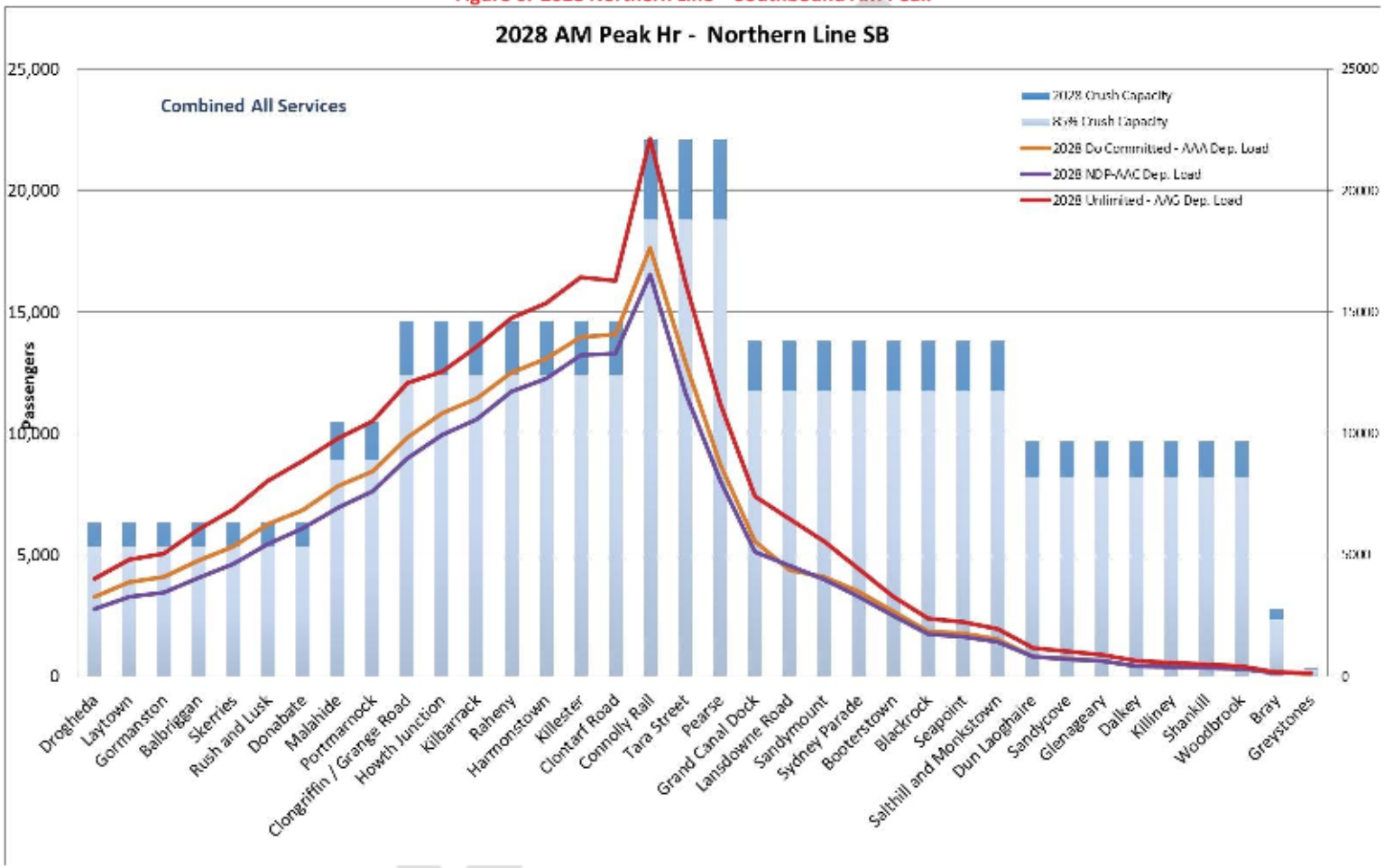


Figure 7. 2028 Kildare Line AM Peak

