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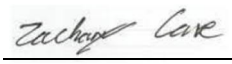
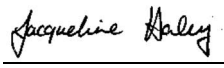
Proposed Strategic Housing Development on lands at Palmerstown Retail Park, Kennelsfort Road Lower, Palmerstown, Dublin 20

Traffic and Transport Assessment

Randelswood Holdings Ltd.

April 2020

Quality information

Prepared by	Checked by	Verified By	Verified by
			
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	14/10/2019	Draft for Design Team Review	CO'B	Cormac O' Brien	Director
2	21/10/2019	Draft for Design Team Review	CO'B	Cormac O' Brien	Director
3	25/10/2019	Draft for Design Team Review	CO'B	Cormac O' Brien	Director
4	29/10/2019	Issued for Planning	CO'B	Cormac O' Brien	Director
5	31/03/2020	Design Team Review	CO'B	Cormac O' Brien	Director
6	10/04/2020	Design Team Review	CO'B	Cormac O' Brien	Director
7	16/04/2020	SHD Issue to ABP	CO'B	Cormac O' Brien	Director

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Table of Contents

1. Introduction

1.1 Background

AECOM has been commissioned by Randelswood Holdings Ltd. to prepare a Traffic and Transport Assessment in support of a planning application submission to South Dublin County Council (SDCC) for 250 no. 'build to rent' apartments (134 no. 1 beds, 116 no. 2 beds) in 5 no. blocks; with a café and ancillary residential amenity facilities on lands adjacent to the Chapelizod Bypass in Palmerstown Business Park, Co. Dublin.

The lands on which the proposed development will be constructed are brownfield consisting of existing commercial properties which are to be demolished as part of this development.

Figure 1.1 – Proposed Site Layout (Courtesy: Downey Planning and Architecture)

1.2 Pre Application Consultation

1.2.1 SDCC, 18th July 2019

Pre-application consultation was undertaken at a meeting with SDCC on Thursday 18th July 2019. At this meeting AECOM presented the scope of the traffic & transportation items associated with the development proposals. The feedback received at this meeting has been incorporated into the methodology utilised in this Traffic and Transportation Assessment. The following items were discussed and agreed at this Pre-application meeting:-

- The provision of a left in/left out arrangement only at Kennelsfort Road Lower Site Access junction.
- Ensure the scheme proposals at site access on Kennelsfort Road Lower and along the southern/eastern site boundaries take cognisance of the emerging BusConnects proposals.
- The provision of a Car Parking ratio of 0.7 per unit is acceptable.
- The use of a nearby donor site to determine representative trip rates for the subject site is acceptable.

1.2.2 An Bord Pleanála Record of Meeting (Case Ref: ABP-305801-19)

A Section 5 PAC was undertaken on the 11th December 2019 with representatives of An Bord Pleanála (Rachel Kenny, Erika Casey and Sorcha Skelly), the design team (Mary McGrath, John Downey, Eva Bridgeman, Justin Halpin, Alesssandra Minicuci, Cormac O'Brien, Michael Dunne, Jane McCorkell) and South Dublin County Council (Hazel Craigie, William Purcell, Laurence Colleran).

The key items on the agenda were as follows:

1. Development Strategy and Architectural Approach

2 Residential Amenity

3. Traffic, Access and Pedestrian/Cycle Amenity

4. Drainage

5. Any other matters

1.2.3 An Bord Pleanála Opinion (Case Ref: ABP-305801-19)

An Bord Pleanála issued a Pre Application Consultation Opinion on the 9th of January 2020. AECOM have provided responses to items 3 and item 12 of this opinion which has been included in Appendix A of this report.

1.2.4 SDCC, April 2020

AECOM undertook further consultation with William Purcell of SDCC to determine if a Letter of Consent was required at the SHD submission stage for the proposed works proposed at on Kennelsfort Road Lower. William confirmed that the Letter of Consent was not required at this stage.

1.3 Objectives

The main objective of this assessment is to examine the potential traffic impact of the proposed development and its access arrangements on the adjacent local road network. The net change in traffic on the network due to additional traffic has been calculated and its influence on the adjacent local road network has been investigated.

In order to complete this report, AECOM has made reference to the following documents:

- South Dublin County Development Plan (2016 – 2022);
- Design Manual for Urban Roads and Streets, DMURS, May 2019 (Dept of Transport, Tourism and Sport/ Dept of Environment, Community & Local Govt);
- Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions), DN-GEO-03060, (TII, June 2017);
- PE-PDV-02045 Traffic and Transport Assessment Guidelines (May 2014), Transport Infrastructure Ireland;
- Greater Dublin Area Cycle Network Plan (National Transport Authority);
- National Cycle Manual (National Transport Authority, 2011); and
- Transport for Ireland Dublin Area Train and Tram Services (Transport for Ireland).

1.4 Study Methodology

The methodology adopted for this report can be summarised as follows:

- Existing Traffic Flow Assessment –Traffic flow data for the AM and PM peak conditions was obtained by classified junction turning count surveys in November 2017.
- Existing Transport Infrastructure – AECOM collated information on the public transport, walking and cycling in the area of the site.
- Development Proposals – Description of the proposed development, including proposed improvements to the road accessing the site and a review of parking and servicing provision and facilities for pedestrians and cyclists.
- Development Trip Generation – based on the quantum of proposed development, AECOM reviewed trip rate data for similar uses and developed anticipated traffic flows, by using the industry standard Trip Rate

Information Computer System (TRICS) database. These flows were then assigned to the existing network having regard for observed traffic patterns on the R148, Lucan Road and Kennelsfort Road.

- Percentage Impact – The development traffic impact on the key junctions, with and without the proposed development was undertaken to determine future operation and any requirements for further analysis or required mitigation measures.
- Impact analysis – traffic modelling was completed where the need for this was identified
- Construction Management – AECOM reviewed the potential impacts of the construction phase upon the surrounding road network.

1.5 Structure of the Report

The remainder of this report is divided into the following sections:

- Section 2 of this report describes the existing conditions at the subject site location and the surrounding area;
- Section 3 provides a summary of the proposed development itself, including the proposed Parking Strategy;
- Section 4 provides a summary of the vehicle trip generation, vehicle distribution, and network assignment exercise is detailed, in addition to quantifying the potential level of impact, as generated by the subject proposals, upon key junctions across the local road network.
- The operational performance of the proposed site access junctions and adjacent local junctions for a range of different development/traffic scenarios following the commissioning of the development proposals are investigated and reported within Section 5;
- Section 6 provides a statement of compliance in accordance with DMURS.
- Section 7 details an indicative Construction Traffic Management Plan.
- Finally, a summary of our appraisal together with the main conclusions of the assessment are provided in Section 8.

2. Existing Conditions

2.1 Introduction

This chapter includes a review of the existing baseline conditions of the site including public transport, walking and cycling facilities and the current operation of the surrounding public network. AECOM undertook numerous site audits to identify the existing conditions in the vicinity of the site. The findings from AECOM's analysis are presented within this chapter.

2.2 Location

The subject site is situated in Palmerstown, approximately 8km from Dublin City Centre, and approximately 0.8km from M50 Junction 7. The existing site use consists of an industrial retail unit that accommodates five businesses, which comprise furniture retail and storage. The site is mainly used for car stock storage with the remainder being utilised as retail units and approximately 20 no. parking spaces and therefore has an existing level of vehicular trips associated with the site.

The site is bounded by the Chapelizod Bypass to the south, residential dwellings to the north, the Kennelsfort Road Lower to the east and commercial properties to the west.

Figure 2.1 below shows the developments location in relation to Dublin City and Figure 2.2 showing the surrounding environs of the proposed development.

The posted speed limit along the Kennelsfort Road Lower, travelling northeast bound from the subject site is 30km/hr, whilst travelling south westbound along Kennelsfort Road Lower, the posted speed limit is 60km/hr. The Chapelizod Bypass is also subject to a speed limit of 60km/hr.

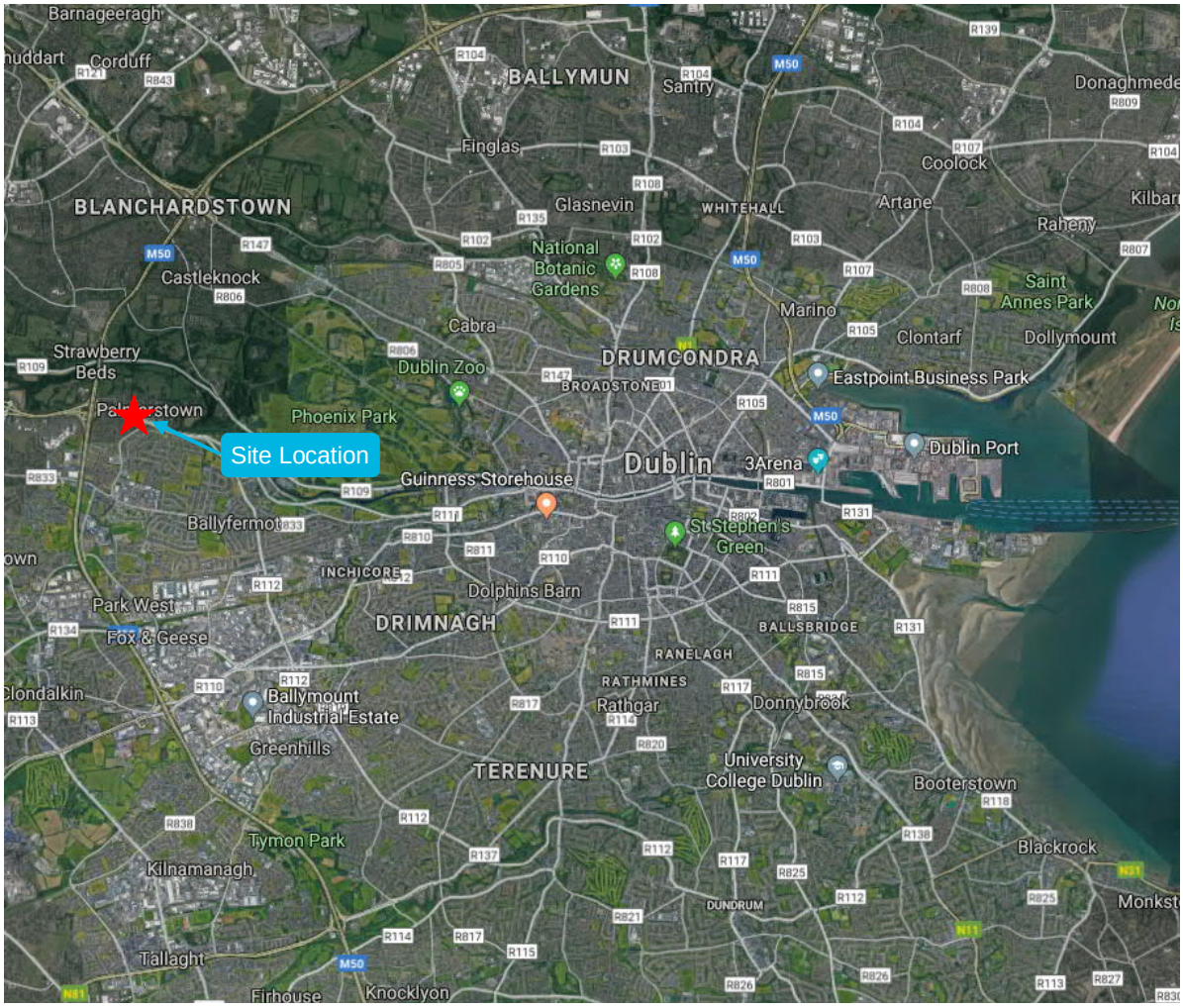


Figure 2.1 – Development location in relation to Dublin City Centre (Source: Google Maps)

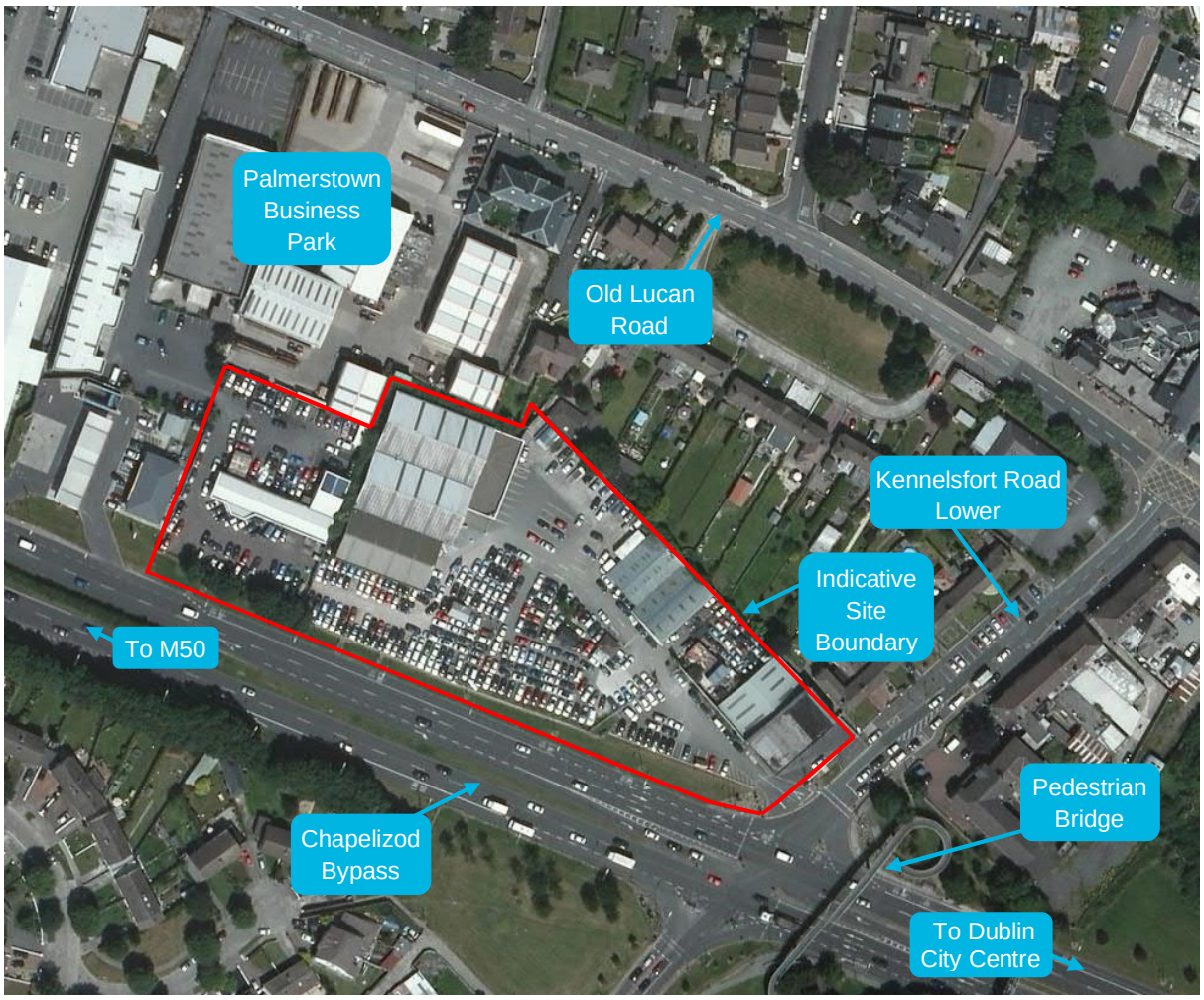


Figure 2.2 – Existing Site Layout (Source: Bing Maps)

2.2.1 Land Use Zoning

The subject lands are zoned for Village Centres *'Objective VC'* within the current South Dublin County Development Plan (2016-2022) as illustrated within Figure 2.3 below.

The zoning objective of 'VC' is '*To protect, improve and provide for the future development of Village Centres'*.

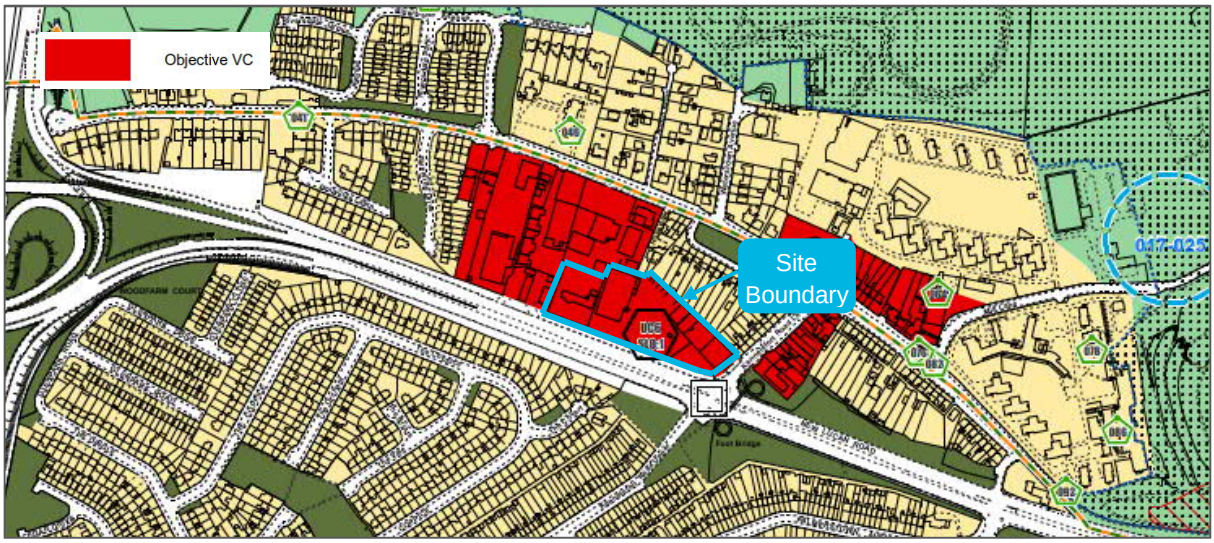


Figure 2.3 – Site Zoning (Source: South Dublin County Development Plan)

2.3 Existing Transportation Infrastructure

2.3.1 Background

An important stage in the development of a Traffic and Transport Assessment is the identification and appreciation of the local network's existing transport conditions and vehicle movement characteristics.

An audit of the local road network has therefore been undertaken to establish the existing transport conditions and vehicle movement patterns across the existing network.

2.3.2 Existing Pedestrian Environment

In the vicinity of the subject site there are pedestrian footways along both sides of the Kennelsfort Road Lower. There is a signalised pedestrian crossing provided on Kennelsfort Road Lower adjacent to the site, north of the existing vehicular access point. The aforementioned crossing leads to a pedestrian footbridge across the Chapelizod Bypass, which allows pedestrians to access Kennelsfort Road Upper.

East of the subject site, there are pedestrian footways available along the Chapelizod Bypass providing access to the bus interchanges situated adjacent to the pedestrian footbridge.

2.3.3 Existing Cycling Environment

Cycle lanes are provided to the south of the proposed development along Kennelsfort Road Upper connecting with the Ballyfermot Road at Cherry Orchard Industrial Estate. From there, there are staggered cycle lanes to the east and west along Ballyfermot Road and Oldcut Road.

To access this cycle lane from the entrance to the site, cyclists can cycle through the existing signalised junction between the Chapelizod Bypass and the Kennelsfort Road.

There is also a pedestrian and cyclist bridge to the south east of the development to facilitate pedestrians and cyclists crossing the M50 and with access to Liffey Valley Shopping Centre. The recently completed Palmerstown Cycle Track commences close to the site, which enhances connectivity towards Dublin City Centre from Palmerstown.

Figures 2.4 shows the existing cycle network in the vicinity of the site with Figures 2.5 to 2.8 below showing the existing pedestrian/cycle network in the vicinity of the site.

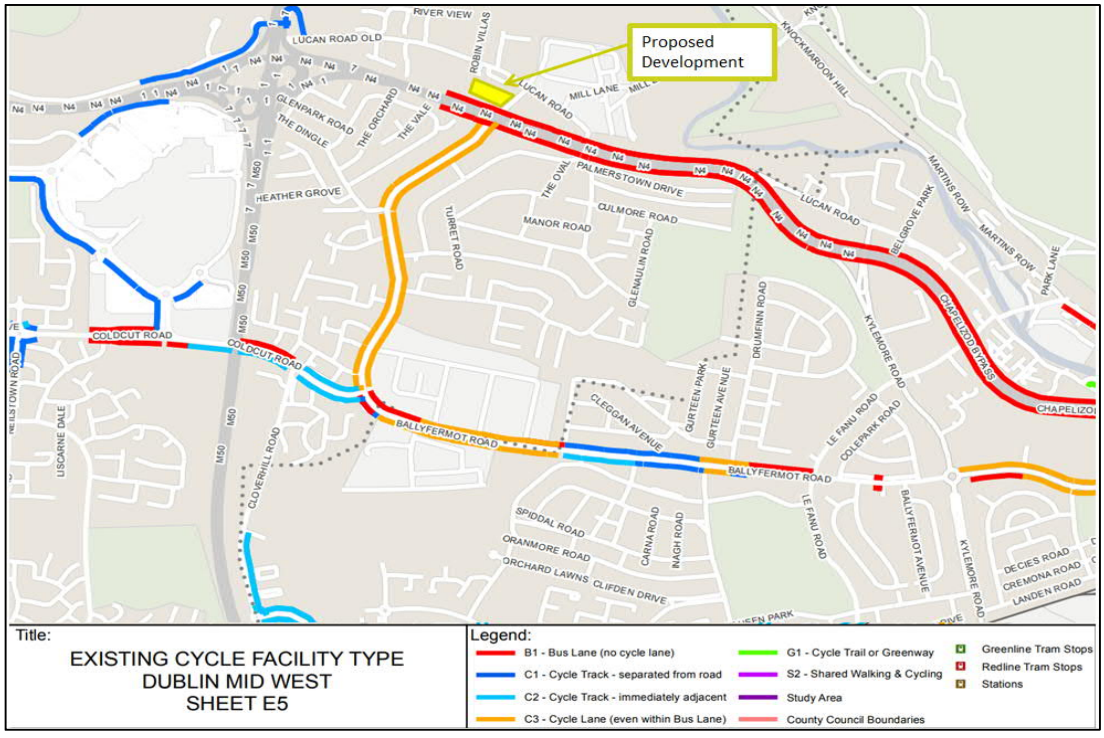


Figure 2.4 – Existing cycling facilities (Source: NTA)

Figure 2.5 –Eastbound Approach to Chapelizod Bypass / Kennelsfort Road Junction adjacent to site

Figure 2.6 – Westbound Approach to Chapelizod Bypass / Kennelsfort Road Junction

Figure 2.7 – Southbound Approach to Chapelizod Bypass / Kennelsfort Road Junction

Figure 2.8 – Northbound Approach to Chapelizod Bypass / Kennelsfort Road Junction

2.3.4 Public Transport - Bus

As graphically illustrated in Figure 2.9 below, the site is situated to benefit from bus transport connections allowing residents of the subject site to travel by this sustainable mode.

The closest bus stops to the site are located on Kennelsfort Road Lower and Chapelizod Bypass approximately 50 meters north-east of the site and 50m south-east of the site, respectively. These bus stops are served by a number of Dublin Bus Routes, as detailed in Figure 2.10 below. The majority of these services are destined for the Dublin City Centre (Merrion Square), travelling on the Chapelizod Bypass and there are high frequency services travelling along these routes. In the opposite direction, travelling outbound from the city, there are services destined for Maynooth, Dodsboro, Lucan and Adamstown, also travelling on the Chapelizod Bypass.

Importantly, the area is serviced by the Lucan QBC, a high Quality Bus Corridor that gives dedicated road space and traffic signal priority to buses in order to reduce journey times and improve service consistency.

To the east of the site, on the Kennelsfort Road Upper bus services are provided in the destination of Sandymount, servicing Kimmage, Rathmines, Ranelagh, Ballsbridge and Sandymount.

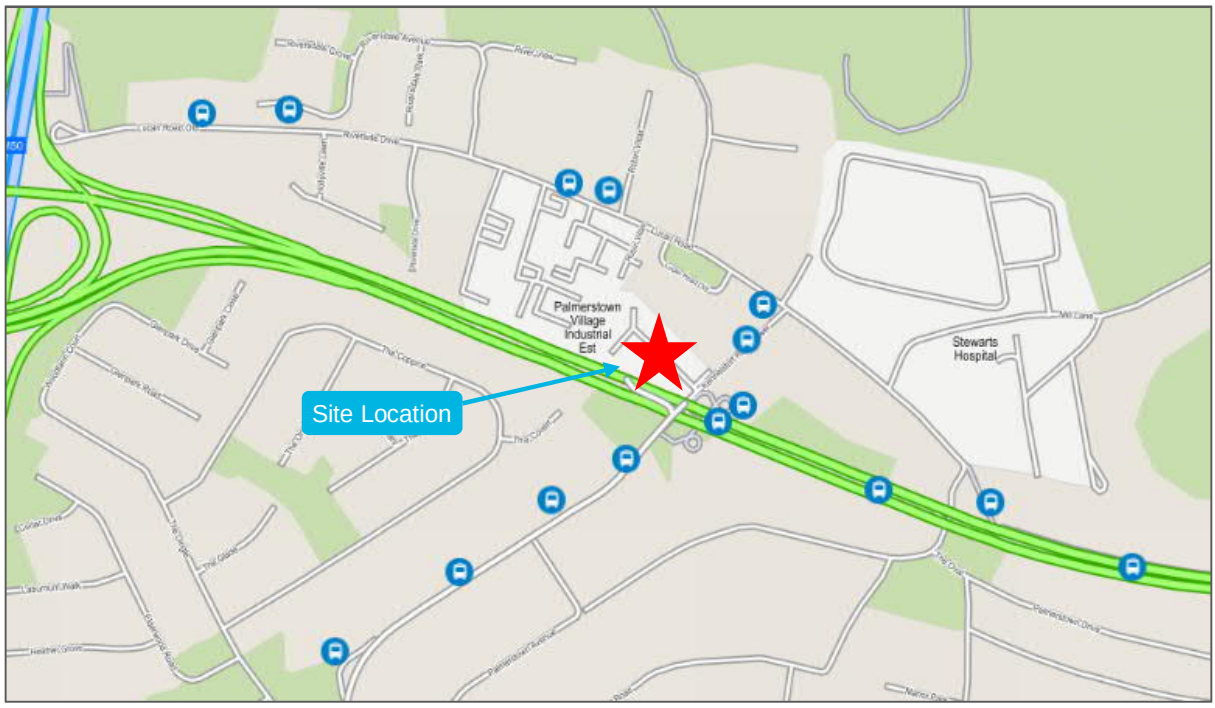


Figure 2.9 – Bus Stops in the Vicinity of the site (Source: www.journeyplanner.transportforireland.ie)

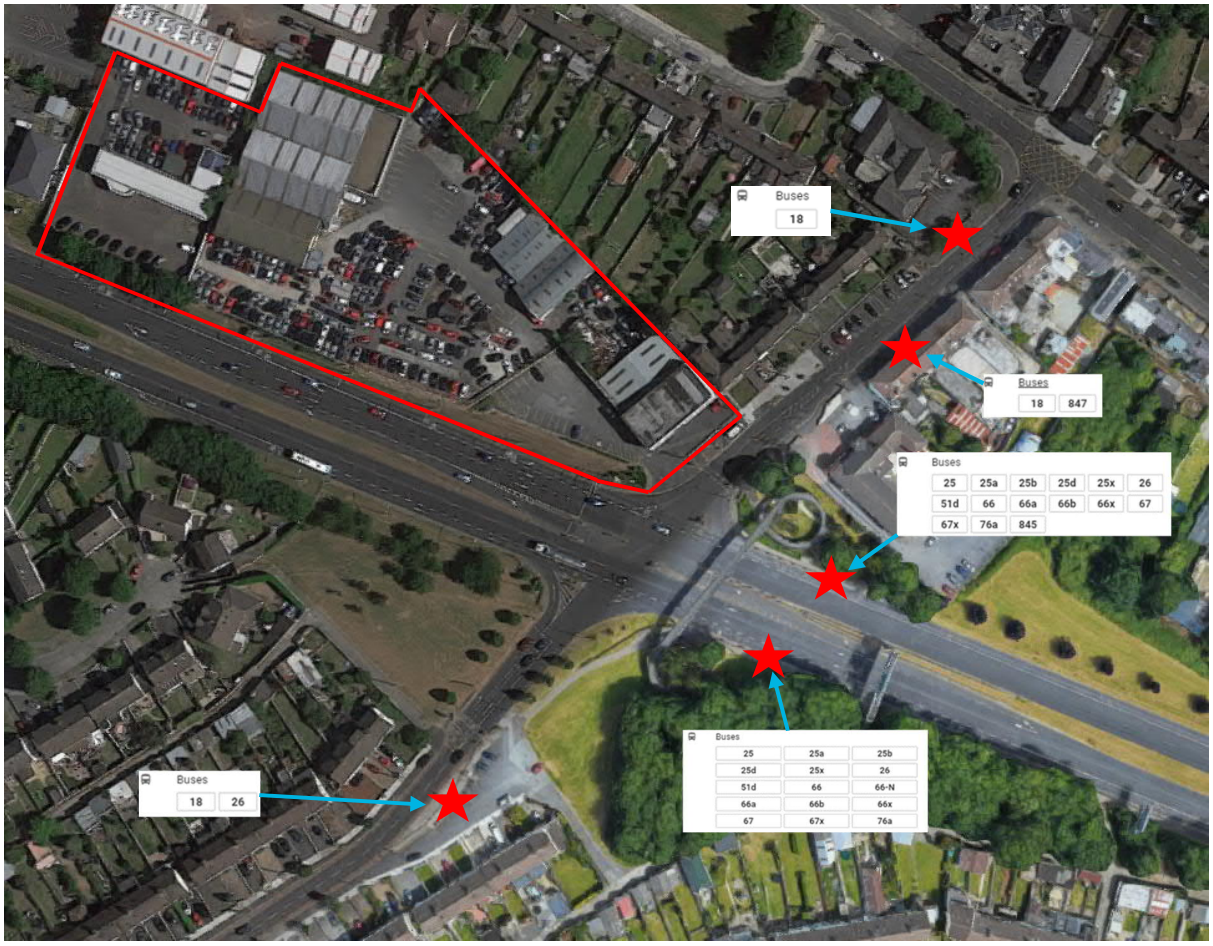


Figure 2.10 – Existing Bus Services (Source: Google Maps)

2.3.5 Public Transport – Heavy Rail

The closest railway station to the site is Park West and Cherry Orchard, located 3.3km (45 minute walking distance) to the south of the development. It provides commuter rail services to/from Dublin Heuston and Dublin Grand Canal Dock. Alternatively Heuston Station is accessible via Dublin Bus route 25a and 25b with an approximately 12min travel time.

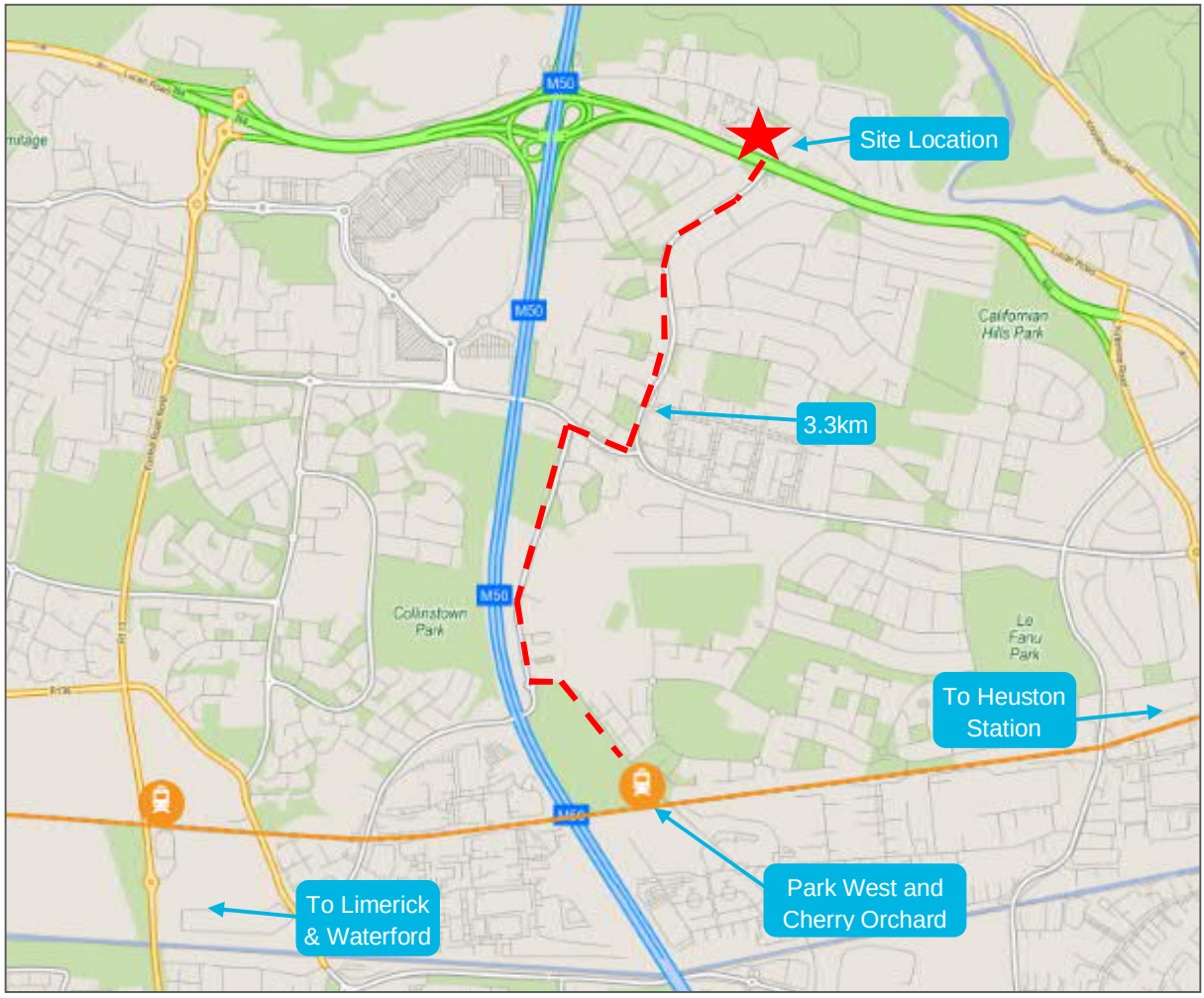


Figure 2.11 – Park West and Cherry Orchard (Source: journeyplanner.transportforireland.ie)

2.3.6 Public Transport – Light Rail

There is no light rail within walking distance of the site with the nearest Luas stop being Kylemore on the Luas Red Line approximately 5.2km from the site however, the Luas Red Line running from Saggart/Tallaght to Connolly/The Point is accessible at Heuston Station which can be reached via Dublin Bus route 25a and 25b in 12min from the proposed development.

Figure 2.12 – Luas Red Line Route (Source: www.journeyplanner.transportforireland)

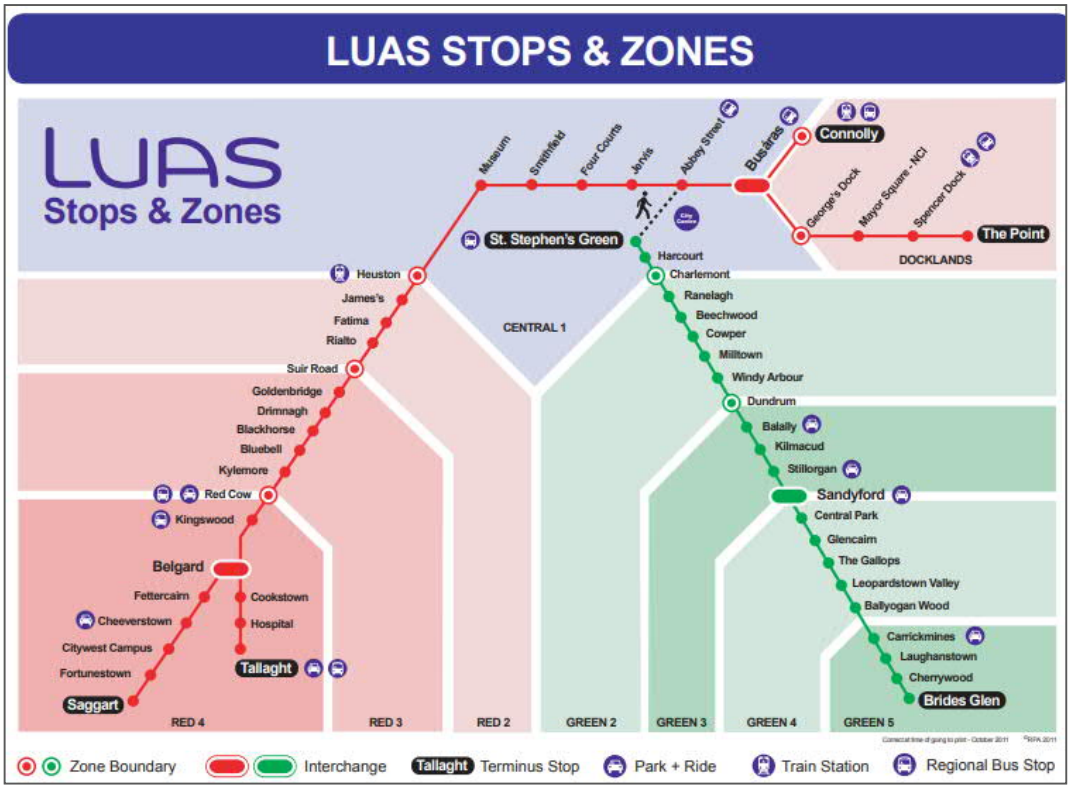


Figure 2.13 – Luas Stops and Zones (Source: Luas.ie)

2.4 Emerging Transportation Infrastructure

2.4.1 Cycle Network Proposals

In the vicinity of the subject site, it is planned to upgrade the Old Lucan Road north of the site as Figure 2.14 below shows the proposed cycle network upgrades as part of the Cycle Network Plan for the Greater Dublin Area.

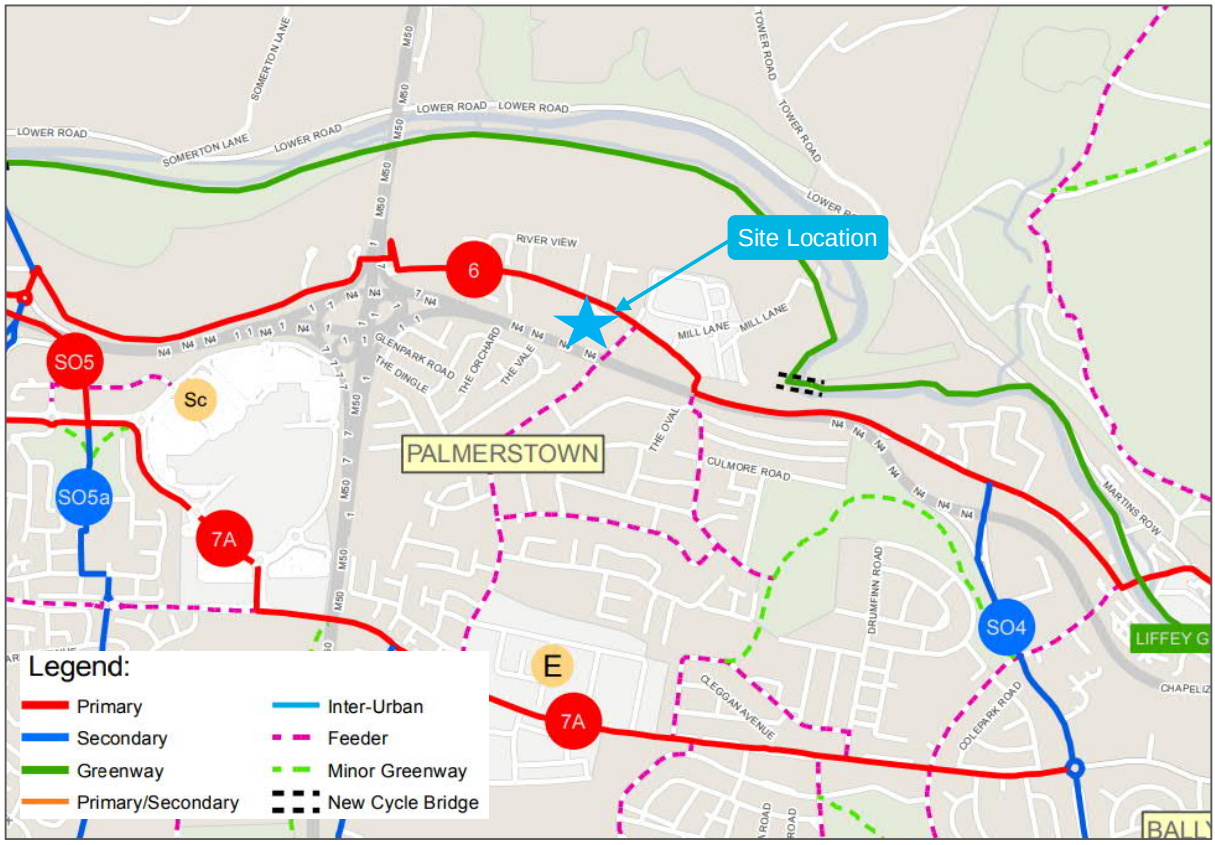


Figure 2.14 – Proposed Cycle Network Upgrades (Source: www.nationaltransport.ie)

2.4.2 Bus Network Proposals - BusConnects

The National Transport Authority (NTA) has put forward proposals to upgrade a number of core bus corridors from the Dublin environs to the city centre under the title 'BusConnects'. The aim of this project is to:

- *'Make bus journeys faster, predictable and reliable*
- *New bus stops and better facilities*
- *More efficient network, connecting more places and carrying more passengers*
- *Updated ticketing systems and implementing a cashless payment system with a simpler fare structure*
- *Improving the cycling network and making it safer'*

The development site is situated along 'Route No. 6 – Lucan to City Centre', Figure 2.15 and 2.16 below shows the proposed route in relation to the development and the preliminary proposed upgrades to the road network, respectively. It should be noted, the BusConnects proposals have yet to be finalised.