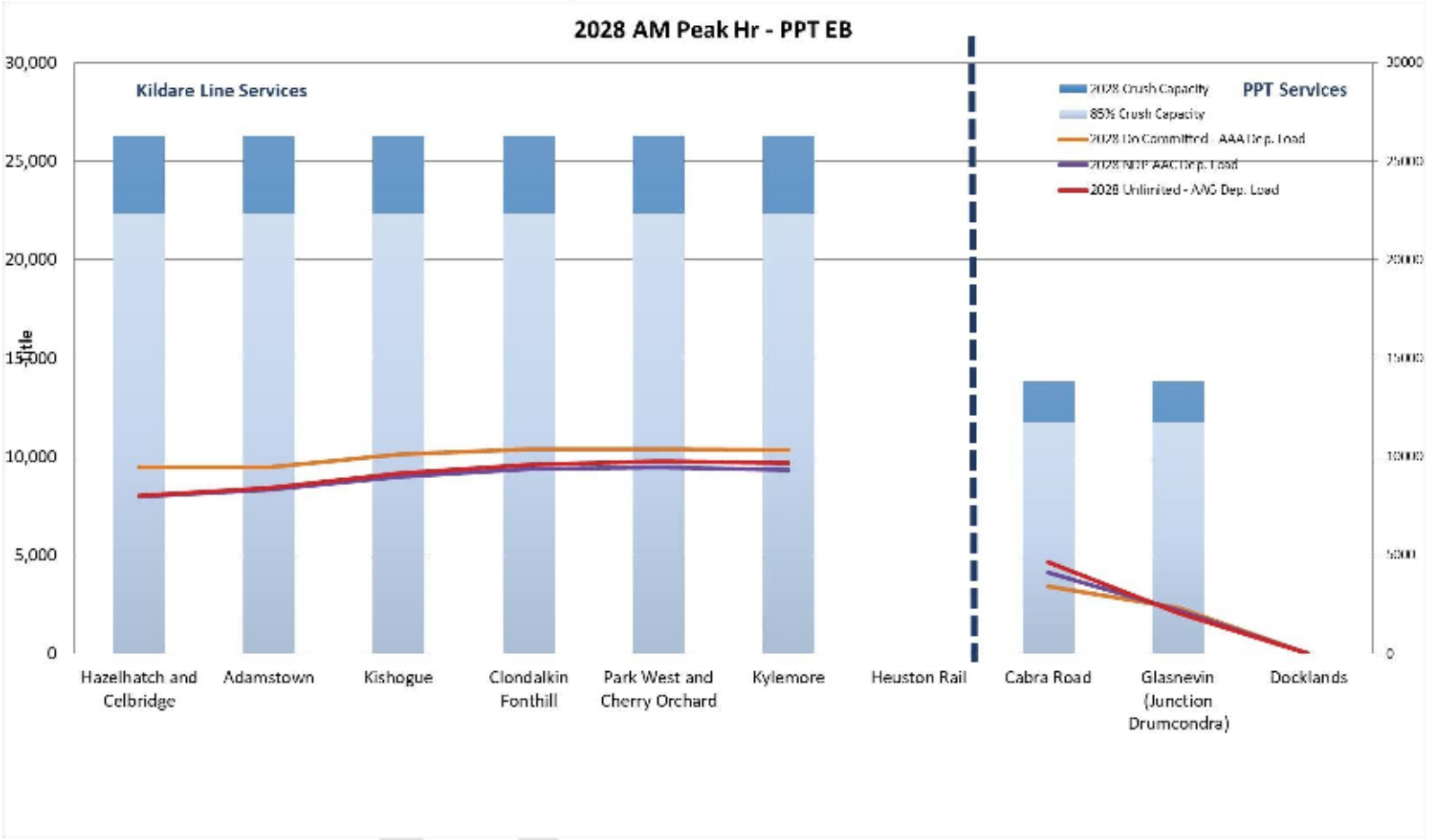


Figure 8. 2028 Maynooth Line AM Peak