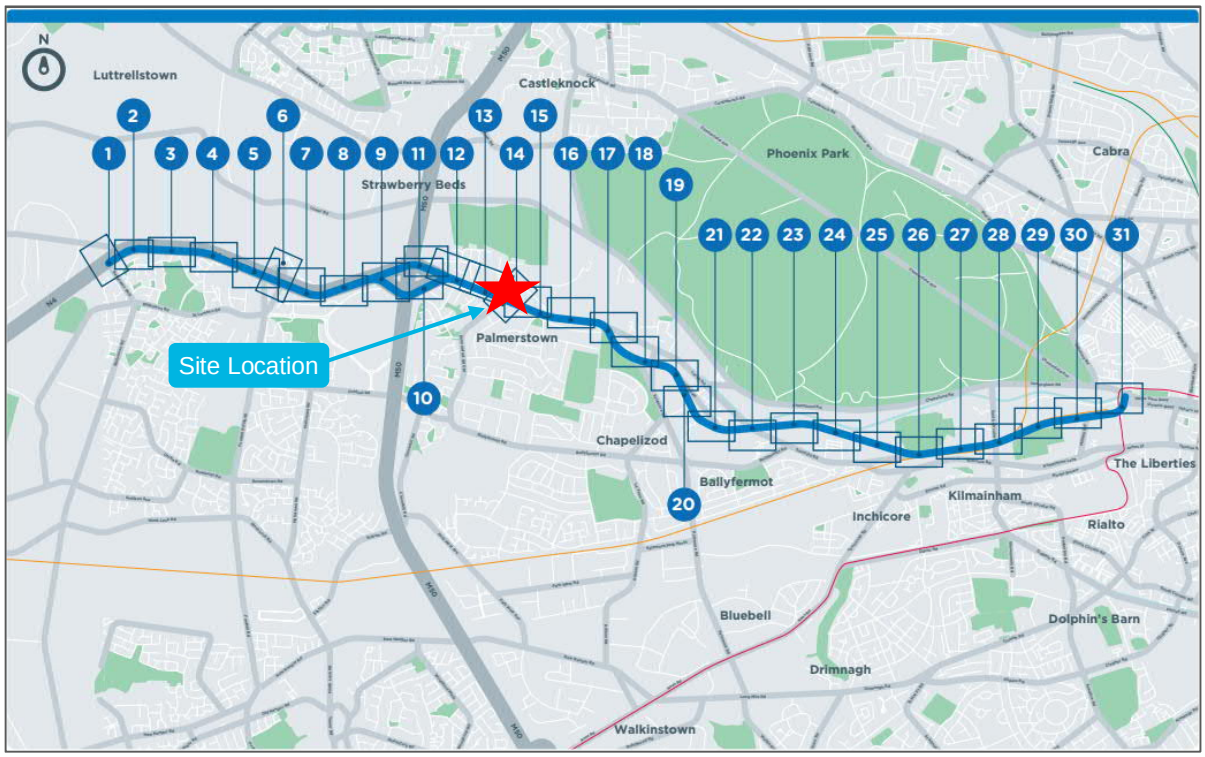


Figure 2.15 – Site Location in Relation to Bus Connects Proposal (Source: 6. Lucan to City Centre - Index Map, Bus Connects.ie)

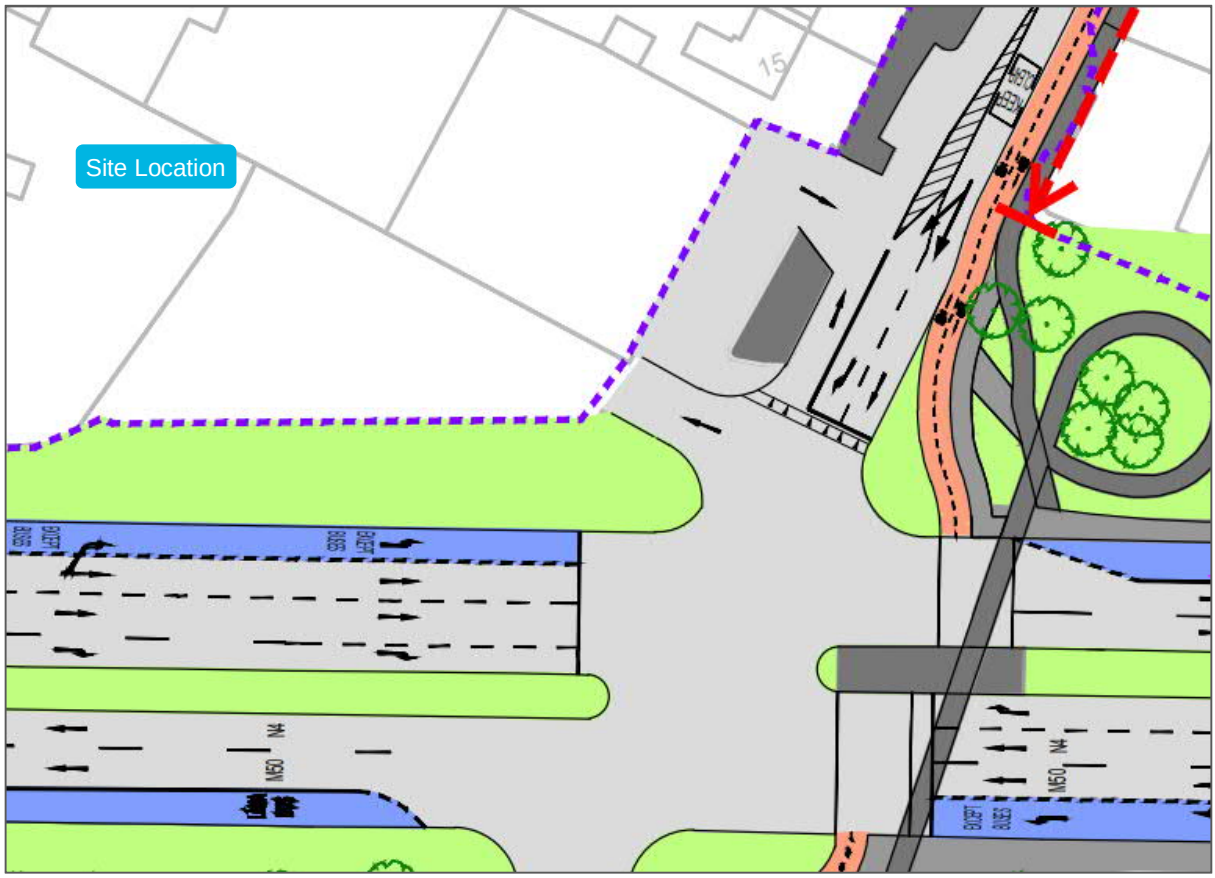


Figure 2.16 – Bus Connects Proposal (Source: 6. Lucan to City Centre – Map 13, Bus Connects.ie)

Figure 2.17 & 2.18 below indicate the existing and the proposed bus service midday frequencies in the vicinity of the subject site, prior to and after the Bus Connects network redesign.

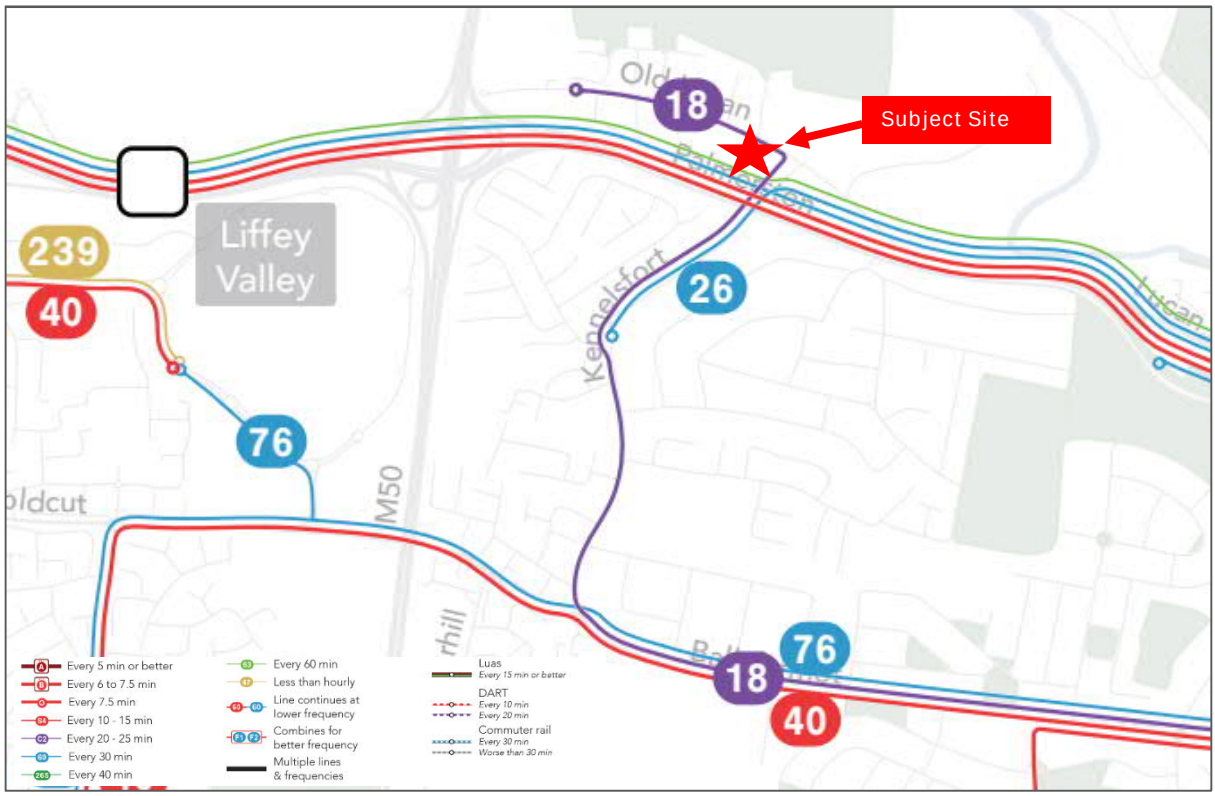


Figure 2.17 – Existing Public Transport Services (weekday midday frequency) (Extract of Map 1 - busconnects.ie)

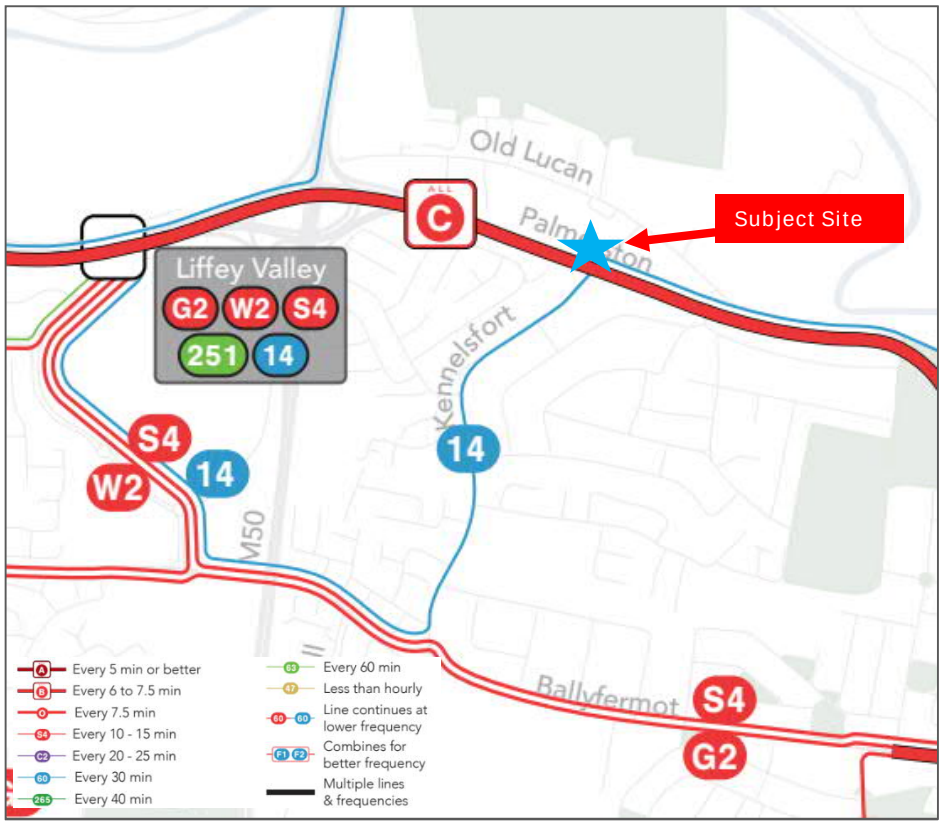


Figure 2.18 – Proposed Public Transport Services (weekday midday frequency) (Extract of Map 2 - busconnects.ie)

Under the Bus Connects proposals, the subject site is ideally located to benefit from the enhanced accessibility levels delivered by Bus Connects scheme as the Chapelizod Bypass will offer a service every 6 to 7.5 minutes.

2.4.3 Local Road Proposals

The South Dublin County Development Plan 2016-2022, has outlined long-term road network proposals which will be phased '*according to need'* and *'may be brought forward for construction at an earlier date, subject to funding being available'*. In the general vicinity of the subject site there are junction proposals identified for the Kennelsfort Road Lower/Chapelizod Bypass junction (refer to Figure 2.19 below).

According to the Development Plan, the function of these upgrades will be:

'Provision of grade separated junction to enhance the efficiency of the junction, particularly for buses on the N4/Lucan Road QBC and ensure safe crossing facilities are provided for all users'.

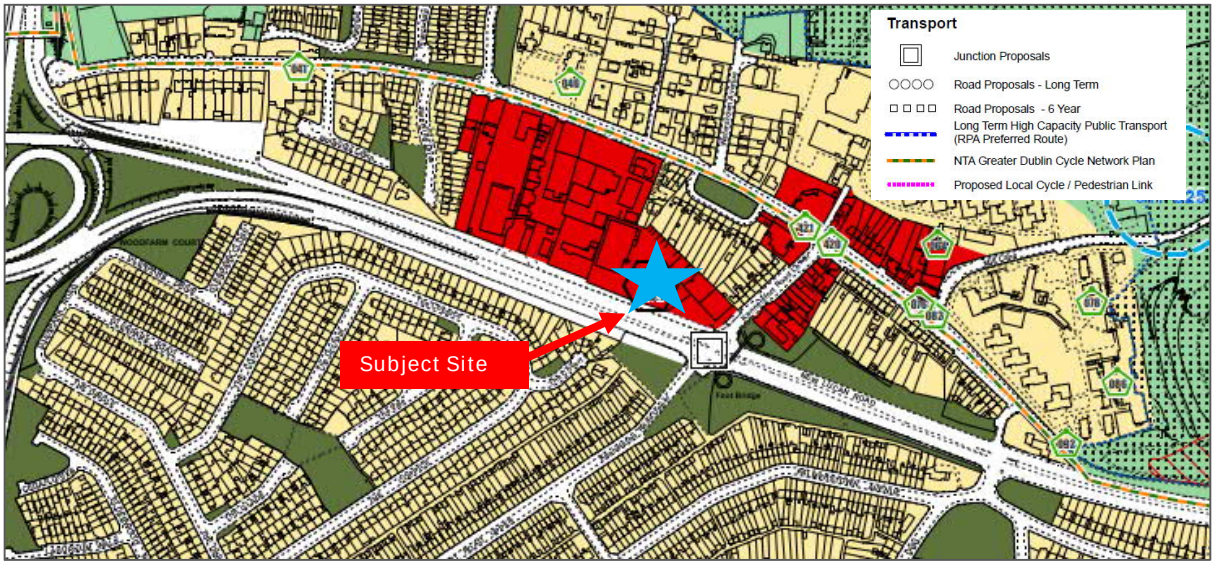


Figure 2.19 – SDCC Infrastructure Objectives in vicinity of subject site (Extract of Map 8 SDCC Development Plan)

2.4.4 Timescales

The implementation of the above cycle, public transport and road infrastructure schemes by the local authority will be subject to further design, public consultation, approval, and importantly availability of funding and resources.

2.5 Existing Site Access

Existing vehicular access to the eastern section of the site is provided at Kennelsfort Road Lower. This access point serves the existing commercial properties located on the subject site.

The western section of the site is currently accessed from the Old Lucan Road via the Palmerstown Business Park as illustrated in Figure 2.20 below.

Figure 2.20 – Existing Site Access Locations

2.6 Road Collision Statistics

A review of the Road Safety Authority (RSA) traffic collision database has been undertaken for the road network in the vicinity of the proposed site to identify any collision trends. This review will assist to identify any potential safety concerns in relation to the existing road network.

Traffic collision data was obtained for the period 2005 – 2016, which is the most recent data available from the RSA website. It should be noted that information relating to reported incidents for the years 2017, 2018 and 2019 is not yet available on the Road Safety Authority (RSA) website. The RSA records detail only those occasions where the incident was officially recorded such as the Garda being present to formally record details of the incident.

The incidents are categorised into class of severity, which includes minor serious and fatal collisions. The collision locations are shown in Figure 2.21 below.

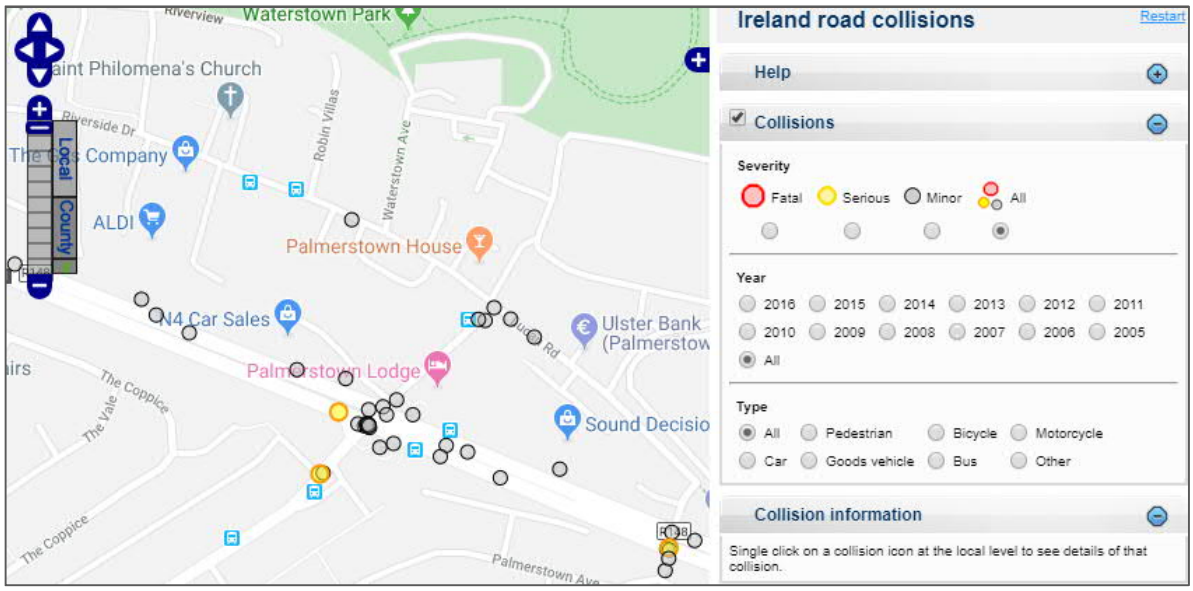


Figure 2.21 – Collision Record within the vicinity of the subject site (source: www.rsa.ie)

Upon inspection there are a number of collisions recorded at the junction of R148 and Kennelsfort Road Upper/Lower. The majority of the collisions are recorded as minor collisions however there was one serious collision in the vicinity of the junction which occurred in 2007, involving a HGV.

It is considered that the number of collisions at this location is reflective of an arterial road into Dublin City Centre, a regional road with the volumes experienced.

However, a road safety concern is the existing uncontrolled site access, located within a signalised junction which is shown in Figure 2.22 below. This existing scenario is undesirable as vehicles entering and exiting the site are not controlled by the adjacent traffic signals on Kennelsfort Road Lower. Therefore there is a risk that there could be conflict between vehicles exiting the site (and turning right) and traffic travelling southwest along Kennelsfort Road.

A key safety improvement of the proposed design (which will be discussed later in this report) is the relocation of the current uncontrolled access from within the junction.

Figure 2.22 – Existing Access to be relocated (Source: Google Maps)

Road Safety is entrenched in the design proposals, within the immediate vicinity, with a view to improve safety where possible. To supplement this, a Quality Audit which includes a Road Safety Audit also forms part of this submission.

Figure 2.23 – Existing Site Access (Source: Google Maps)

2.7 Previous Planning Applications

2.7.1 Mixed Use Development, Planning Ref: SD09A/0021/EP

The subject site was previously granted planning permission as part of an overall mixed use development (which also encompassed the 'Printworks' lands to the west), by South Dublin Council in July 2009 (Ref SD09A/0021), and subsequently by ABP in May 2010 following a third party appeal.

The proposed development comprised of the following, of which was amended at part of Significant Further Information:

Table 2.1 – Mixed Use Development Schedule

Initial Development Schedule Submitted for Planning		Significant Further Information Amendments	Resulting Development Schedule Approved Planning Permission	
5,957sqm Retail	Main Anchor Unit 3,158sqm	Reduction in size to 1,535 sqm	4334sqm Retail	Main Anchor Unit 1,535 sqm
	Secondary Anchor Unit 952sqm	-		Secondary Anchor Unit 952sqm
	14 no. retail units (50-241 sqm)	Omission of 1 retail unit		14 no. retail units (50-241 sqm)
	Restaurant 156 sqm	-	Restaurant 156 sqm	
	Café 156 sqm	-	Café 156 sqm	
	Office space 733 sqm	-	Office space 733 sqm	
	Library 348 sqm	-	Library 348 sqm	
	Health Centre 708 sqm	-	Health Centre 708 sqm	
	Apart-hotel 220 no. bedrooms	Omission of 56 no. hotel bedrooms	Apart-hotel 164 no. bedrooms	
	102 residential units	Omission of 26 no. residential units	76 residential units	
'Printworks' Building **Does not form part of the subject site lands*	Office space 3,630sqm	-	Office space 3,630sqm	
		Creche 197sqm	Creche 197sqm	
		Café 215sqm	Café 215sqm	

Initial Development Schedule Submitted for Planning		Significant Further Information Amendments	Resulting Development Schedule Approved Planning Permission
Vehicle Access	Primary Access via Kennelsfort Road Lower Secondary Access Via existing junction on Old Lucan Road	-	Primary Access via Kennelsfort Road Lower Secondary Access Via existing junction on Old Lucan Road ABP condition 2d: '*the internal spine road shall be one-way only, west-bound, from Kennelsfort Road up to a point in line with the eastern boundary of the filling station on the adjoining lands to the southwest.*'
		Bar 555sqm	Bar 555sqm
		Restaurant 555sqm	Restaurant 555sqm

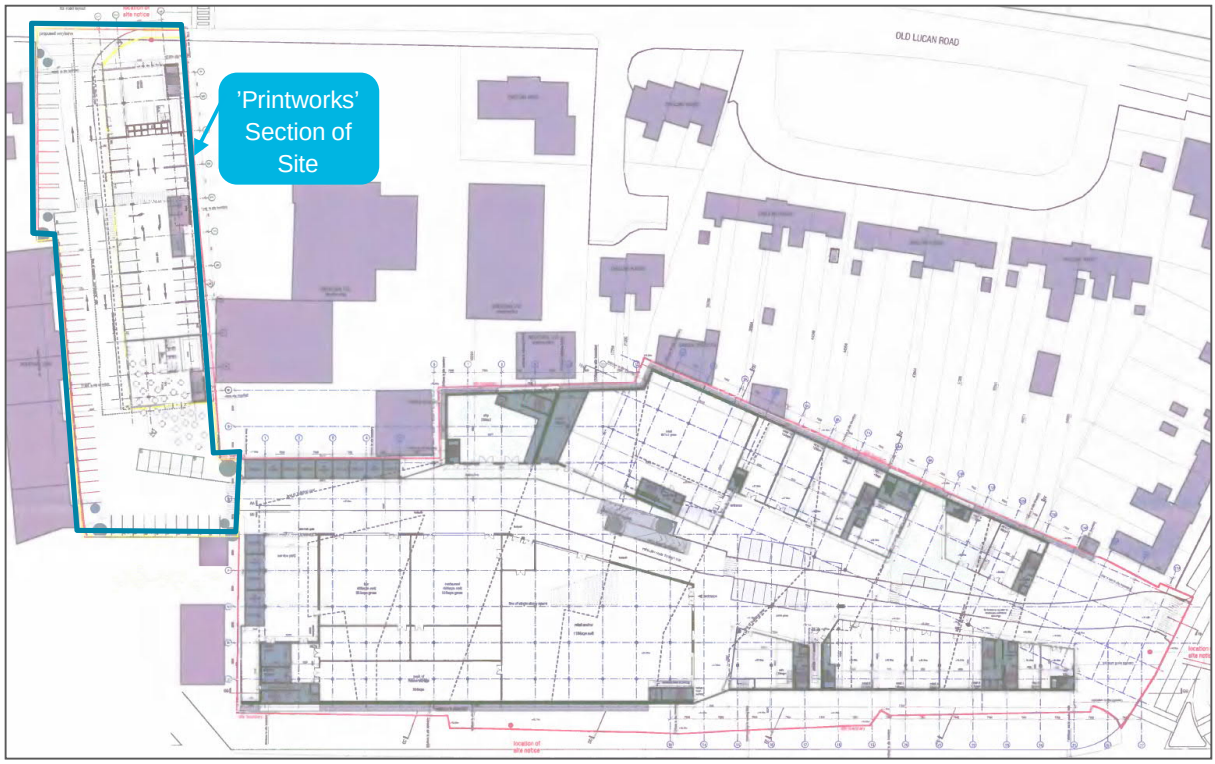


Figure 2.24 – Site Layout Ref SD09A/0021 (Additional Information Stage)

The aforementioned planning consent was extended (Ref. SD09A/0021EP) by SDCC in January 2015, subject to two number planning conditions, one of which stated that ***'the development shall be completed no later than 20th May 2020'*.**

2.7.2 Strategic Housing Development, ABP Ref: 302521-18

The subject site was previously refused planning permission for a Strategic Housing Development (ABP Ref. 302521-18) by ABP in December 2018. The planning application consisted of the following:

- Demolition of existing structures;
- Provision of 303 No. Apartments in two blocks consisting of;
  - 26 no. studios;
  - 125 no. one bed;
  - 133 no. two bed;
  - 19 no. three bed;
- Creche;
- Concierge office;

- Community room;
- Community/ sports hall;
- Basement parking consisting of:
  - 269 No. car spaces;
  - 22 No. motorcycle spaces;
  - 262 No. cycle spaces;
- Surface Parking consisting of:
  - 5 No. car spaces;
  - 44 No. cycle spaces;
- Upgrades to the existing vehicular access; and
- Associated site works

This application was refused planning permission by ABP subject to five number reasons, two of which were in relation to traffic and transportation items:

Condition 2
"The proposed development would be self-contained with a single access and egress point onto Kennelsfort Road Lower. It is considered that the layout of the proposed development provides limited opportunities to facilitate potential future access to the rear gardens of the house to the north, or for future connectivity (pedestrian, cyclist and vehicular) to the lands to the west of the application site. The proposed development is therefore premature pending the preparation of a masterplan for the subject site and adjoining industrial sits that addresses connectivity and permeability for all road users, and to permit the development of this site, as proposed, would prejudice the future redevelopment of adjoining lands in a comprehensive fashion."

Condition 3
It is considered that the traffic generated by the proposed development of 303 residential units and thee provision of a single vehicular access/ egress point at the junction of the Kennelsfort Road Lower and the R-148 regional road, would endanger public safety by reason of traffic hazard from increase traffic movements and would lead to conflict between road users, that is, pedestrians, cyclists and vehicular traffic. Furthermore, the proposal for a pedestrian and cycle route through an existing industrial/ commercial area, which appears to be in private ownership, is inappropriate and would mitigate against the creation of an attractive pedestrian environment. The proposed development would therefore, be contrary to the proper planning and sustainable development of the area.

Within the Board Direction, ABP provided three notes, of which Note 2 and Note 3 are in relation to Condition No. 2 and 3. These notes provide additional information as to why ABP refused permission on these particular issues.

Note 2
"In including reason number 2, the Board had regard to the Urban Development and Building Heights Guidelines for Planning Authorities, and in particular paragraph 2.11 of these Guidelines, which refer to the need to prepare master plans for areas that have the potential for comprehensive urban development or redevelopment, and where assessment of movement, public realm, design and other issues are best addressed at a neighbourhood level rather than at an individual site scale.

Note 3
In including reason number 3, the Board did not consider that the trip generation predictions for the development were convincing and was of the view that the selection parameters and filtering selection chosen for the model used in the submitted Traffic and Transport Assessment were inappropriate and were not properly representative of the location and circumstances of the site. In addition, the Board noted the planning history of this site, which provided for entry only at the location of the proposed access, with exit for vehicular traffic onto the Old Lucan Road, and considered that the proposed traffic arrangements, with the sole egress as well as access adjoining the junction of Kennelsfort Road Lower and the R-148, would be unacceptable."

2.7.2.1 Subject Development Proposals,

The subject site development proposals have been designed to address the previous reasons for refusal on traffic grounds. The new scheme now includes an additional access point at the western boundary of the site through the Palmerstown Business Park which will allow residents to access the site from the Old Lucan Road by means of car, bicycle or on foot. This will be an improvement over the previous application by reducing the volume of traffic exiting onto the Kennelsfort Road Lower. Provision has also been made along the northern boundary of the site to facilitate for future connections to the north. Full details of the subject development proposals are contained within Section 3 of this report.

2.8 Existing Conditions Summary

The subject site is ideally positioned within the urban environment to maximise access to/from the site utilising sustainable forms of travel including walking, cycling and public transport.

The sites proximity to public transport interchanges on both the Kennelsfort Road Lower and the Chapelizod Bypass (circa 50m / 200m walking distance to the inbound / outbound bus stops, respectively) further enhances the sustainability characteristics of the site.

The subject site is ideally located to benefit from the enhanced accessibility levels delivered by the emerging BusConnects bus network improvements with the provision of a bus service through Rathcoole with a 6 – 7.5 minute peak hour frequency.

3. Proposed Development

3.1 Introduction

This chapter details the proposed development with regard to the transportation elements which includes the internal roads layout, proposed pedestrian/cycling infrastructure and parking provisions within the development area.

3.2 Proposed Development

The development will consist of the demolition of all existing structures on site and the construction of a residential development of 250 no. 'build to rent' apartments (134 no. 1 beds, 116 no. 2 beds) in 5 no. blocks; with a café and ancillary residential amenity facilities, to be provided as follows:

- Block A containing a total of 27 no. apartments comprising of 13 no. 1 beds and 14 no. 2 beds, in a building ranging from 3-6 storeys over basement in height, with 1 no. communal roof garden (at third floor level), and most apartments provided with private balconies/terraces. Block A also provides a café, a reception/concierge with manager's office and bookable space at ground floor level; meeting rooms and workspace/lounge at first floor level; a gym at second floor level; and a cinema and a games room at basement level;
- Block B containing a total of 46 no. apartments comprising of 18 no. 1 beds and 28 no. 2 beds, in a building 6 storeys over basement in height, and all apartments provided with private balconies/terraces;
- Block C containing a total of 47 no. apartments comprising of 30 no. 1 beds and 17 no. 2 beds, in a building 6 storeys over basement in height, and all apartments provided with private balconies/terraces;
- Block D containing a total of 67 no. apartments comprising of 33 no. 1 beds and 34 no. 2 beds, in a building 7 storeys over basement in height, and most apartments provided with private balconies/terraces;
- Block E containing a total of 63 no. apartments comprising of 40 no. 1 beds and 23 no. 2 beds, in a building 8 storeys over basement in height, and all apartments provided with private balconies/terraces.

It is proposed to provide a total of 125 car parking spaces (120 basement spaces & 5 surface level spaces) which includes 26 Electric Vehicle (EV), 5 visitor parking spaces, 5 mobility impaired spaces, 2 Car Club, 10 motorbike parking spaces. In addition, 276 No. cycle parking spaces will be provided (250 within the basement and 26 at surface level).

3.3 Site Access

There will be 2 no. access locations serving the subject site, the first on Kennelsfort Road Lower and the second Old Lucan Road (via Palmerstown Business Park), both access points are to serve pedestrians, cyclists and vehicles.

3.3.1 Kennelsfort Road Lower Access

The proposed access on Kennelsfort Road Lower (eastern access) will involve the relocation of the existing entrance approximately 15m north along Kennelsfort Road Lower. This relocated access junction will permit left in/ left out vehicle movements only, with no right turns permitted to/from Kennelsfort Road Lower. These banned right turn manoeuvres will be enforced via the provision of pencil bollards along the Kennelsfort Road Lower and concrete hardstanding which has been illustrated in Figure 3.2. Accordingly, this will improve road safety conditions at this location.

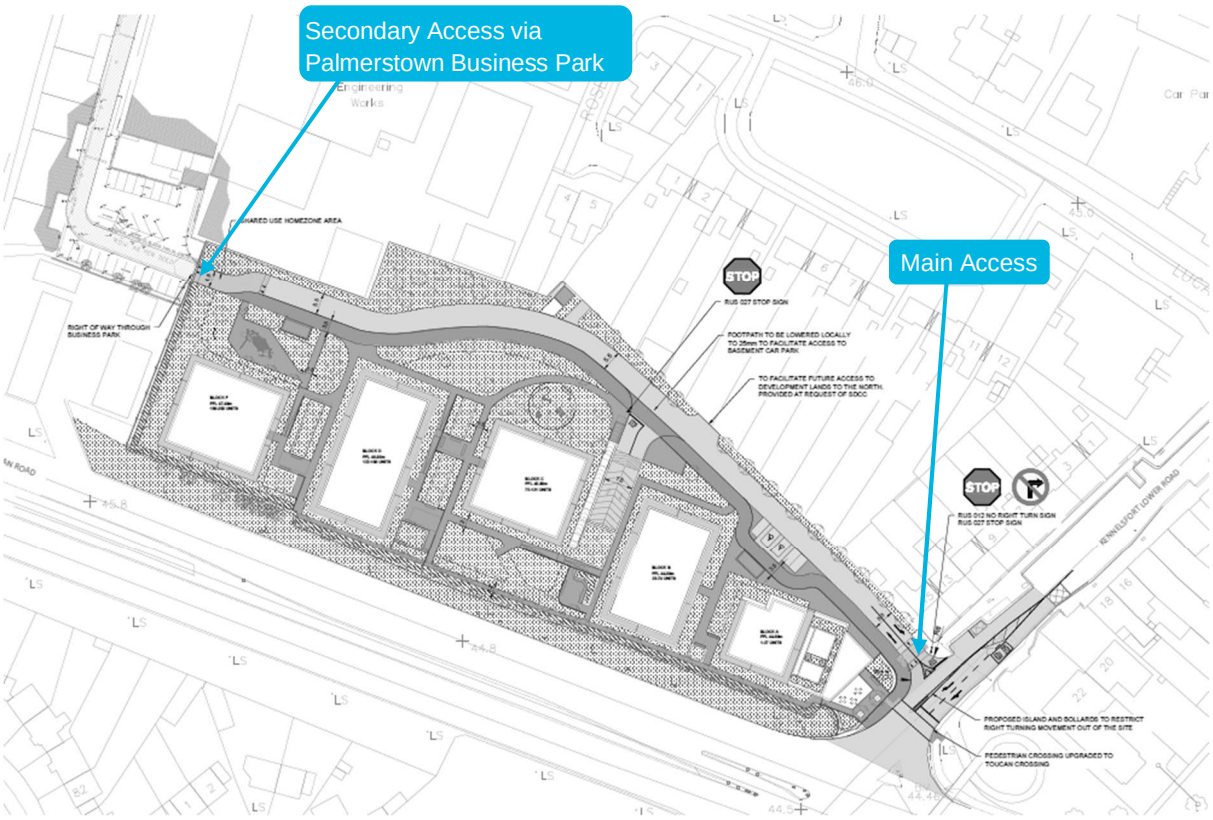


Figure 3.1 – Proposed Access Arrangements (AECOM Drawing: PR224738-ACM-00-00-DR-CE-00-0001)

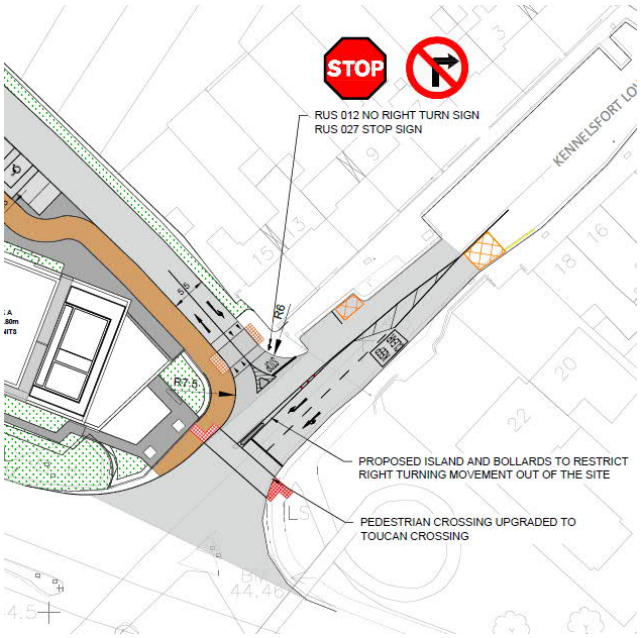


Figure 3.2 – Proposed Site Access onto Kennelsfort Road (AECOM Drawing: PR224738-ACM-00-00-DR-CE-00-0001)

Further to this as noted in section 2.4.2 of this report, the proposed development will be built along the BusConnects route 6 Lucan to City Centre. It is envisioned that the proposed development will be built prior to the construction of the BusConnects route. As illustrated in Figure 3.3 below, it should be noted that the proposed access arrangements into the site as part of the development is an improvement over the BusConnects proposal for this site access. In comparison to the BusConnects proposal, the site access will be situated further away from the junction along with pencil bollards preventing vehicles from turning right along the Kennelsfort Road Lower into the site. The concrete hardstanding will also prohibit drivers from making illegal right turns into the proposed development. This will improve road safety at this junction by reducing the number of potential conflict points and only allowing one traffic movement into and out of the development. AECOM see this as an improvement over the BusConnects proposal for this junction.

It should be noted that the Client will be very willing to provide input to the Emerging BusConnects proposals when the public consultation goes ahead later in 2020.

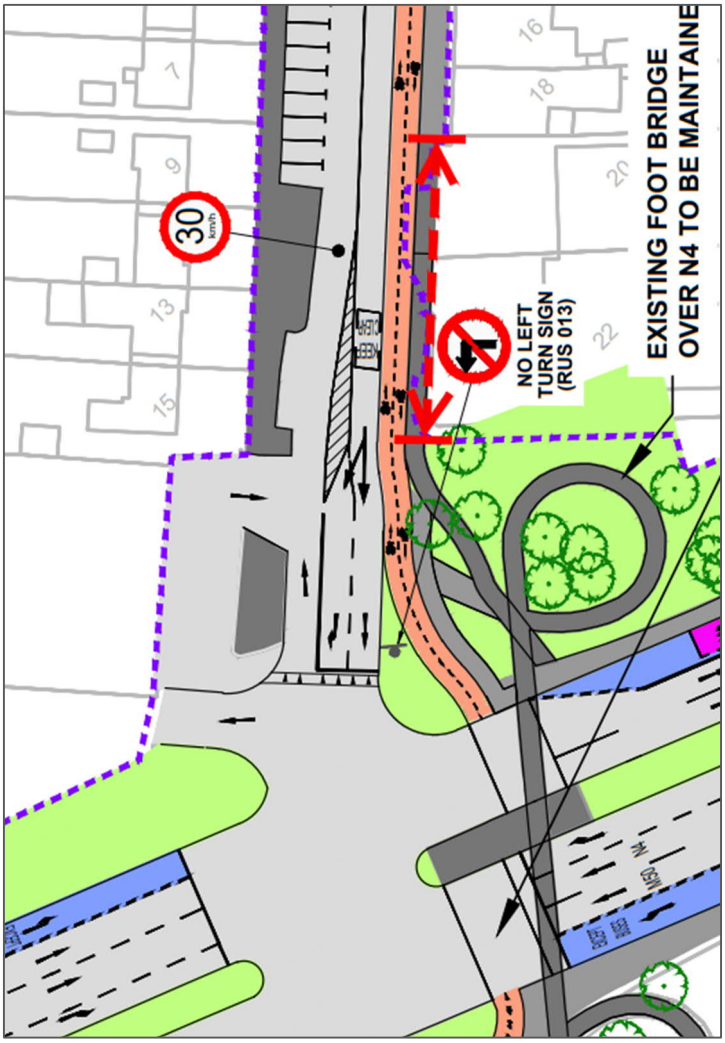


Figure 3.3 – Current BusConnects Proposals at Subject Site Access

3.3.2 Old Lucan Road Access – Right Of Way

As detailed in section 2 above, ABP stated the following in relation to condition 2 of the 2018 SHD (Ref. 302521-18) that was refused planning permission:

"The proposed development would be self-contained with a single access and egress point onto Kennelsfort Road Lower. It is considered that the layout of the proposed development provides limited opportunities to facilitate potential future access to the rear gardens of the house to the north, or for future connectivity (pedestrian, cyclist and vehicular) to the lands to the west of the application site. The proposed development is therefore premature pending the preparation of a masterplan for the subject site and adjoining industrial sits that addresses connectivity and permeability for all road users, and to permit the development of this site, as proposed, would prejudice the future redevelopment of adjoining lands in a comprehensive fashion."

There is an existing Right of Way between the subject site through the Palmerstown Business Park, providing a connection to the Old Lucan Road, which will enable residents/visitors travelling to/from the subject site to utilise the Lucan Road access 24 hours per day. The use of this Right of Way to access the subject site is further detailed in Section 3.5 below.

3.4 Internal Roads Layout

The main east-west thoroughfare through the development is to be 5.5m wide as per the requirements of DMURS with the road width in the underground car park being minimum 6.0m.

A shared use area compliant with DMURS has been provided at the western section of the internal access road to enable pedestrians/cyclists to transition between the subject site and Palmerstown Business Park. The shared use are is distinguished by the provision of a raised area with a contrasting surface treatment.

The proposed roads layout can be seen in AECOM drawing PR224738-ACM-00-00-DR-CE-00-0001.

There has been an inclusion of a future access (Figure 3.2) along the north-eastern boundary of the site, to the rear of the residential dwellings to the north, which could further enhance pedestrian/cyclist/vehicle permeability in the future should these lands be developed.