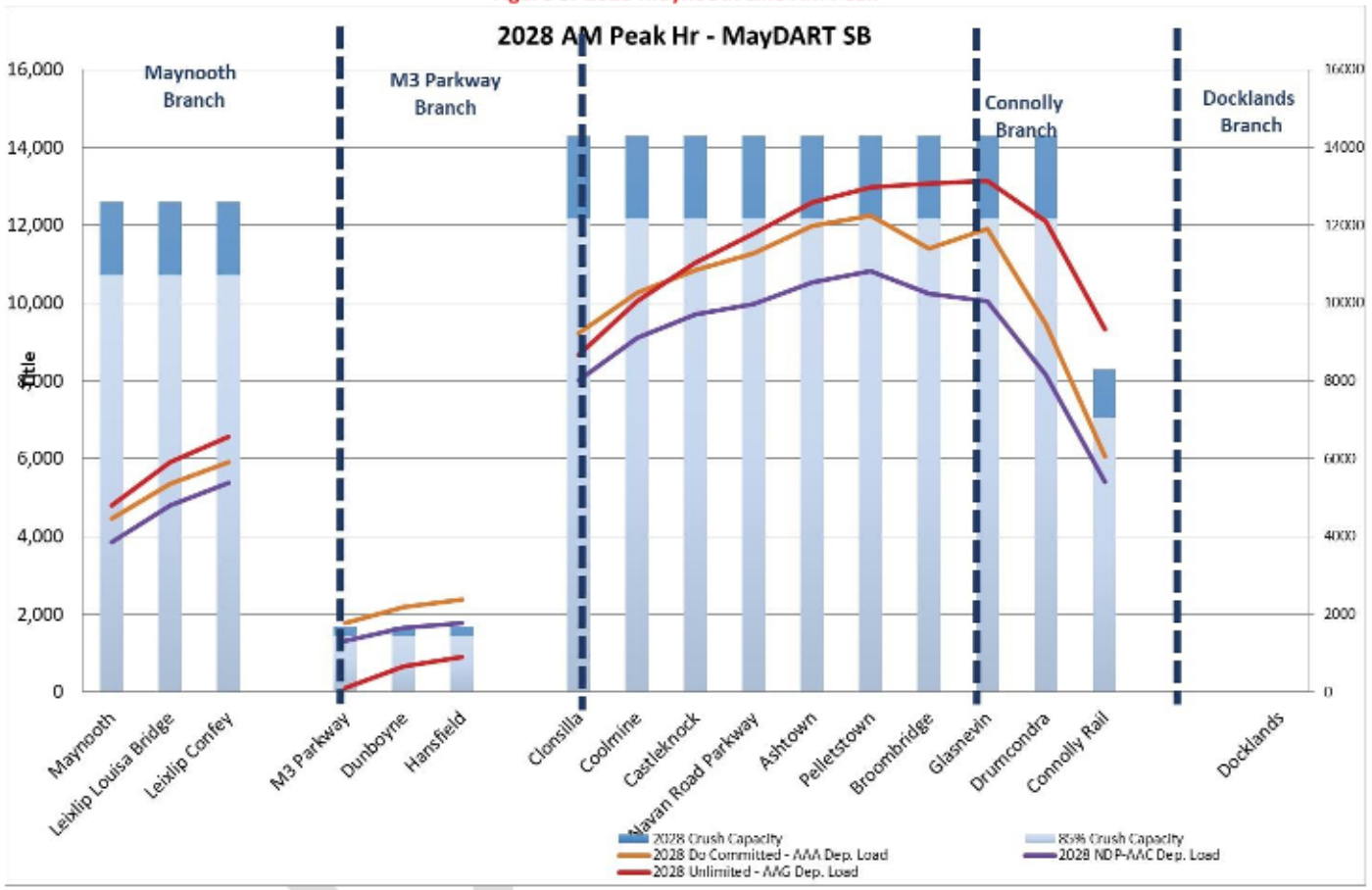


Figure 9. 2028 Southern Line Northbound AM Peak

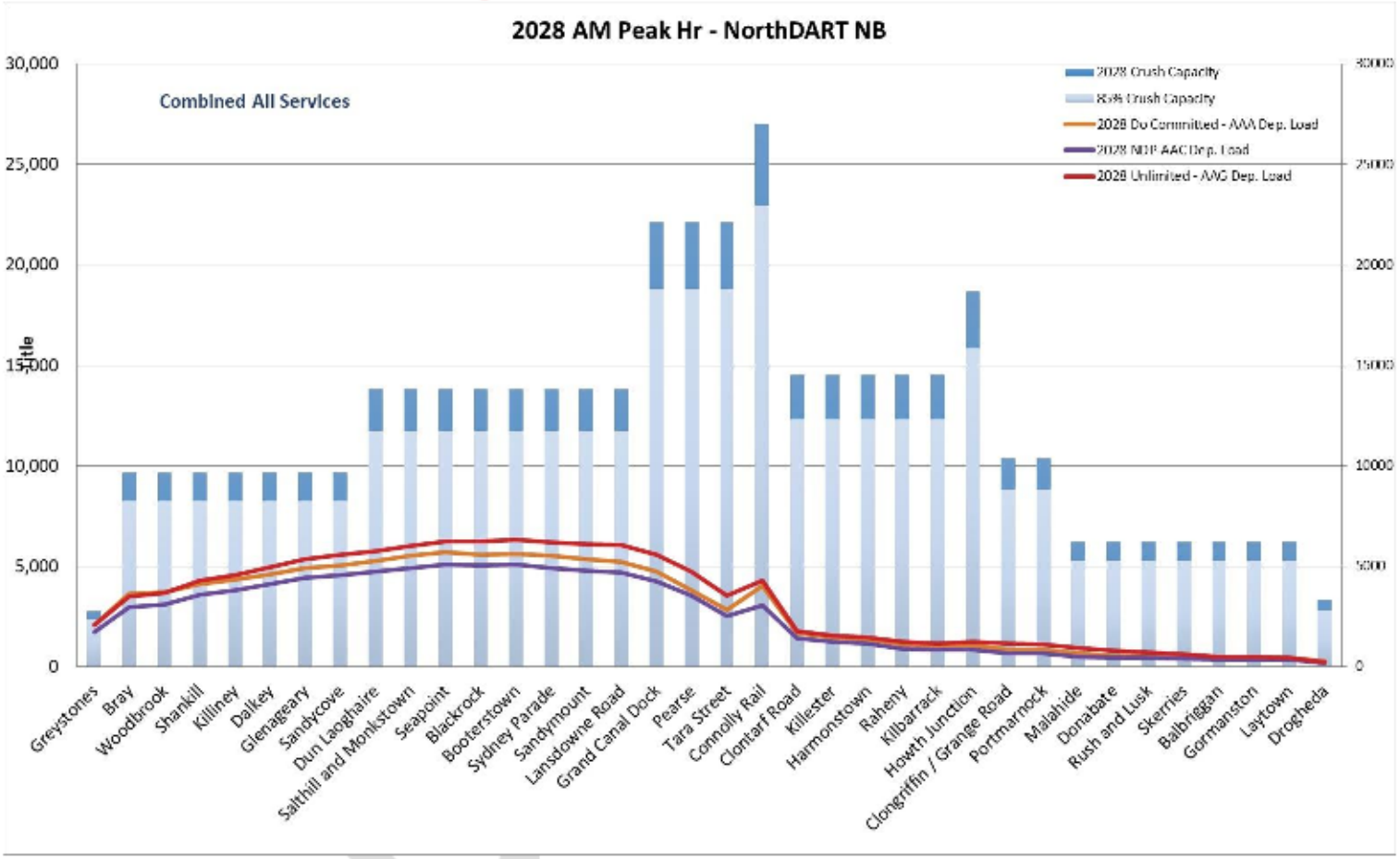


Figure 10. 2043 Northern Line – Southbound AM Peak