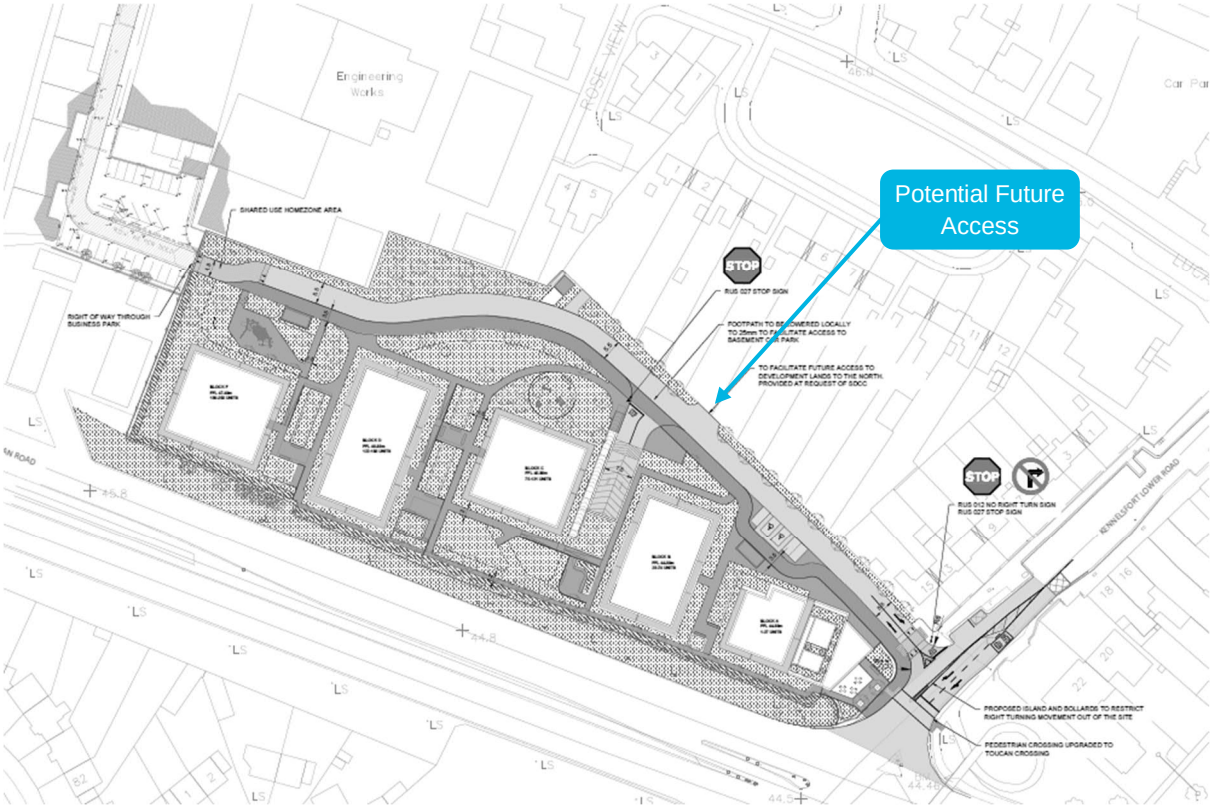


Figure 3.2 – Potential Future Tie in (AECOM Drawing: PR224738-ACM-00-00-DR-CE-00-0001)

3.5 Pedestrian and Cyclists Permeability

The subject site will be highly accessible to pedestrians and cyclists from the adjacent Kennelsfort Road Lower and the nearby Old Lucan Road. The proposed development achieves filtered permeability, primarily for walking and cycling at the two site access locations on **Kennelsfort Road Lower** and **Old Lucan Road**, as illustrated in (Figure 3.2).

3.5.1 Internal Site

Pedestrians are given priority within the internal site layout to ensure desire lines within the site are accommodated providing a good level of service and ensures the risk of vehicle/pedestrian conflict with vehicles is minimised.

The internal pedestrian routes within the site were derived from the location of the apartment blocks, and associated facilities. This has led to the creation of pedestrian routes that lead to/from and around the development and ties into the existing pedestrian facilities along Kennelsfort Road Lower and the Old Lucan Road. Figure 3.2 below indicates the pedestrian routes within and around the subject site.

Figure 1 also indicates the routes that cyclists can take around the site. In addition to the routes indicated, cyclists can also make use of the pedestrian paths indicated, should they choose to walk their bicycles along them.

3.5.2 Kennelsfort Road Lower Access

To further enhance pedestrian and cyclist accessibility to the site from Kennelsfort Road Lower, the R148 and the surrounding area, the existing pedestrian crossing on Kennelsfort Road Lower adjacent to the site access will be upgraded to a Toucan Crossing.

The provision of this Toucan Crossing will provide a safe transition to enable cyclists to travel between the site and the existing cycle facilities along the R148.

It should also be noted that the café element of the subject development will attract a local walk-in catchment from both the subject development and the surrounding local area. The provision of these enhanced pedestrian and cycle facilities at the Kennelsfort Road Lower site access will facilitate this new pedestrian travel desire line into the site.

3.5.3 Old Lucan Road Access via Palmerstown Business Park

There is an existing Right of Way between the subject site through the Palmerstown Business Park, providing a connection to the Old Lucan Road, which will enable residents/visitors travelling to/from the subject site to utilise the Lucan Road access 24 hours per day.

The provision of the pedestrian/cycle connection onto Old Lucan Road via Palmerstown Business Park will provide pedestrians/cyclists with a shorter more direct link between Old Lucan Road and Kennelsfort Road, in comparison to the existing necessity to travel along Kennelsfort Road Lower and Old Lucan Road representation a reduction in travel distance of approximately 100m.

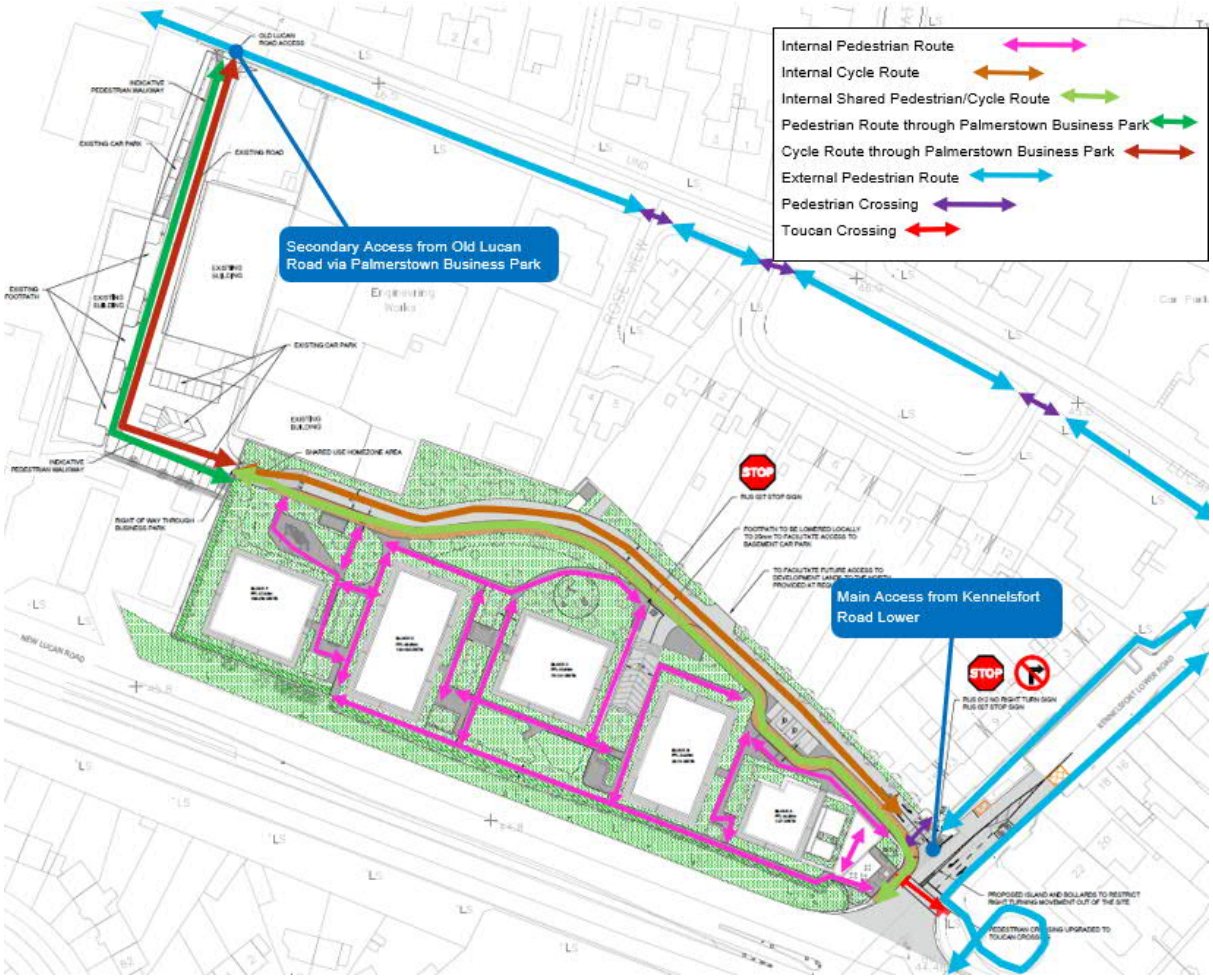
Although it does not form part of this SHD application, it should be noted that enhanced Public Lighting will be provided within Palmerstown Business Park within the coming months (in advance of occupation of the subject site). These forthcoming public lighting upgrades have been designed to the appropriate standard by Fallon Design M&E Engineering. The provision of this enhanced public lighting within the Business Park will improve safety and personal security for all road users (pedestrians/cyclists/vehicles) travelling between the site and the Old Lucan Road.

A design for the provision of potential upgrades within the Business Park has been prepared by the design team (refer to drawing PR224738-ACM-00-00-DR-CE-00-0002 submitted with this application). This design includes the provision of a demarcated pedestrian route via the provision of enhanced road markings. with within the Business Park. Subject to agreement, it is envisaged that these upgrades within the Business Park will be provided prior to opening of the development.

The route through Palmerstown Business Park will also facilitate egress for service vehicles (i.e. refuse vehicles), from the development onto Old Lucan Road. Service vehicles entering the site will be restricted to one way only traffic movements, with service vehicles entering the subject site from Kennelsfort Road Lower and exiting onto the Old Lucan Road.

The prohibition of all right turn manoeuvres at the Kennelsfort Road Lower site access junction will also ensure that the subject site does not become an attractive rat run for vehicles travelling from Old Lucan Road and Palmerstown Business Park.

These traffic management measures will improve pedestrian safety within both Palmerstown Business Park and through the subject development site as the quantum of service vehicles travelling through the site will be minimised. This arrangement will also reduce the traffic demand on the Kennelsfort Road Lower / R158 junction.


Internal Pedestrian Route
Internal Cycle Route
Internal Shared Pedestrian/Cycle Route
Pedestrian Route through Palmerstown Business Park
Cycle Route through Palmerstown Business Park
External Pedestrian Route
Pedestrian Crossing
Toucan Crossing
Secondary Access from Old Lucan Road via Palmerstown Business Park
Main Access from Kennelsfort Road Lower
STOP

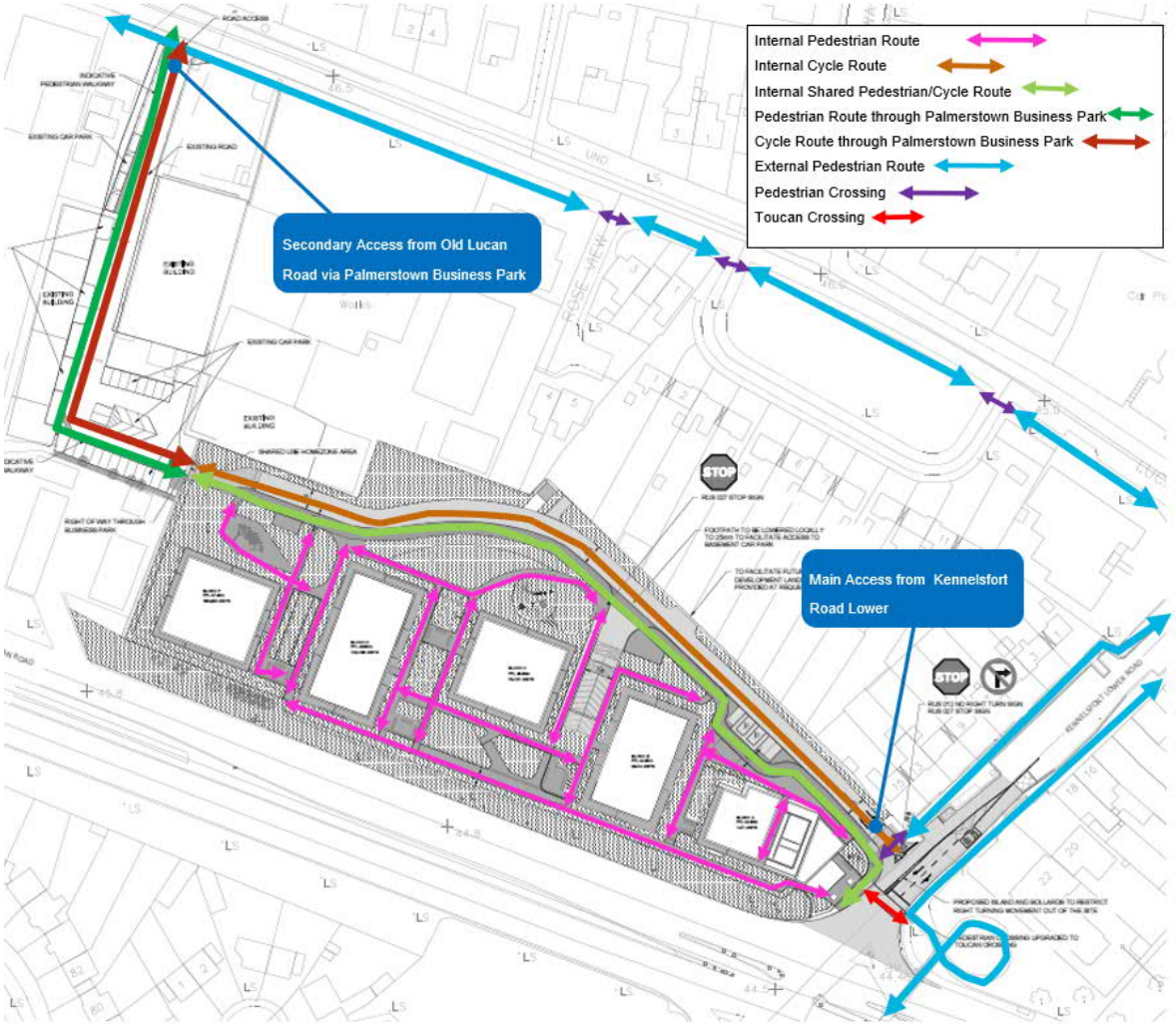


Figure 3.3 – Pedestrian & Cycle Access Locations

3.6 Servicing

An AutoTrack analysis has been carried out at the site access junctions and the internal junctions within the site to demonstrate their capability to cater for a 10.2m long refuse lorry. The results of the analysis show that the site access junctions can accommodate servicing vehicles accessing, exiting and travelling through the site. This is illustrated in AECOM drawing no. PR224738-ACM-00-00-DR-CE-00-0102.

3.7 Visibility Splays

In accordance with DMURS a sightline of 24m to the left is required having regard to both the speed limit along the Kennelsfort Road Lower (30km/h) north of the relocated site access, and it is also a bus route. The visibility splay requirement towards the Chapelizod bypass is 65m, as this section of Kennelsfort Road is subject to a posted speed limit of 60km/h. This visibility splay requirement can be achieved looking towards the Lucan Road / Kennelsfort Road Lower junction but not towards the R148 / Kennelsfort Road Lower as the subject site access is located less than 75m to the R148. It should be noted that due to the close proximity of the R148 / Kennelsfort Road Lower junction and the operation of this junction as signal controlled, it would be envisioned that vehicles would not be travelling at the posted speed limit of 60kph as they will be entering Palmerstown Village, a built up urban environment with on-street parking. A visibility splay of 49m is achieved, as illustrated in AECOM drawing PR224738-ACM-00-00-DR-CE-00-0101.

3.8 Parking Strategy

3.8.1 Vehicle Parking

In order to determine the appropriate quantum of vehicle parking for the proposed residential development, reference has been made to the following guidance:-

- Chapter 4 of Sustainable Urban Housing: Design Standards For New Apartments Guidelines For Planning Authorities, as published by the Department of Housing, Planning and Local Government (DHPLG), March 2018; and
- Table 11.23 of the current South Dublin Council County Development Plan (2016-2022);

Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities Department of Housing, Planning and Local Government (DHPLG)

The Department of Housing, Planning and Local Government has recently published (March 2018) new guidance 'Sustainable Urban Housing: Design Standards for New Apartments' (SUHDS). In relation to car parking, within *'Central and/or Accessible Urban Locations'* the document states *'In larger scale and higher density developments, comprising wholly of apartments in more central locations that are well served by public transport, the default policy is for car parking provision to be minimised, substantially reduced or wholly eliminated in certain circumstances. The policies above would be particularly applicable in highly accessible areas such as in or adjoining city cores or at a confluence of public transport systems such as tail and bus stations located in close proximity.'*

The DHPLG guidelines defines Central and/or Accessible Urban Locations as:

'Such locations are generally suitable for small- to large-scale (will vary subject to location) and higher density development (will also vary), that may wholly comprise apartments, including:

- *Sites within walking distance (i.e. up to 15 minutes or 1,000- 1,500m), of principal city centres, or significant employment locations, that may include hospitals and third-level institutions;*
- *Sites within reasonable walking distance (i.e. up to 10 minutes or 800- 1,000m) to/from high capacity urban public transport stops (such as DART or Luas); and*
- *Sites within easy walking distance (i.e. up to 5 minutes or 400-500m) to/ from high frequency (i.e. min 10 minute peak hour frequency) urban bus services.'*

Accordingly the subject site, can be classified as an *'Central and/or Accessible Urban Location'* as it is located within less than 400m walking distance of several high frequency urban bus services. Furthermore the site is also ideally located to benefit from the emerging Bus Connects Route 6 (Lucan to City Centre) which will travel along the Chapelizod Bypass approximately 40m to the southwest of the subject site access.

In addition, Specific Planning Policy Requirement 8 of the DHPLG Apartment guidelines states:

'For proposals that qualify as specific BTR development in accordance with SPPR 7:

iii) There shall be a default of minimal or significantly reduced car parking provision on the basis of BTR development being more suitable for central locations and/or proximity to public transport services. The requirement for a BTR scheme to have a strong central management regime is intended to contribute to the capacity to establish and operate shared mobility measures;'

AECOM believe parking provision for the proposed Build to Rent (BTR) development should be provided in accordance with the Department of Housing, Planning and Local Government SUHDS guidance as referred to above, and as such the quantum of vehicle parking provided on site should be ***'default of minimal or significantly reduced'***.

South Dublin County Development Plan 2016-2022

The South Dublin County Development Plan 2016-2022 states the following in relation to car parking:-

- *'It is the policy of Council to take a balanced approach to the provision of car parking with the aim of meeting the needs of businesses and communities whilst promoting a transition towards more sustainable forms of transportation.'*
- *'Tables 11.23 and 11.24 set out the Maximum Parking rates for non-residential and residential development. Parking rates are divided into two main categories:*
  - Zone 1: General rate applicable throughout the County.

- *Zone 2 (Non Residential): More restrictive rates for application within town and village centres, within 800 metres of a Train or Luas station and within 400 metres of a high quality bus service (including proposed services that have proceeded to construction).*
- *Zone 2 (Residential): More restrictive rates for application within town and village centres, within 400 metres of a high quality public transport service [5] (includes a train station, Luas station or bus stop with a high quality service)'*

  ([5] A high frequency route is where buses operate with a minimum 10 minute frequency at peak times and a 20 minute off-peak frequency.).

The Development Plan goes on to say:

'The number of spaces provided for any particular development should not exceed the maximum provision. The maximum provision should not be viewed as a target and a lower rate of parking may be acceptable subject to:

- *The proximity of the site to public transport and the quality of the transport service it provides. (This should be clearly outlined in a Design Statement submitted with a planning application),*
- *The proximity of the development to services that fulfil occasional and day to day needs,*
- *The existence of a robust and achievable Workforce Management or Mobility Management Plan for the development,*
- *The ability of people to fulfil multiple needs in a single journey,*
- *The levels of car dependency generated by particular uses within the development,*
- *The ability of residents to live in close proximity to the workplace,*
- *Peak hours of demand and the ability to share spaces between different uses,*
- *Uses for which parking rates can be accumulated, and*
- *The ability of the surrounding road network to cater for an increase in traffic.'*

With regard to the proposed development schedule, the associated SDCC **Maximum** car parking requirements are outlined in Table 3.3 below.

Table 3.1 – SDCC Development Plan Vehicle Parking Maximum Requirements & Development Parking Provision

Description	Quantity of Units	SDCC Maximum Parking Standard (Zone 2))		Development Parking Provision		
		Parking Required Per Unit (Zone 2)	MAXIMUM Parking Permitted	Residential Parking	Visitor Parking	Go Car Parking (inclusive)
1 bed apartment	134	0.75 spaces per unit	101	120	5	2
2 bed apartment	116	1 space per unit	116			
Total			**217**	**125**		

In regard to the development proposals for the 250 residential apartment units, it is noted that the car parking proposals for these apartment units are below (approximately 43% below) the maximum and subsequently comply with the maximum standard recommended by SDCC.

AECOM believe this level of car parking should is acceptable given the sites public transport accessibility, the provision of car club spaces, electric vehicle spaces and motorbike spaces. A Mobility Management Plan has also been prepared by AECOM outlining the existing travel patterns for residents in this area along with the target goals for using various modes of transport with detailed measures which can be utilised by the Mobility Management Plan Coordinator to achieve these target goals.

In regard to the development proposals for the 250 residential apartment units, it is noted that the car parking proposals for these apartment units are approximately 43% below the SDCC maximum, (i.e. 125 parking spaces provided versus the SDCC 217 maximum permitted) and subsequently comply with the maximum standard recommended by SDCC.