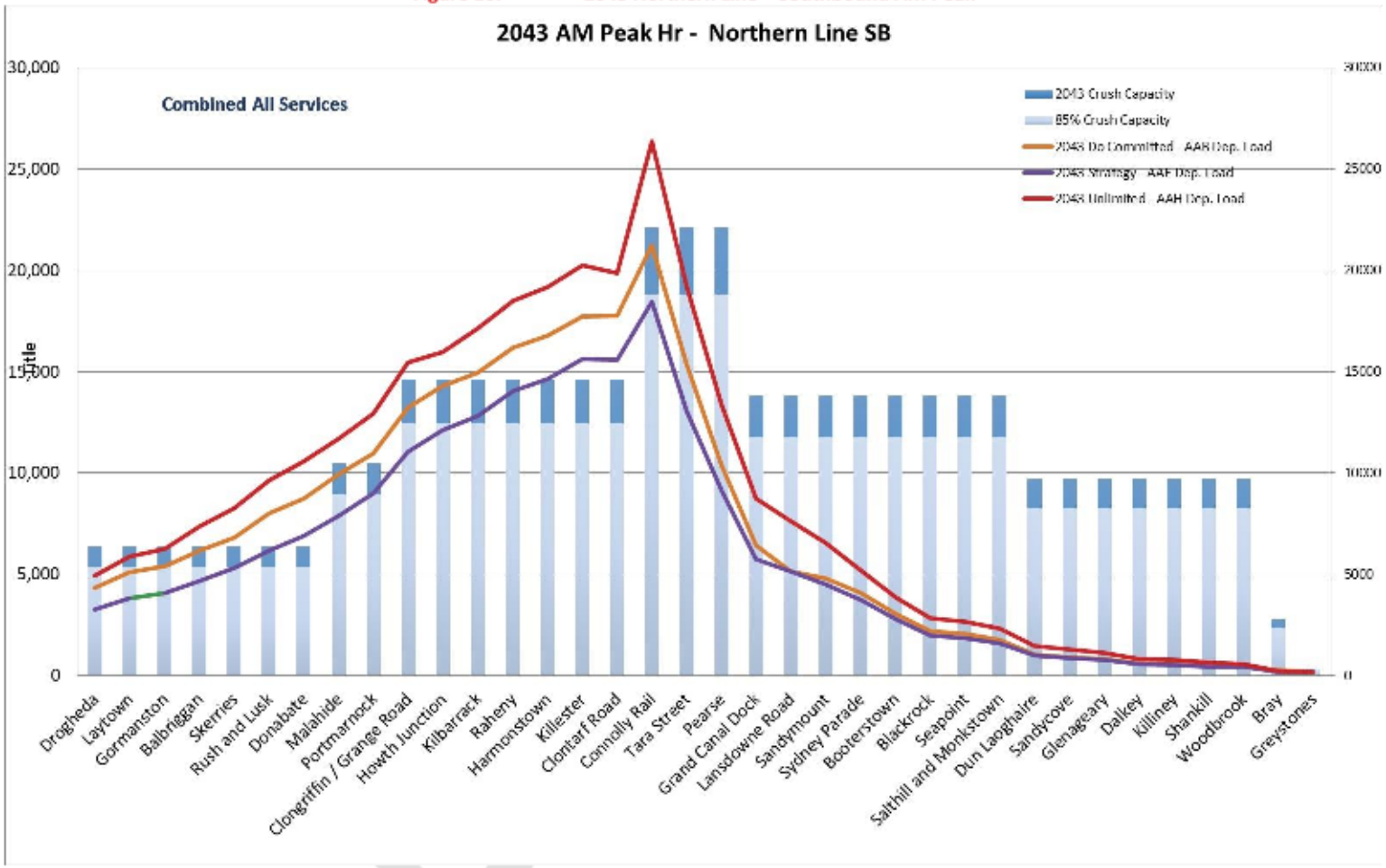


Figure 11. 2043 Kildare Line AM Peak