Accordingly the '*significantly reduced*' development parking provision accords with SPPR 8 as outlined within the DHPLG guidelines.

Visitor Parking
It is proposed to provide 5 visitor parking spaces on-site.

Mobility Impaired Parking
The appropriate level of mobility impaired parking provision for the proposed development will also be provided in accordance with South Dublin County Council Development Plan requirements. The Development Plan States:-

'*Disabled car parking spaces shall generally be provided at a rate of 5% of the total number of spaces*.'

The proposed development provides 5 no. mobility impaired spaces, which is in line with the SDCC requirements.

Electric Vehicle Parking
The appropriate level of electric vehicle parking has been provided for the proposed development has been provided in accordance with the South Dublin County Council Development Plan Requirements. The Development Plan states:-

'*All developments shall provide facilities for the charging of battery operated cars at a rate of up to 10% of the total car parking spaces'*

The subject development proposals include the provision of 26 (10% of 250) electric vehicle charging spaces, which is in line with the SDCC requirements.

Motorcycle Parking
The South Dublin County Council Development Plan does not give any specific guidance in relation to the provision of motor cycle parking spaces. The subject development includes the provision of 10 no. motor cycle parking spaces which should satisfy motorcycle demand for the development.

Car Club/Car Share Parking
It is proposed that 2 No. car parking spaces are allocated as Car Club spaces for use by local residents and the general public. These spaces have been provided in accordance with the DHPLG to promote reduced car ownership and more sustainable travel.

3.8.2 Cycle Parking

The appropriate level of cycle parking provision for the proposed development should also be provided in reference to both (i) the South Dublin County Council requirements; and (ii) the DHPLG guidelines. The South Dublin County Council & DHPLG cycle parking standards are detailed in Table 3.4 below.

Table 3.2 – SDCC Development Plan & DHPLG Cycle Parking Requirements & Development Parking Provision

Description	SDCC Cycle Parking Standard		DHPLG Requirements	
	Short Stay	Long Stay	Short Stay	Long Stay
Apartment	1 space per 10 apartments	1 space per 5 apartments	1 space per 2 units	1 space per bedroom

Table 3.3 – Cycle Parking Requirements & Development Provision

Description	Quantity of Units	SDCC Cycle Parking Requirement			DHPLG Requirement			Development Provision		
		Short Stay	Long Stay	Total	Short Stay	Long Stay	Total	Short Stay	Long Stay	Total
1 bedroom Apartment	134	13	27	40	67	134	201	26	250	276
2 bedroom Apartment	116	12	23	35	58	232	345			
Totals		**25**	**50**	**75**	**128**	**336**	**464**	**26**	**250**	**276**

In reference to Table 3.5 above, the proposals include the provision of a total of 26 short term and 250 long term bicycle parking spaces (276 in total) on-site within the development. The SDCC bicycle parking standards are considered to be 'minimum' standards, whereas the DHPLG requirements are considered to be the preferred level of provision in situations where on-site car parking has been substantially or completely removed as permitted in certain situations by the corresponding DHPLG car parking guidance.

The level of bicycle parking proposed on-site for the apartment units has been provided in the context that the development car parking proposals are below the SDCC development plan standards (i.e. 125 spaces opposed to 217 for the residential units). AECOM consider this reduction to be consistent with the reduction that the DHPLG guidelines recommend and at which the high DHPLG bicycle parking requirements would be of greater relevance.

Accordingly, the design approach in regard to the specification of bicycle parking on-site, in the context of the sites' accessibility characteristics (including the proposed car parking provision), is considered to appropriate and is above the SDCC cycle parking standards and leans towards the 'maximum' DHPLG requirements.

In reference to Table 3.5 above, it can be established that the proposed on-site bicycle parking provision of 276 spaces (including Short and Long-term parking spaces) is approximately 368% more than the 75 parking spaces required by the SDCC development management standards.

It is proposed within the Mobility Management Plan to monitor the usage of the cycle stands following the opening of the proposed development. Should demand meet the proposed level of cycle parking, the management company will allocate additional cycle parking for the development i.e. increasing the number of cycle stands. There is ample space to add more cycle stands following a review of the demand.

3.8.3 Parking Restrictions

Perspective residents of the apartment block will be made aware of the car parking arrangements. The management company will be responsive for enforcing the above arrangement. This will include measures such as the following:

- Regular car registration checks against assigned parking space and clamping enforcements.
- Internal warning signs to be erected to warn visitors of parking restrictions in place.
- Letters to be sent to all residents informing them of the agreed car parking strategy.
- Discouraging the parking on public streets.

4. Trip Generation and Distribution

4.1 Introduction

The following paragraphs present the process by which the potential level of vehicle trips, associated with the future residential development have been generated and subsequently assigned across the local road network.

4.2 Traffic Surveys

In order to establish the existing local road networks traffic characteristics and subsequently enable the identification of the potential impact of the proposed residential development, traffic surveys were commissioned in November 2017.

The aforementioned traffic surveys (weekday classified junction turning counts) were conducted by Nationwide Data Collection over two number survey periods from 07:00-10:00 and 16:00-19:00 on Wednesday the 8th of November 2017 at the following locations (Figure 4.1):-

- Lucan Road / Kennelsfort Road Lower
- M50 Motorway (Jct 7) / N4 Motorway (Jct 1)
- Site Access / Kennelsfort Road Lower / Kennelsfort Road Upper
- Lucan Road / N4 / The Oval

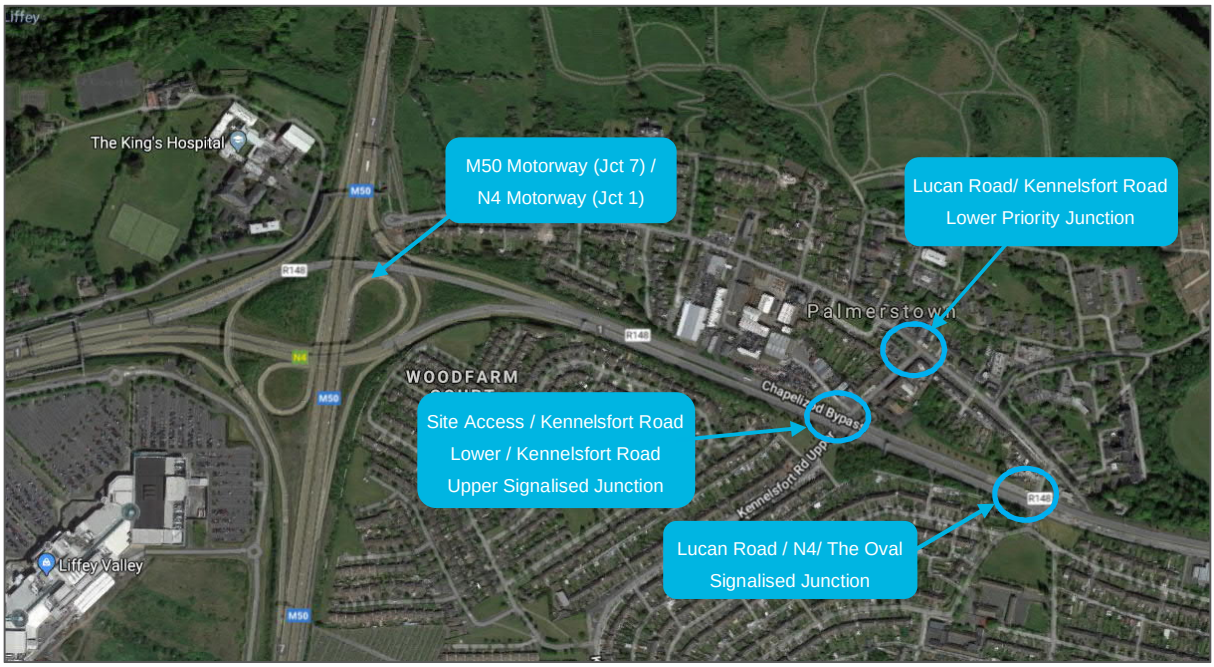


Figure 4.1 – Traffic Survey Locations (Source: Bing Maps)

The traffic survey established that the local AM and PM peak hours occur between 08:00 – 09:00 and 16:00 – 17:00, respectively. The recorded 2017 peak hour traffic flows are presented within Appendix B.

4.3 Proposed Development Trip Generation

As detailed in section 2 above, ABP stated the following note in relation to conditions 2 & 3 of the 2018 SHD (Ref. 302521-18) that was refused planning permission:

'In including reason number 3, the Board did not consider that the trip generation predictions for the development were convincing and was of the view that the selection parameters and filtering selection chosen for the model used in the submitted Traffic and Transport Assessment were inappropriate and were not properly representative of the location and circumstances of the site. In addition, the Board noted the planning history of this site, which provided for entry only at the location of the proposed access, with exit for vehicular traffic onto the old Lucan Road, and considered that the proposed traffic arrangements, with the sole egress as well as access adjoining the junction of Kennelsfort Road Lower and the R-148, would be unacceptable."

The vehicle traffic generation for the 2018 SHD application was determined using trip rates obtained from the industry standard TRICS Database. Table 4.1 shows the trip rates used as part of the 2018 submission.

Table 4.1 – Previous SHD Submission Trip Rates for Apartment Units

303 Units	AM Peak Hour		AM Peak Hour	
	Arrivals	Departures	Arrivals	Departures
Vehicle Trip Rates	0.050	0.191	0.181	0.071
Traffic Generation	15	57	54	21

In order to alleviate any concerns that ABP may have pertaining to the validity of the use of TRICS, AECOM undertook an analysis of existing residential developments which are located in close proximity to the Chapelizod Bypass, public transport interchange opportunities and a range of retail/leisure facilities.

The Knockmaree residential development was identified by AECOM as a representative donor site which exhibited comparable accessibility opportunities that could be used to determine the most realistic vehicle trip generation levels for the subject development.

At the Stage 1 Pre-Application meeting (July 2019) with SDCC, AECOM suggested the use of the Knockmaree residential development as a donor site, to which SDCC raised no issues.

Knockmaree residential development is located on St. Laurence's Road, Chapelizod, Dublin, situated approximately 2.3km from the subject site. The Knockmaree residential development comprises 160 number apartment units. In order to determine the level of traffic generated by this development, a traffic survey was undertaken on a neutral weekday between the AM and PM peak hour periods. Table 4.2 indicates the surveyed vehicle traffic generation and the associated vehicle trip rates based upon 160 no. units at the development.

Table 4.3 shows a comparison between the updated TRICS rates and the Knockmaree residential development, as is evident the trip rate for the Knockmaree residential development is greater than the TRICS rates and as a result the donor site will be used to determine the traffic generation.

Table 4.2 – Knockmaree Residential Development Observed Vehicle Traffic Generation and Trip Rates

160 Units	AM Peak Hour		AM Peak Hour	
	Arrivals	Departures	Arrivals	Departures
Vehicle Trip Rates	0.075	0.225	0.238	0.131
Traffic Generation	12	36	38	21

Table 4.3 – TRICS Rate Vs Existing Development Trip Rate

Trip Rate	AM Peak Hour		AM Peak Hour	
	Arrivals	Departures	Arrivals	Departures
TRICS	0.062	0.259	0.224	0.078
Knockmaree	0.075	0.225	0.238	0.131
Uplift / Difference	+0.013	-0.034	+0.014	+0.053

4.3.1 Proposed Development Trip Generation

In order to determine the potential vehicle trip generation for the subject Palmerstown site, the trip rates for the Knockmaree donor site have been used, refer to Table 4.3 above. Accordingly Table 4.4 below indicates the predicted vehicle trip generation of the likely vehicle traffic flows travelling to/from the proposed subject development during the morning and evening peak hour periods.

Table 4.4 – Proposed Development Traffic Generations

Land Use	No of units/ GFA	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (16:00 – 17:00)	
		Arrivals	Departures	Arrivals	Departures
Residential	250 Units	20	60	63	35
Peak Hour Totals		20	60	63	35
		80 Two-way		98 Two-way	

4.4 Extant & Consented Development Trip Generation

It should be noted that the subject site currently has extant traffic generation due to its existing land uses. In addition, as previously referred to in Section 2, the subject site also benefits from existing planning consent for a large mixed use development (Ref. SD09A/0021), which is valid until May 2020. The site has been subject to a number of previously approved planning permissions, each of which would generate an envelope of traffic generation, which would have been considered and approved as part of the planning permission. Of particular relevance is the live planning permission associated with SD09A/0021, which is detailed below.

4.4.1 Mixed Use Development (SD09A/0021) – Consented Development

The following peak hour traffic generation was associated with this development proposal (Table 4.5). Critically, this considerably exceeds the anticipated trip generation associated with the current 2019 proposal. This development was subject to a significant request for further information and as such the scale of the development was reduced and the TTA submitted was amended to take into account this significant change. The trip generation shown in Table 4.5 is based on the revised TTA as part of the request for Further Information.

Table 4.5 – SD09A/0021 Traffic Generation

Mixed Use Development	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (17:00 – 18:00)	
	Arrivals	Departures	Arrivals	Departures
SD09A/0021	231	163	296	332
Peak Hour Totals	394 Two-way		628 Two-way	

The above traffic generation associated with the consented mixed use development, if implemented would result in the addition of a significantly higher proportion of vehicle trips onto the adjacent local road network than the now proposed development. The analysis contained within this TTA does not take account of the existing traffic generation arising from the existing land uses on the subject site, or the potential traffic generation arising from the consented mixed use development on the subject site.

Accordingly, AECOM are of the opinion that the analysis completed is robust, i.e. the traffic impact that has been assessed is a worst case scenario, which assumes additional traffic generation arising from the subject development, without discounting the existing land uses on the subject site.

4.4.2 Comparison of Consented Development versus Subject Development Traffic Generation

For clarity, Table 4.6 compares the site's consented traffic generation (SD09/0021) to the potential traffic generation arising from the proposed subject development. This demonstrates that the net traffic generation arising from the subject development is considerably less than the consented development (ref. SD09A/0021) traffic generation.

Table 4.6 – Net trip generation of current proposal versus permitted use

Development	AM Peak Hour (08:00 – 09:00)		PM Peak Hour (17:00 – 18:00)	
	Arrivals	Departures	Arrivals	Departures
SD09A/0021 (currently permitted)	231	163	296	332
Subject Development Traffic Generation	20	60	63	35
Net trips generated by this application versus consented	**-211**	**-103**	**-233**	**-297**

4.5 Trip Distribution & Assignment

To understand the potential distribution of the trips arriving and departing the site, the base traffic survey results have been interrogated. The base traffic surveys indicate the direction that motorists currently travel to/from when arriving onto the immediate road network immediately adjacent the site during the typical peak periods. Figure 4.2 illustrate the proposed trip distribution patterns during the AM and PM Peak Hours, respectively. For traffic travelling to/from the subject development it has been assumed that 60% will arrive / depart from the main entrance and 40% will arrive / depart from the secondary entrance.

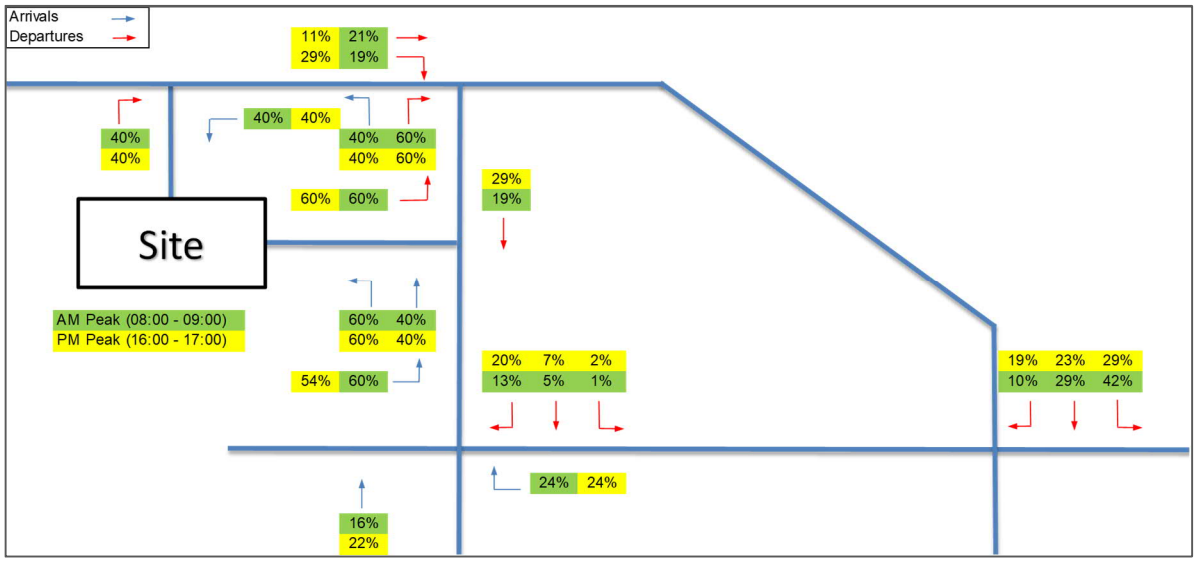


Figure 4.2 – Trip Distribution during the AM & PM Peak Hour

As shown in Figure 4.2, the Kennelsfort Rd Lower access is left turn only therefore all traffic departs the site at this location, turning left onto Kennelsfort Road Lower.

4.6 Traffic Growth

The TTA adopts an Opening Design Year of 2021. In accordance with TII Guidance, Future Design years (+5 and +15 years) of 2026 and 2036 will therefore be adopted.

The Transport Infrastructure Ireland (TII) 'Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections (May 2019)' sets out growth rates for forecasting future year traffic for use in scheme modelling and appraisal. It is noted that in respect of Palmerstown, which is in the 'Dublin Metropolitan Area', the growth during the period 2016 – 2030 is set at 1.0162% per annum for medium growth, reducing to 0.51% per annum from 2030 – 2040 (LV rates used).

The development has assessed the opening year of the development (2021) and the two horizon year assessments (2026 and 2036), as per the TII Traffic Assessment Guidelines. The assessment years used for this assessment are as follows:-

- 2017 to 2021 – 1.0664 (or 6.64%);
- 2017 to 2026 – 1.1556 (or 15.56%); and

- 2017 to 2036 – 1.2581 (or 25.81%).

4.7 Threshold Analysis

The TII Guidelines for Transport Assessments state that the thresholds for junction analysis in Transport Assessments are as follows:

- 'Traffic to and from the development exceeds 10% of the existing two-way traffic flow on the adjoining highway.'
- 'Traffic to and from the development exceeds 5% of the existing two-way flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations.'

4.8 Impact of the Proposed Development

4.8.1 Local Road Network

A comparison was made between the pre-development and post-development scenarios, to identify the percentage impact of the development.

The projected percentage impact of operational traffic on the surrounding road junctions in the year of opening (2021) is set out in Table 4.7 and shown indicatively in Figure 4.3.

Figure 4.3 – Traffic Survey Junction Locations

We recognise the proximity between the site access and the Kennelsfort Road/R148 signalised junction to the south. The percentage impact analysis has therefore been undertaken on these junctions as a linked junction to understand the true percentage impact on the signalised junction/site access. This is considered appropriate as the proposed site access is located adjacent to the junction and its operation will be linked to the junction operation in terms of left-turns out of the site being undertaken when there is a red phase for traffic travelling northbound onto Kennelsfort Lower. It is therefore not considered representative to look at the site access junction in isolation and without consideration of the adjacent junction.

It should be noted that the opening year of the development has been assessed only. Any future year base flows would be greater than the flows presented in Table 4.7, hence a smaller percentage impact in comparison to the development flows would be recorded.

It is again noted that the below figures do not take account of the existing or consented traffic generation for the subject site under SD09/0021; in fact the consented traffic generation is higher than what is being proposed. The percentage impact noted is therefore considered a worst-case scenario.

Table 4.7 – Percentage Impact on adjacent road network during Opening Year

Junction Location	Traffic Flows	Opening Year – 2021	
		AM Peak (08:00 – 09:00)	PM Peak (17:00 – 18:00)
Junction 1 – Site Access / Kennelsfort Road Lower/ R148	Base Flows at Junction	4,902	4,679
	Development	85	82
	% Impact	1.7%	1.7%
Junction 2 - Kennelsfort Road Lower/ Old Lucan Road	Base Flows at Junction	603	629
	Development	68	60
	% Impact	11.2%	9.5%
Junction 3 - Lucan Road / R148	Base Flows at Junction	4,503	3,845
	Development	60	36
	% Impact	1.3%	0.9%
Junction 4 – M50 / R148	Discussed in Section 4.8.2 below		
Junction 5 – Secondary Site Access / Old Lucan Road	Base Flows at Junction	406	470
	Development	32	39
	% Impact	7.8%	8.3%

The percentage impact of the operational phase will result in an impact of:

- 1.7% and 1.7% upon the Kennelsfort Road Lower/R148 / Site access junction in the respective AM and PM peaks;
- 11.2% and 9.5% upon the Kennelsfort Road/ Lucan Road priority junction in the respective AM and PM peaks;
- 1.3% and 0.9% upon the Lucan Road/R148 signalised junction in the respective AM and PM peaks; and
- 7.8% and 8.3% upon the Secondary site access / Lucan Road junction in the respective AM and PM Peaks.

Each junction is discussed in more detail in the paragraphs below.

Junction 1: On the basis of the thresholds outlined in the TII Traffic and Transport Guidelines (May 2014); given that the impact upon the signalised junction is considerably less than 5% of the existing two-way traffic flow, junction modelling is not required for this junction. The traffic impact upon this junction due to the proposed development will be nominal. Notwithstanding the above, for robustness, AECOM has completed a LinSig analysis of Junction 1.

Junction 2: The percentage impact of Junction 2 exceeds 10%, therefore analysis has been undertaken utilising the TII approved modelling package, Junctions 9, on this priority controlled junction. It is noted that the percentage impact noted in Table 4.5 is very conservative, as extant trip generation has not been considered.

Junction 3: On the basis of the TII Traffic and Transport Guidelines (May 2014), given that the impact upon this signalised junction does not exceed 5% of the existing two-way traffic flow, modelling is not required for this junction. The traffic impacts upon this junction will be nominal.

Junction 5: On the basis of the TII Traffic and Transport Guidelines (May 2014), given that the impact upon this priority controlled junction does not exceed 10% of the existing two-way traffic flow, modelling is not required for this junction. The traffic impacts upon this junction will be nominal. Notwithstanding the above, for robustness, AECOM has completed a Junctions 9 analysis of Junction 5.

4.8.2 National Road Network

As requested during pre-application scoping for the previous 2018 SHD application, an assessment of the traffic impacts on the R148/M50 has been completed. It shows that the increase in traffic will be well below 5% as shown in Table 4.8.

Table 4.8 – National Road Network Percentage Increase

Traffic Flows	AM Peak (08:00 – 09:00)	PM Peak (17:00 – 18:00)
Base Flows at Junction	7325	8299
Development	80	98
% Impact	1.09%	1.18%

It can be seen from Table 4.8 that the percentage impact of the proposed development flows identifies a maximum of 1.09% impact upon the morning base on the M50 Motorway, whilst in the PM peak the percentage impact is 1.18% upon the existing base. Given that the percentage impacts are low in relation to the existing base flows, no further analysis has been undertaken at this location.

5. Network Analysis

5.1 Introduction

This chapter presents the impact analysis to identify the potential effects of the proposed development upon the surrounding road network. Figure 5.1 shows the junctions analysed as part of this assessment.

Figure 5.1 – Junctions Analysed (Source: Google Maps)

5.2 Junction Analysis

The operational assessment of the local road network has been undertaken using the Transport Research Laboratory (TRL) computer package PICADY for priority controlled junctions and LinSig for signal controlled junctions. When considering priority controlled junctions, a Ratio of Flow to Capacity (RFC) of greater than 85% (0.85) would indicate a junction to be approaching capacity, as operation above this RFC value is poor and deteriorates quickly. Similarly when considering signal controlled junctions, a DoS of 90% (0.90) would indicate a junction to be approaching capacity.

5.2.1 Junction 1 – R148 / Kennelsfort Road Lower Signalised Junction

As noted; on the basis of the thresholds outlined in the TII Traffic and Transport Guidelines (May 2014); given that the impact upon the signalised junction is considerably less than 5% of the existing two-way traffic flow, modelling is not required for this junction. The traffic impacts upon this junction due to the proposed development will be nominal. Additionally, and critically with regard to the consideration of impact on this junction, right-turn manoeuvres from the subject site are prohibited , and therefore there will be no impact to degree of saturation, queuing or delays on the adjoining arm of the signalised junction due to traffic exiting the subject site. Traffic approaching the site will be dispersed through the junction arms and the impact is forecast to be nominal, which is corroborated by the overall low percentage impact at the junction.

Additionally, and as stated earlier, the current access and egress point for the existing uses on the subject site forms an uncontrolled ‘fifth arm’ at the junction at the northwest corner of the crossroads and as such traffic can exit from the site into live traffic flows on the R148. This is a hazardous practice and addressing this would be a critical benefit of redevelopment of these lands.

The removal of the access point from these businesses onto the R148/Kennelsfort Road junction and concentrating vehicle trips exiting this site to Old Kennelsfort Road will help the functionality of the R148/Kennelsfort Road junction.

However, as noted earlier, for robustness, AECOM has completed a LinSig analysis of Junction 1.

LinSig is an industry standard software to model the capacity and queuing of signalised junctions. The meaning of the acronyms used within the capacity assessment results are discussed below.

- DoS Degree of Saturation (for signal controlled junctions)
- Q Queue length (PCU's)
- PRC Practical Reserve Capacity (for signal controlled junctions)

It is generally accepted that DoS values of 90% and less are indicators that a junction is operating within capacity. Although a junction would be said to be operating at capacity at values of 100%, the use of 90% allow for a margin of error and fluctuations in traffic flows. Junctions are therefore only identified as operating over capacity if these values are exceeded.

PRC is a term used to denote the maximum desirable flow through a signalised junction and 0% PRC is reached when one or more of the approaches to the junction are operating at 90% of their capacity. Therefore it should be recognised that the actual maximum limit for a signalised junction is -10% PRC and a junction would therefore be considered to be operating within its maximum capacity with a PRC value of -9.99%.

With regard to the above, it is noted that DMURS acknowledges that the above thresholds cannot always be achieved in urban areas and that "In areas …such as in Neighbourhoods and Centres…junctions may have to operate at saturation levels for short periods…"

A model was completed for observed traffic volume scenario (2017 volumes) for AM and PM, as shown in Table 5.1 below. Full results are contained within Appendix D.

Table 5.1 – LinSig Analysis of existing traffic volumes

Arm	2017 AM Baseline		2017 PM Baseline	
	DoS %	MMQ	DoS %	MMQ
R148 east Left	11.70%	1.0	8.20%	0.7
R148 east Ahead	290.10%	567.6	375.60%	820.4
R148 east Right	50.50%	2.6	38.90%	1.9
R148 west Left	28.60%	3.8	20.20%	2.6
R148 west Ahead	381.90%	919.1	222.90%	405.6
R148 west Right	182.70%	86.1	129.30%	34.4
Kennelsfort Rd Upper Left	78.90%	5.6	99.10%	13.3
Kennelsfort Rd Upper Right Ahead	21.10%	5.5	55.00%	3.05
Kennelsfort Rd Lower Left	4.60%	0.2	11.00%	0.5
Kennelsfort Rd Lower Right Ahead	63.60%	3.6	125.50%	32.1
Site Access Left	0.00%	0.0	0.00%	0.0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	6.30%	0.0	12.70%	0.1

It is noted under current conditions that the junction experiences high demand, with degree of saturation exceeding capacity, primarily on the R148. However, Kennelsfort Upper and Kennelsfort Lower respective "straight and right" lanes both experience capacity issues at peak times.

Analysis was then completed for Opening Year of 2021, Opening Year +5 of 2026 and Opening Year + 15 of 2036. The results are synopsised in Table 5.2.

Table 5.2 – 2021 With and Without Development LinSig Analysis

Arm	2021 AM Without Dev		2021 AM With Dev	
	DoS %	MMQ	DoS %	MMQ
R148 east Left	12.40%	1.1	12.40%	1.1
R148 east Ahead	309.50%	624.3	309.50%	624.3
R148 east Right	53.90%	2.8	56.80%	3
R148 west Left	30.50%	4.1	32.10%	4.3
R148 west Ahead	407.30%	1001.9	407.30%	1001.9
R148 west Right	194.80%	97.9	194.80%	97.9
Kennelsfort Rd Upper Left	84.20%	6.5	84.20%	6.5
Kennelsfort Rd Upper Right Ahead	86.70%	6.5	88.30%	6.8
Kennelsfort Rd Lower Left	5.20%	0.2	5.20%	0.2
Kennelsfort Rd Lower Right Ahead	67.40%	4	67.40%	4
Site Access Left	0.00%	0	3.60%	0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	6.80%	0	6.80%	0
Arm	**2021 PM Without Dev**		**2021 PM With Dev**	
R148 east Left	8.80%	0.8	8.80%	0.8
R148 east Ahead	400.50%	894.6	400.50%	894.6
R148 east Right	41.20%	2	49.90%	2.5
R148 west Left	21.50%	2.8	26.00%	3.4
R148 west Ahead	237.70%	453.2	237.70%	453.2
R148 west Right	138.00%	42.7	138.00%	42.7
Kennelsfort Rd Upper Left	105.80%	21.9	105.80%	21.9
Kennelsfort Rd Upper Right Ahead	58.90%	3.2	66.70%	3.9
Kennelsfort Rd Lower Left	11.60%	0.5	11.60%	0.5
Kennelsfort Rd Lower Right Ahead	133.80%	40	133.80%	40
Site Access Left	0.00%	0	2.00%	0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	13.50%	0.1	13.50%	0.1

Table 5.3 – 2026 With and Without Development LinSig Analysis

Arm	2026 AM Without Dev		2026 AM With Dev	
R148 east Left	13.40%	1.2	13.40%	1.2
R148 east Ahead	335.40%	700.9	335.40%	700.9
R148 east Right	58.60%	3.1	61.50%	3.3
R148 west Left	33.20%	4.6	34.70%	4.8
R148 west Ahead	441.40%	1112.9	441.40%	1112.9
R148 west Right	211.10%	113.8	211.10%	113.8
Kennelsfort Rd Upper Left	91.20%	8.6	91.20%	8.6
Kennelsfort Rd Upper Right Ahead	93.90%	8.5	95.60%	9.1
Kennelsfort Rd Lower Left	5.20%	0.2	5.20%	0.2
Kennelsfort Rd Lower Right Ahead	73.50%	4.5	73.50%	4.5
Site Access Left	0.00%	0	3.70%	0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	7.30%	0	7.30%	0
Arm	**2026 PM Without Dev**		**2026 PM With Dev**	
R148 east Left	9.50%	0.8	9.50%	0.8
R148 east Ahead	434.00%	994.1	434.00%	994.1
R148 east Right	44.70%	2.2	53.40%	2.8
R148 west Left	23.30%	3	27.90%	3.7
R148 west Ahead	257.60%	517.3	257.60%	517.3
R148 west Right	149.60%	53.8	149.60%	53.8
Kennelsfort Rd Upper Left	114.50%	36.5	114.50%	36.5
Kennelsfort Rd Upper Right Ahead	63.30%	3.6	71.10%	4.3
Kennelsfort Rd Lower Left	12.80%	0.6	12.80%	0.6
Kennelsfort Rd Lower Right Ahead	144.80%	50.7	144.80%	50.7
Site Access Left	0.00%	0	2.10%	0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	14.60%	0.1	14.60%	0.1

Table 5.4 – 2036 With and Without Development LinSig Analysis

Arm	2036 AM Without Dev		2036 AM With Dev	
R148 east Left	14.80%	1.3	14.80%	1.3
R148 east Ahead	364.90%	788.8	364.90%	788.8
R148 east Right	63.20%	3.4	66.10%	3.7
R148 west Left	36.10%	5	37.70%	5.3
R148 west Ahead	480.50%	1240.5	480.50%	1240.5
R148 west Right	229.60%	132	229.60%	132
Kennelsfort Rd Upper Left	99.40%	13.6	99.40%	13.6
Kennelsfort Rd Upper Right Ahead	102.20%	12.6	103.90%	13.7
Kennelsfort Rd Lower Left	5.80%	0.3	5.80%	0.3
Kennelsfort Rd Lower Right Ahead	80.20%	5.4	80.20%	5.4
Site Access Left	0.00%	0	3.90%	0.1
Kennelsfort Rd Lower Ahead Right (Northern Arm)	8.00%	0	8.00%	0
Arm	**2036 PM Without Dev**		**2036 PM With Dev**	
R148 east Left	10.20%	0.9	10.20%	0.9
R148 east Ahead	472.40%	1108.5	472.40%	1108.5
R148 east Right	48.70%	2.5	57.40%	3
R148 west Left	25.30%	3.4	29.80%	4
R148 west Ahead	280.40%	590.4	280.40%	590.4
R148 west Right	163.00%	66.7	163.00%	66.7
Kennelsfort Rd Upper Left	124.50%	54.6	124.50%	54.6
Kennelsfort Rd Upper Right Ahead	68.90%	4.1	76.70%	4.9
Kennelsfort Rd Lower Left	13.90%	0.6	13.90%	0.6
Kennelsfort Rd Lower Right Ahead	158.10%	63.7	158.10%	63.7
Site Access Left	0.00%	0	2.10%	0
Kennelsfort Rd Lower Ahead Right (Northern Arm)	16.00%	0.1	16.00%	0.1

Table 5.2 indicates the proposed development traffic has a low impact on the junction with the overall PRC value remaining unchanged in each peak period. The *without development* scenarios show large volumes of queueing on the R148 which remain unchanged in the *with development* scenarios. In all *without development* scenarios, there is a large queue on Kennelsfort Road between the signalised crossroads and the access junction; this queue is reduced in the *with development* scenarios. This shows that the development may have a partly positive impact on the overall operation of the junction.

It is acknowledged that this junction experiences queuing and delays at peak times, and that upgrade would benefit the junction operation based on existing conditions irrespective of any development on the subject site, primarily due to the large volumes of traffic travelling along the R148. The impact of the proposed development is negligible on the junction. A proposal to upgrade the junction by grade separation is understood to have been previously considered by South Dublin County Council. The proposed access arrangement would not preclude such an upgrade.

5.2.2 Junction 2 - Lucan Road / Kennelsfort Road Lower Priority Junction

The junction has been modelled as a separate 3-arm priority junction using the industry standard Junctions 9 modelling package (PICADY).

The outputs for Junctions 9 present Ratio of Flow to Capacity (RFC) figures and queue lengths (PCU vehicles) as indicators of the operational efficiency of the junction. An RFC value of 0.85 indicates that the junction is operating at its theoretical capacity.

The Mean Maximum Queue (MMQ) represents the average maximum queue length reported from the model in the junction analysis in PCU.

A synopsis of the results of the of the Site Access / Kennelsfort Road Lower and Kennelsfort Road Lower / Old Lucan Road priority junctions are outlined in Tables 5.3 and 5.4 below, respectively. The full traffic model results are shown in Appendix E.

Table 5.3 – Junction 1 Analysis

Assessment Year	Arm	AM		PM	
		MMQ (PCU)	RFC	MMQ (PCU)	RFC
2017 Baseline	Site Access	0	0	0	0.02
	Kennelsfort Road (Northern Arm)	0	0	0	0
2021 Without Development	Site Access	0	0	0	0.03
	Kennelsfort Road (Northern Arm)	0	0	0	0
2021 With Development	Site Access	0.1	0.07	0.1	0.07
	Kennelsfort Road (Northern Arm)	0	0	0	0
2026 Without Development	Site Access	0	0	0	0.03
	Kennelsfort Road (Northern Arm)	0	0	0	0
2026 With Development	Site Access	0.1	0.07	0.1	0.07
	Kennelsfort Road (Northern Arm)	0	0	0	0
2036 Without Development	Site Access	0	0	0	0.03
	Kennelsfort Road (Northern Arm)	0	0	0	0
2036 With Development	Site Access	0.1	0.07	0.1	0.07
	Kennelsfort Road (Northern Arm)	0	0	0	0

Table 5.4 – Junction 2 Analysis

Assessment Year	Arm	AM		PM	
		MMQ (PCU)	RFC	MMQ (PCU)	RFC
2017 Baseline	Kennelsfort Road (Southern Arm)	2.1	0.68	1	0.49
	Old Lucan Road (Western Arm)	0.2	0.17	0.5	0.29
2021 Without Development	Kennelsfort Road (Southern Arm)	2.7	0.73	1.1	0.52
	Old Lucan Road (Western Arm)	0.3	0.18	0.5	0.32
2021 With Development	Kennelsfort Road (Southern Arm)	4.5	0.83	1.6	0.61
	Old Lucan Road (Western Arm)	0.3	0.2	0.6	0.34
2026 Without Development	Kennelsfort Road (Southern Arm)	3.7	0.79	1.4	0.57
	Old Lucan Road (Western Arm)	0.3	0.2	0.6	0.35
2026 With Development	Kennelsfort Road (Southern Arm)	7	0.89	2	0.66
	Old Lucan Road (Western Arm)	0.4	0.22	0.7	0.37
2036 Without Development	Kennelsfort Road (Southern Arm)	6	0.87	1.7	0.62
	Old Lucan Road (Western Arm)	0.3	0.22	0.7	0.38
2036 With Development	Kennelsfort Road (Southern Arm)	13.3	0.97	2.6	0.72
	Old Lucan Road (Western Arm)	0.4	0.24	0.8	0.4

The results above show that Junction 1 is well within capacity and maintains a reserve capacity of 93% in the 2036 future assessment year while Junction 2 is reaching theoretical capacity during the 2026 Base + Development Scenario. While there is queuing during the peak AM traffic, this is considered within reasonable limits having regard to the urban/commuter nature of the Lucan Road. The junction analysis shows that the peak period of congestion develops for a short period within the peak hour.

5.2.3 Junction 5 - Lucan Road / Secondary Access Priority Junction

The junction has been modelled as a 3-arm priority junction using the industry standard Junctions 9 modelling package (PICADY).

The outputs for Junctions 9 present Ratio of Flow to Capacity (RFC) figures and queue lengths (PCU vehicles) as indicators of the operational efficiency of the junction. An RFC value of 0.85 indicates that the junction is operating at its theoretical capacity.

The Mean Maximum Queue (MMQ) represents the average maximum queue length reported from the model in the junction analysis in PCU.

A synopsis of the results of the of the Secondary Access / Lucan Road priority junction is outlined in Table 5.5. The full traffic model results are shown in Appendix D.

Table 5.5 – Junction 3 Analysis

Assessment Year	Arm	AM		PM	
		MMQ (PCU)	RFC	MMQ (PCU)	RFC
2017 Baseline	Site Access (Western Access)	0	0	0	0.03
	Old Lucan Road (Western Arm)	0	0	0	0
2021 Without Development	Site Access (Western Access)	0	0	0	0.03
	Old Lucan Road (Western Arm)	0	0	0	0
2021 With Development	Site Access (Western Access)	0.1	0.07	0.1	0.07
	Old Lucan Road (Western Arm)	0	0	0	0
2026 Without Development	Site Access (Western Access)	0	0	0	0.03
	Old Lucan Road (Western Arm)	0	0	0	0
2026 With Development	Site Access (Western Access)	0.1	0.07	0.1	0.07
	Old Lucan Road (Western Arm)	0	0	0	0
2036 Without Development	Site Access (Western Access)	0	0	0	0.04
	Old Lucan Road (Western Arm)	0	0	0	0
2036 With Development	Site Access (Western Access)	0.1	0.07	0.1	0.08
	Old Lucan Road (Western Arm)	0	0	0	0

The results above show that Junction 3 is well within capacity and maintains a reserve capacity of 92% in the 2036 future assessment year. The junction analysis shows that the peak period of congestion develops for a short period within the peak hour.

6. DMURS Statement of Compliance

6.1 Objectives

This Statement of Compliance has been prepared as per the Strategic Housing Development (SHD) Section 5 Pre-Application Consultation Request, Section 19, which requests the following:

"Please submit a statement indicating, in the prospective applicant's opinion, the proposal is consistent with the Design Manual for Urban Roads and Streets (Department of Transport, Tourism and Sport & Department of Environment, Community and Local Government, 2013)."

It is AECOM's opinion that the proposed development is consistent with both the principles and guidance outlined within the Design Manual for Urban Roads and Streets (DMURS) 2013. The scheme proposals are the outcome of an integrated approach that incorporate road design, urban design and landscaping to create lower traffic speeds and thereby facilitate a safer, more attractive environment for pedestrians and cyclists.

The adopted design approach successfully achieves the appropriate balance between the functional requirements of different network users whilst enhancing the sense of place. The implementation of self-regulating streets actively manages movement by offering real modal and route choices in a low speed, high quality residential environment.

The main objective of this report is to examine the design principles of the proposed development with reference to the two core principles presented within DMURS, as outlined below:

1. **Street Networks:** To support the creation of integrated street networks which promote either levels of permeability and legibility for all users and in particular more sustainable forms of transport.
2. **Street Design:** The promotion of multi-functional, place-based streets that balance the needs of all users within a self-regulating environment.

6.2 Street Networks

Specific attributes of the street network which contribute to achieving the DMURS objective include:

- The subject site will be highly accessible to pedestrians and cyclists from the adjacent Kennelsfort Road Lower and the nearby Old Lucan Road. The proposed development achieves filtered permeability, primarily for walking and cycling at the two site access locations on Kennelsfort Road Lower and Old Lucan Road.
- The internal pedestrian routes within the site were derived from the location of the apartment blocks, and associated facilities. This has led to the creation of pedestrian routes that lead to/from and around the development and ties into the existing pedestrian facilities along Kennelsfort Road Lower and the Old Lucan Road.
- Gateway entry treatments in the form of ramped/raised entries are provided at the 2 number vehicle site access locations on Kennelsfort Road Lower and at the Palmerstown Business Park access, thereby informing drivers that they are entering into a different type of street network and to adjust their driving style accordingly, whilst also serving as traffic calming features.
- Well-designed pedestrian/cycle crossing facilities are provided along the key travel desire line at the site access junction along Kennelsfort Road Lower. There is a raised entry treatment (Gateways) at this junction which will help to control the speed at which vehicles can enter/exit the junction whilst also raising the conspicuousness of the pedestrians crossing at the junction.
- All open spaces provided as part of the scheme shall offer linkages and connectivity to and from the scheme, including direct connections to Kennelsfort Road Lower and the shared area leading to/from Palmerstown Business Park.
- The designed open spaces have been developed on the basis of linkages and connectivity throughout the scheme; pre-empting desire lines has been critical. People places are successful places and it is envisaged that these spaces will be actively used and enjoyed by future residents which will bring about a great sense of ownership and overall pride.