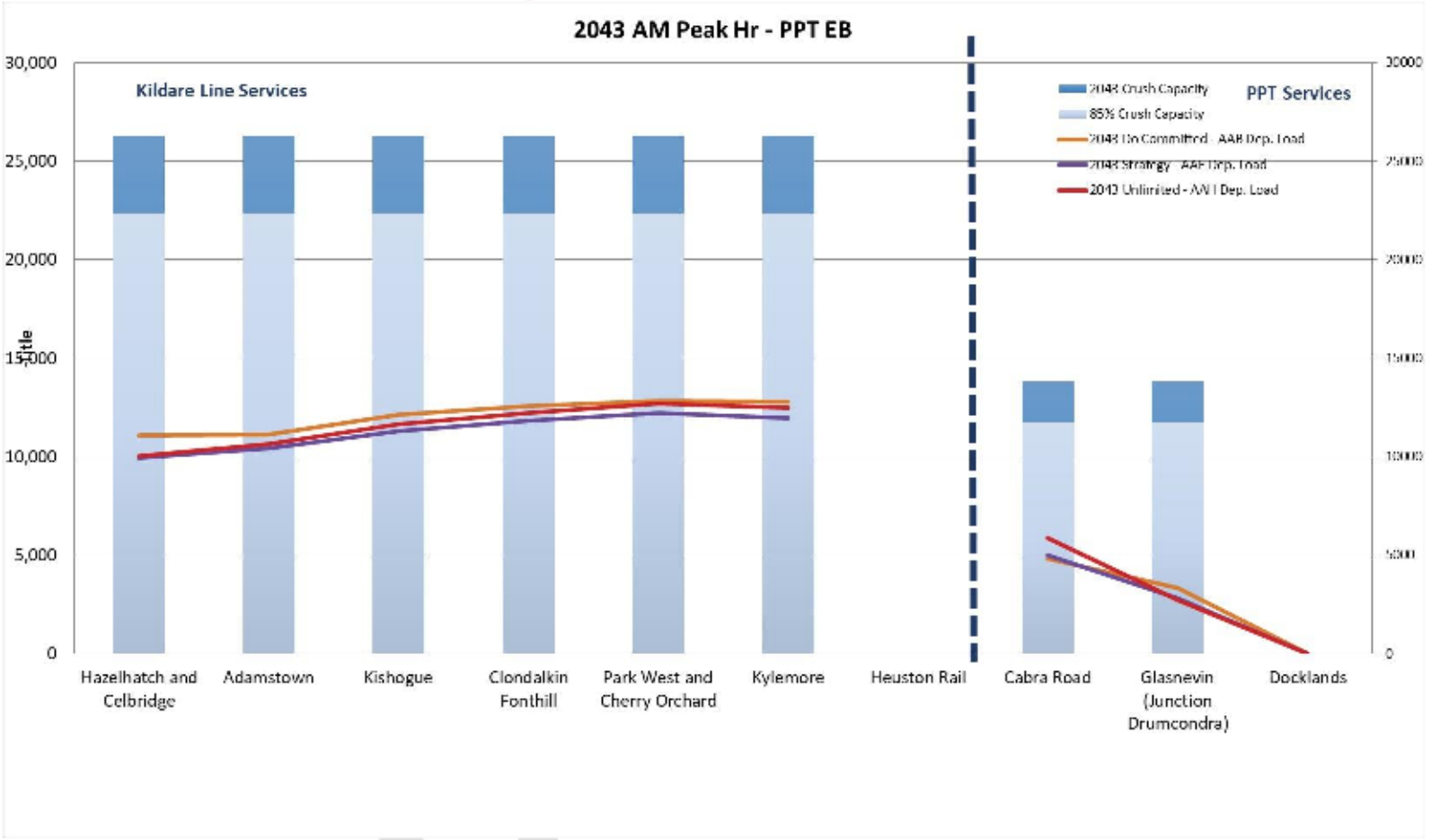


Figure 12. 2043 Maynooth Line AM Peak

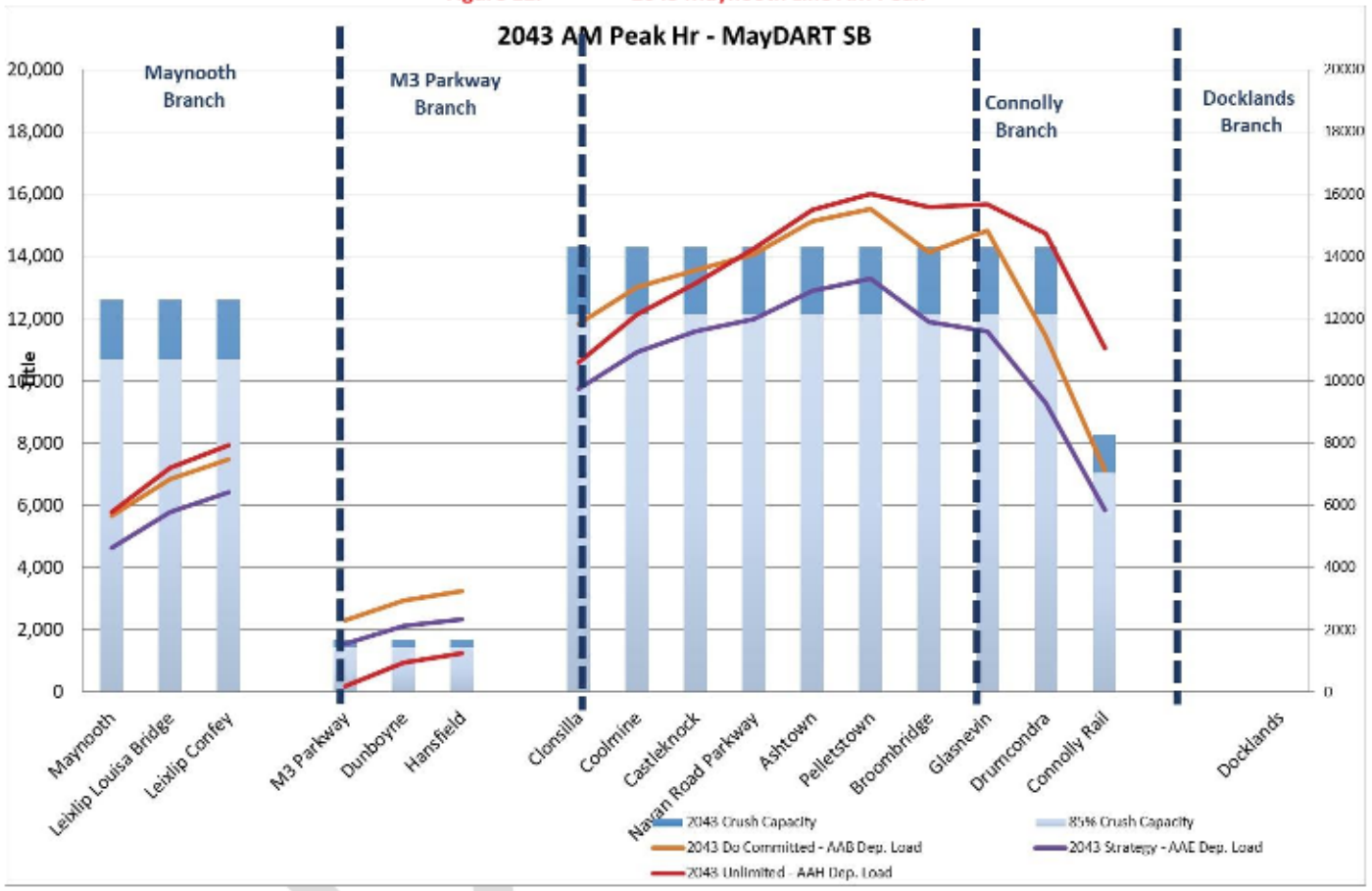
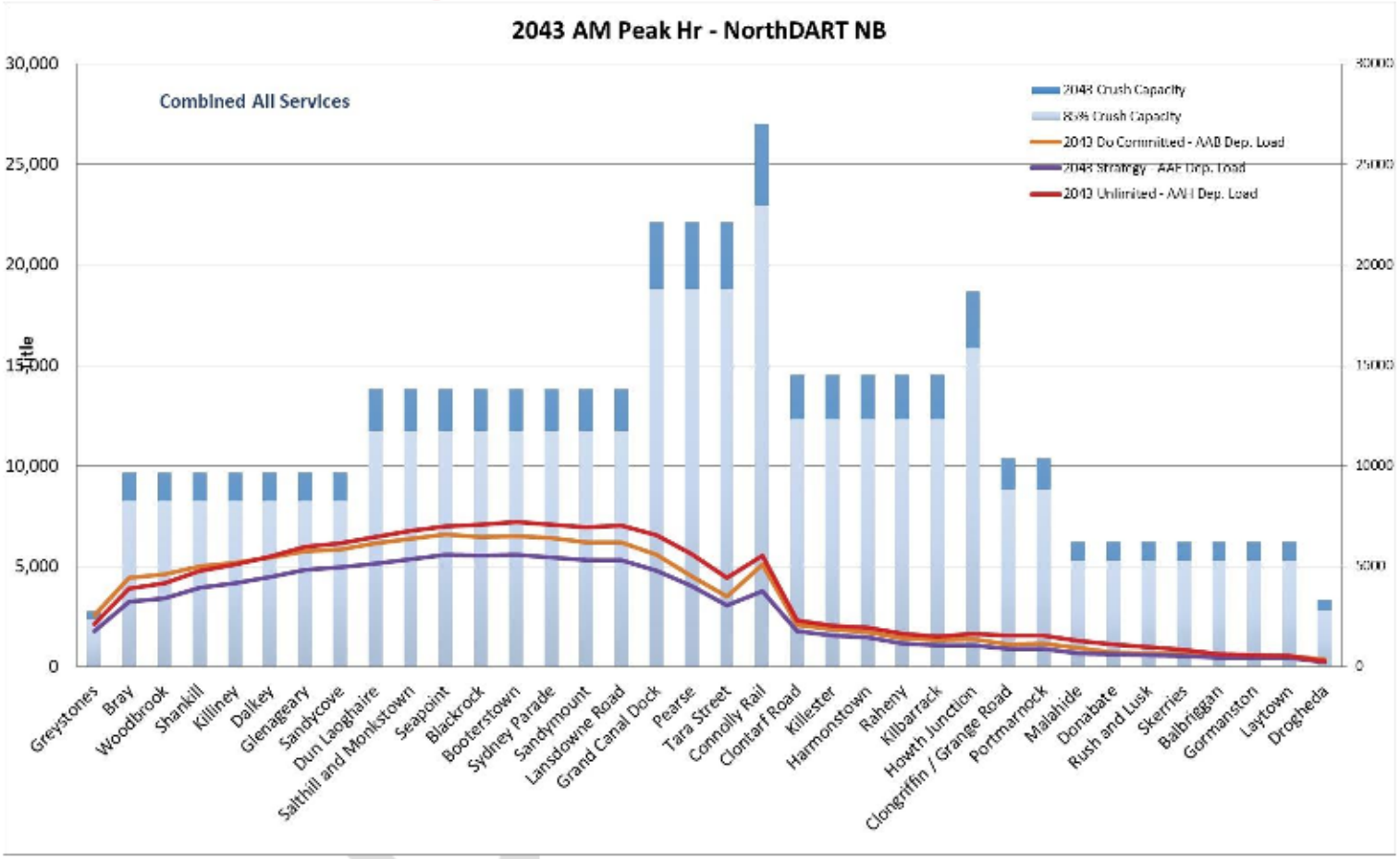


Figure 13. 2043 Southern Lines Northbound AM Peak



5. CONCLUSIONS

5.1 Assessment Conclusions

5.1.1 This report summarises the outcomes of a strategic modelling assessment of the preferred DART Expansion scheme bundle option under a range of Do Minimum Scenarios to understand the potential and likely future demand in each scenario and the latent demand that exists on each line.

5.1.2 The scenarios were tested in the NTA ERM to understand the impacts on passenger demand levels on each line.

5.1.3 In summary, the modelling assessment has found that:

- Latent demand exists on the Maynooth, Northern and Southern lines
  - **Latent demand is the difference in the Total number of boarders between the Unlimited Scenario and the NDP Schemes and GDA Strategy scenarios for 2028 and 2043 respectively (as an example when reviewing Figure 6, this would represent the sum of the area between the purple (2028 NDP) and red line (2028 unlimited). The figures presented in this summary represent the AM peak hour.**
- For the Maynooth line, there is peak latent demand of 4,006 (34% of total NDP boarders) on the line in 2028, and peak latent demand of 5,496 (39% of total GDA Strategy boarders) in 2043
- For the Northern line, there is peak latent demand of 4,378 (25% of total NDP boarders) on the line in 2028, and peak latent demand of 6,121 (30% of total GDA Strategy boarders) in 2043
- For the Southern line, there is peak latent demand of 2,717 (27% of total NDP boarders) on the line in 2028, and peak latent demand of 3,570 (31% of total GDA Strategy boarders) in 2043
- Whilst the proposed TSS for the Kildare line provides sufficient capacity to service future demand requirements, there is still a small level of latent demand of 518 (8% of total NDP boarders) on the line in 2028, and 890 (11% of total GDA Strategy boarders) in 2043.

5.2 Recommendation

To accommodate the additional forecast demand from the unlimited scenarios it is recommended that additional services are provided on the Northern Line between Balbriggan and Connolly and on the Maynooth Line between Navan Road Parkway and Glasnevin.

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Astana, Copenhagen, Kiev, London, Moscow, Riga, Wroclaw

Southern Europe & Mediterranean: Algiers, Baku, Bucharest,
Madrid, Rabat, Rome, Sofia, Tunis

Middle East:
Cairo, Dubai, Riyadh

Asia Pacific:
Bangkok, Beijing, Brisbane, Delhi, Hanoi, Hong Kong, Manila, Seoul, Shanghai, Singapore, Shenzhen, Taipei

Africa:
Abidjan, Douala, Johannesburg, Kinshasa, Libreville, Nairobi

Latin America:
Lima, Mexico, Rio de Janeiro, Santiago, São Paulo

North America:
Little Falls, Los Angeles, Montreal, New-York, Philadelphia, Washington

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