6.3 Street Design

The internal layout design has been informed by Chapter 4 of the DMURS guidelines. The following measures are examples of where compliance with the recommended street design guidelines has been demonstrated:

6.3.1 Self regulating Streets

The implementation of a self-regulating shared pedestrian/vehicle route within the site actively manages movement by offering real modal and route choices in a low speed, high quality residential environment. The design of the scheme proposals has actively sought to ensure there are no long straight sections of carriageway with the provision of strategically placed traffic calming features (i.e. vertical and horizontal deflections) located at an appropriate frequency and distance.

6.3.2 Streetscape

Enclosure

'A sense of enclosure spatially defines streets and creates a more intimate and supervised environment. A sense of enclosure is achieved by orientating buildings toward the street and placing them along its edge. The use of street trees can also enhance the feeling of enclosure.'

To promote a sense of enclosure within the site, the proposed development has been designed to ensure the residential units overlook the adjacent site access road, and open space areas within the site.

The provision of Street Trees and planting are an vital component of the site layout, adding a sense of enclosure to the streetscape, and accordingly help to encourage vehicles to travel at lower speeds.

6.3.3 Active Edge

'An active frontage enlivens the edge of the street creating a more interesting and engaging environment. An active frontage is achieved with frequent entrances and openings that ensure the street is overlooked and generate pedestrian activity as people come and go from buildings.'

The proposed apartment blocks fronts onto and overlook the internal site access road, Kennelsfort Road Lower and the R148, thereby creating a more active site boundary whilst also creating a focal point for the development.

6.3.4 Pedestrian Activity/Facilities

'The sense of intimacy, interest and overlooking that is created by a street that is enclosed and lined with active frontages enhances a pedestrian's feeling of security and well-being. Good pedestrian facilities (such as wide footpaths and well designed crossings) also make walking a more convenient and pleasurable experience that will further encourage pedestrian activity.'

As previously outlined, the proposed development has been designed to provide pedestrian permeability throughout the site and onto Kennelsfort Road Lower, and the Old Lucan Road via Palmerstown Business Park. The apartment blocks overlook the pedestrian routes throughout the site thereby providing surveillance and active edges

In addition, the following measures are examples of where compliance with the DMURS pedestrian focus has been demonstrated:

- The proposed corner radii at the site access junction on Kennelsfort Road Lower comply with DMURS (Section 4.3.3) in order to reduce vehicular speeds and reduce pedestrian crossing distances.
- Seating areas have been incorporated thereby performing the dual function of providing rest areas for pedestrians whilst also enhancing the sense of place by encouraging pedestrian activity internally within the site.
- All open spaces provided as part of the scheme shall offer linkages and connectivity to and from the scheme, including direct connections to Kennelsfort Road Lower and the transition area between Palmerstown Business ark and the subject site.
- The designed open spaces shall be developed on the basis of linkages and connectivity throughout the scheme; pre-empting desire lines has been critical. People places are successful places and it is envisaged that these spaces will be actively used and enjoyed by future residents which will bring about a great sense of ownership and overall pride.

6.3.5 Cyclists

'The National Cycle Manual (2011) (NCM) promote cycling as a sustainable form of transport and seek to rebalance design priorities to promote a safer and more comfortable environment for cyclists. To achieve these goals, the NCM recognises the importance of slowing vehicular traffic within cities, towns and villages, and advocates many of the measures contained within this Manual, such as narrower vehicular carriageways and tighter corner radii.'

DMURS goes on to state: *'On lightly-trafficked/low-speed streets, designers are generally directed to create* Shared *Streets where cyclists and motor vehicles share the carriageway'.*

As previously outlined, the proposed corner radii at the site access junction on Kennelsfort Road complies with DMURS (Section 4.3.3) in order to reduce vehicular speeds. Furthermore the development proposes a shared pedestrian/cycle route through the site.

6.3.6 Carriageway Conditions

The adopted design approach successfully achieves the appropriate balance between the functional requirements of different network users whilst enhancing the sense of place. The subject development proposes a hierarchy of streets which include:-

- A Local Street which ranges in width from 4.8m-5.5-m through the subject site.

A swept path analysis has been undertaken to demonstrate that the proposed development can cater for a 10.2m refuse vehicle to safely access and egress the site and manoeuvre within the development.

6.3.7 Materials and Finishes

DMURS also gives guidance on the types of materials and finishes to be used in order to provide a sense of calm for traffic and improve legibility for vulnerable road users. All carriageways, footpaths and tactile paving will be of visually contrasting colour. The road markings will be flush so as to permit refuse vehicles and fire tenders manoeuvring within the development infrequently.

6.3.7.1 Signing and Lining:

As per Section 4.2.4 of DMURS, signing and lining has been provided appropriately at the required locations. However, the proposed development has been designed to have a self-regulating approach to increase the road safety as opposed to relying on mandatory and warning signs.

6.3.7.2 Lighting

The lighting design will be fully in compliance with DMURS Specification Section 4.2.5, BS 5489 and a level P Classification in accordance IS EN 13201-2:2015.

7. Construction Management Plan

This chapter of the report deals directly with the impacts of construction of the subject development. As with any construction project, the contractor will be required to prepare a comprehensive traffic management plan for the construction phase. The purpose of such a plan is to outline measures to manage the expected construction traffic activity during the construction period.

This chapter will provide an overview of the likely routing of construction vehicles, based on a most likely scenario of construction. It should be noted that the impacts of the construction will be temporary, and it will be the contractor's responsibility to prepare a Traffic Management Plan for the approval of South Dublin County Council in advance of any works. Further to this in regard to the construction traffic trip generation and impact on the road network this has been included within AECOMs outline Construction and Demolition Waste Management Plan which has been submitted as part of this publication.

7.1 Policy Guidance

Guidance for the temporary control of traffic at road works to facilitate the safety of the public during the works is provided below:

- Traffic Signs Manual Chapter 8 Temporary Traffic Measures and Sign Roadworks (2008);
- Addendum Transport Chapter 8, Temporary Traffic Measures and Sign Roadworks (2008);
- Traffic Management Guidelines, Department of Transport (2003);
- Requirements of South Dublin County Council.

7.2 Indicative Construction Programme & Phasing

The construction programme is expected to require 16 - 18 months (approximately) to complete from occupation of the site.

7.3 Construction Route

To minimise construction impacts upon the surrounding road network, it is recommended that all construction traffic accesses and exits the site from the M50 / N4 by travelling down Chapelizod Bypass and turning into the development. Traffic will then exit the development and turn onto the Lucan Road and back onto the Chapelizod Bypass and travelling towards the N4 / M50 direction, as illustrated by Figure 7.1 below.

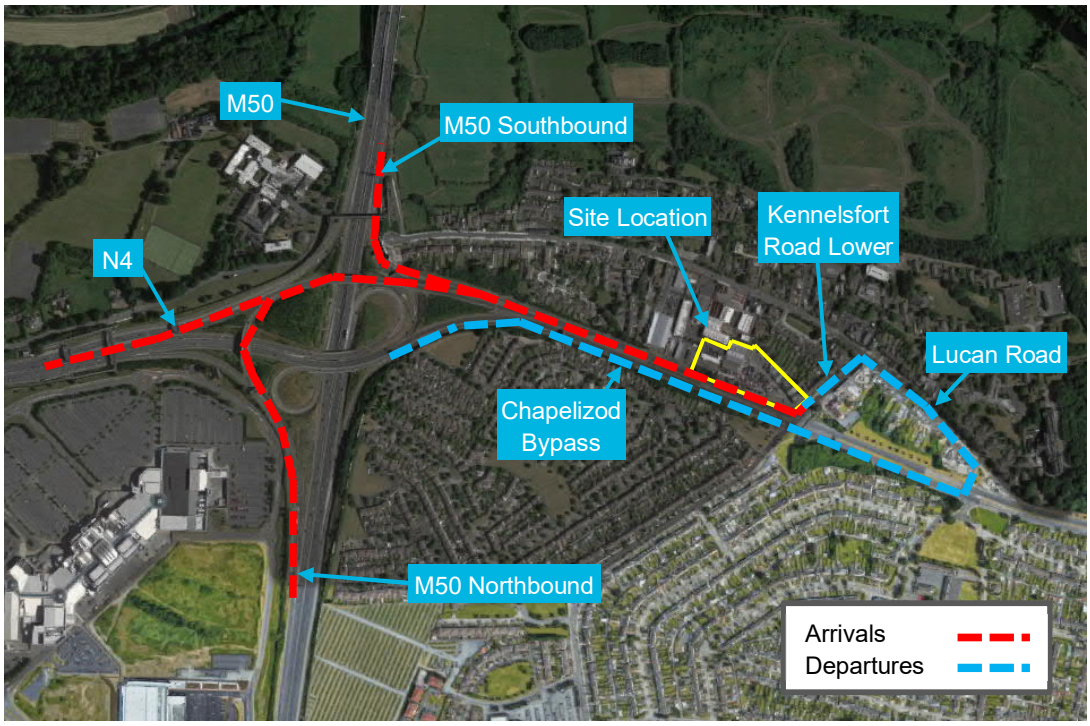


Figure 7.1 – Proposed Construction Traffic Route (Source: Google Maps)

7.4 Parking

All contractors vehicles will park within the development site area, it is recommended that as park of the construction management plan the contactor designates an area within the confines of the site dedicated to operative car parking. There will be no parking permitted on the surrounding road network or estate roads by the contractor or site operatives.

7.5 Mitigation Measures

A construction management plan will be developed by the contractor prior to the commencement of work on site and will be prepared in consultation with South Dublin County Council.

Construction debris particularly site clearance, spoil removal and dirty water run off can have a significant impact on footpaths and roads adjoining a construction site, if not adequately dealt with.

7.6 Hours of Operation

Site development and building works shall be carried out between the hours of operation recommended by SDCC to safeguard the residential amenities of properties in the vicinity. The typical hours of operation are as follows:

- Monday to Friday, 8am – 7pm, Saturdays 8am – 2pm and no works on Sundays or Public holidays.

7.7 Traffic Management Measures

Below is a list of the proposed traffic management measures to be adopted during the construction works. Please note that this is not an exhaustive list, and that it will be the appointed contractor's responsibility to prepare a detailed construction management plan.

- Warning signs / Advanced warning signs will be installed at appropriate locations in advance of the construction access locations;
- Construction and delivery vehicles will be instructed to use only the approved and agreed means of access; and movement of construction vehicles will be restricted to these designated routes;
- Appropriate vehicles will be used to minimise environmental impacts from transporting construction material, for example the use of dust covers on trucks carrying dust producing material;
- Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the site;

- Parking of site vehicles will be managed and will not be permitted on public road, unless proposed within a designated area that is subject to traffic management measures and agreed with SDCC;
- A road sweeper will be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works;
- On site wheel washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the site, to remove any potential debris on the local roads;
- All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol or diesel. Spill kits will be available on site. All scheduled maintenance carried out off-site will not be carried out on the public highway; and
- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons.

The mitigation measures will therefore ensure that the presence of construction traffic will not lead to any significant environmental degradation or safety concerns in the vicinity of the proposed works. Furthermore, it is in the interests of the construction programme that deliveries, particularly concrete deliveries are not unduly hampered by traffic congestion, and as a result continuous review of haulage routes, delivery timings and access arrangements will be undertaken as construction progresses to ensure smooth operation.

8. Summary and Conclusions

AECOM has been commissioned by Randelswood Holdings Ltd to prepare a Traffic and Transport Assessment to accompany a planning application for a site on Kennelsfort Road Lower, Palmerstown, Co. Dublin. The site is located at the junction of Old Lucan Road / Kennelsfort Road Lower and is accessed from the junction.

Pre-application consultation was undertaken with:

- SDCC Roads Department on Thursday the 18th July 2019,
- ABP Section 5 PAC on 11th December 2019; and
- SDCC Roads Department on 2nd April 2020.

The feedback received during these consultation exercises in relation to traffic and transportation items have been a taken into consideration in the development of this TTA.

The receiving environment has been assessed in terms of walking, cycling, public transport and road infrastructure. Notably, the site is in proximity to high frequency bus services and the proposed Bus Connects route No.6.

The proposed development, subject to this application, consists of five apartment blocks with 1-2 bedroom apartments and 250 apartment units in total. It also contains supporting land uses, comprising, gym and community room.

The site is proposed to be accessed by way of a vehicular priority junction off Kennelsfort Road Lower. Left-in and left out manoeuvres will only be permitted at this access. The secondary entrance on the Old Lucan Road will allow residents to enter and exit from this junction as normal.

The proposed site access is considered to represent a marked improvement from the existing site access, which forms an uncontrolled fifth arm of the / Kennelsfort Road Lower/ R148 signalised junction.

Visibility requirements are provided for in line with DMURS for 30kph (to the north along Kennelsfort Road Lower), however, visibility to the south is not achieved due to proximity of the R148 / Kennelsfort Road Lower junction although it is envisioned vehicle speeds will be low at this junction . Site servicing is provided for in terms of refuse lorry and fire tender access and circulation, which have been tested in AutoTrack and included in AECOMs drawings.

Car parking has been provided in line with SDCC Development Plan requirements. In total, 125 car parking spaces are proposed. Cycle parking has also been provided in excess of minimum SDCC Development Plan standards – in total 276 cycle parking spaces are proposed.

A trip generation assessment has been completed. The subject site has an extant trip generation, due to its respective existing and permitted uses. This is examined but for robustness has not been subtracted from the trip generation assessment. The existing consented planning permission associated with the site has a considerably higher traffic generation than this application proposes. The trip generation assessment has been completed utilising the trip rate as determined by the donor site which was agreed with at the pre-application meeting with SDCC. The calculation has established that the anticipated trip generation is 80 two-way trips in the AM peak and 98 two-way trips in the PM peak.

Trip distribution onto the network was established cognisant of current and future traffic patterns.

A percentage impact assessment has been completed in line with TII guidance. This has established that the following percentage impacts are anticipated at local junctions:

- Junction 1 – Kennelsfort Road Lower / R148 / Site Access (1.7% increase in the AM and 1.7% increase in the PM);
- Junction 2 – Kennelsfort Road Lower / Lucan Road (11.2% in the AM and 9.5% In the PM);
- Junction 3 – Lucan Road / R148 (1.3% in the AM and 0.9% in the PM).
- Junction 4 – M50 / R148 (1.09% in the AM and 1.18% in the PM)

- Junction 5 – Secondary Site Access / Lucan Road (7.8% in the AM and 8.3% in the PM)

Cognisant of the percentage impact assessment and consistent with TII thresholds, Junction 2 (Kennelsfort Road Lower / Lucan Road Priority Junction) and Junction 5 (Secondary Site Access / Lucan Road) was modelled using the industry standard Junctions 9. For robustness, Junction 1 (signalised junction of R148 / Kennelsfort Road) was also modelled. The traffic analysis results from Junctions 9 show that the junction experiences short periods of congestion in the future year during the peak hour, much of which is due to background growth. No mitigation measures are required at the priority junction. Junction 1 is shown to have an unchanged PRC at the junction irrespective of whether the development proceeds or not.

An outline of the Mobility Management Plan has been prepared indicating the potential measures that could be implemented by the management company to promote more sustainable forms of transport to potential residents / staff.

An outline for the Construction Traffic Management Plan has been prepared indicating the potential construction traffic route and measures that could be implemented by the contractor to minimise the impact on the surrounding road network, this will be subject to agreement with South Dublin County Council Roads Department.

Finally, a Statement of Compliance has been included, which demonstrates that the proposed development meets DMURS requirements and that traffic and transport issues have been comprehensively considered and addressed.

It is AECOM's considered opinion that there is no traffic or transportation reason why this development should not proceed.

Appendix A Response to ABP Opinion (Case Ref: ABP-305801-19)

Technical Note

To An Bord Pleanala	**Project number** 60556657	**Client** Randelswood Holdings Ltd.	**Subject** Response to ABP Opinion (Case Ref: ABP-305801-19)
Date April 2020	**Project name** Proposed Strategic Housing Development, Palmerstown	**Issued by** Jacqueline Haley	**Prepared by** Zachary Cave

Introduction

AECOM have prepared this technical note in response to the Opinion issued by An Bord Pleanála (Case Ref: ABP-305801-19) to the proposal for 250 no. apartments and associated site works in the Palmerstown Retail Park, Kennelsfort Road Lower, Palmerstown, Dublin 20.

AECOM note the following items relate to Traffic & Transportation; accordingly AECOM has sought to address these specific issues, details of which are included below.

ABP Item 3. Pedestrian/Cyclist permeability and Car Parking

'Further Consideration and/or justification of the documents as they relate to:

- *Quality of public realm and particularly future pedestrian and cyclist connections through to the Lucan Road. Clarity should be provided regarding any upgrade works proposed to the right of way including public lighting. In the absence of appropriate pedestrian and cyclist connections, full justification for the proposed through route should be provided including an assessment of traffic safety.*
- *Extent of car parking having regards to the guidance set out under SPPR 8'*

AECOM Response to Item 3

Pedestrian/Cycle Access & Permeability

The subject site will be highly accessible to pedestrians and cyclists from the adjacent Kennelsfort Road Lower and the nearby Old Lucan Road. The proposed development achieves filtered permeability, primarily for walking and cycling at the two site access locations on **Kennelsfort Road Lower** and **Old Lucan Road**, as illustrated in (Figure 1).

Internal Site

Pedestrians are given priority within the internal site layout to ensure desire lines within the site are accommodated providing a good level of service and ensures the risk of vehicle/pedestrian conflict with vehicles is minimised.

The internal pedestrian routes within the site were derived from the location of the apartment blocks, and associated facilities. This has led to the creation of pedestrian routes that lead to/from and around the development and ties into the existing pedestrian facilities along Kennelsfort Road Lower and the Old Lucan Road. Figure 1 below indicates the pedestrian routes within and around the subject site.

Figure 1 also indicates the routes that cyclists can take around the site. In addition to the routes indicated, cyclists can also make use of the pedestrian paths indicated, should they choose to walk their bicycles along them.

Kennelsfort Road Lower Access

To further enhance pedestrian and cyclist accessibility to the site from Kennelsfort Road Lower, the R148 and the surrounding area, the existing pedestrian crossing on Kennelsfort Road Lower adjacent to the site access will be upgraded to a Toucan Crossing.

The provision of this Toucan Crossing will provide a safe transition to enable cyclists to travel between the site and the existing cycle facilities along the R148.

It should also be noted that the café element of the subject development will attract a local walk-in catchment from both the subject development and the surrounding local area. The provision of these enhanced pedestrian and cycle facilities at the Kennelsfort Road Lower site access will facilitate this new pedestrian travel desire line into the site.

Old Lucan Road Access via Palmerstown Business Park

There is an existing Right of Way between the subject site through the Palmerstown Business Park, providing a connection to the Old Lucan Road, which will enable residents/visitors travelling to/from the subject site to utilise the Lucan Road access 24 hours per day.

The provision of the pedestrian/cycle connection onto Old Lucan Road via Palmerstown Business Park will provide pedestrians/cyclists with a shorter more direct link between Old Lucan Road and Kennelsfort Road, in comparison to the existing necessity to travel along Kennelsfort Road Lower and Old Lucan Road representation a reduction in travel distance of approximately 100m.

Although it does not form part of this SHD application, it should be noted that enhanced Public Lighting will be provided within Palmerstown Business Park within the coming months (in advance of occupation of the subject site). These forthcoming public lighting upgrades have been designed to the appropriate standard by Fallon Design M&E Engineering. The provision of this enhanced public lighting within the Business Park will improve safety and personal security for all road users (pedestrians/cyclists/vehicles) travelling between the site and the Old Lucan Road.

A design for the provision of potential upgrades within the Business Park has been prepared by the design team (PR224738-ACM-00-00-DR-CE-00-0002 submitted with this application). This design includes the provision of a demarcated pedestrian route via the provision of enhanced road markings. with within the Business Park. Subject to agreement, it is envisaged that these upgrades within the Business Park will be provided prior to opening of the development.

The route through Palmerstown Business Park will also facilitate egress for service vehicles (i.e. refuse vehicles), from the development onto Old Lucan Road. Service vehicles entering the site will be restricted to one way only traffic movements, with service vehicles entering the subject site from Kennelsfort Road Lower and exiting onto the Old Lucan Road.

The prohibition of all right turn manoeuvres at the Kennelsfort Road Lower site access junction will also ensure that the subject site does not become an attractive rat run for vehicles travelling from Old Lucan Road and Palmerstown Business Park.

These traffic management measures will improve pedestrian safety within both Palmerstown Business Park and through the subject development site as the quantum of service vehicles travelling through the site will be minimised. This arrangement will also reduce the traffic demand on the Kennelsfort Road Lower / R158 junction.

Upgrade Works Summary

In summary the following upgrade works and development proposals will ensure safe, attractive and permeable pedestrian and cycle connections to/from and within the subject site from both Kennelsfort Road Lower and the Old Lucan Road:

- Pedestrians and cyclists are provided with direct and attractive routes through the subject site
- The existing pedestrian crossing on Kennelsfort Road Lower adjacent to the site access will be upgraded to a Toucan Crossing.
- Pedestrians and cyclists can travel between Old Lucan Road and Kennelsfort Road through the subject site with a shorter more direct link than the existing scenario, representing a reduction in travel distance of approximately 100m.
- Enhanced Public Lighting is being provided within the Palmerstown Business Park.
- A design has been prepared (subject to agreement) for the provision of a demarcated pedestrian route within Palmerstown Business Park.

Assessment of Safety (Quality Audit)

A Quality Audit (including Stage 1/2 Road Safety Audit, Access Audit, Cycle Audit and Walking Audit) has been carried out by an audit team who are independent of the design team in accordance with the TII publication GE-STY-01024. Full details of this Audit are detailed below under **ABP Item 12**.

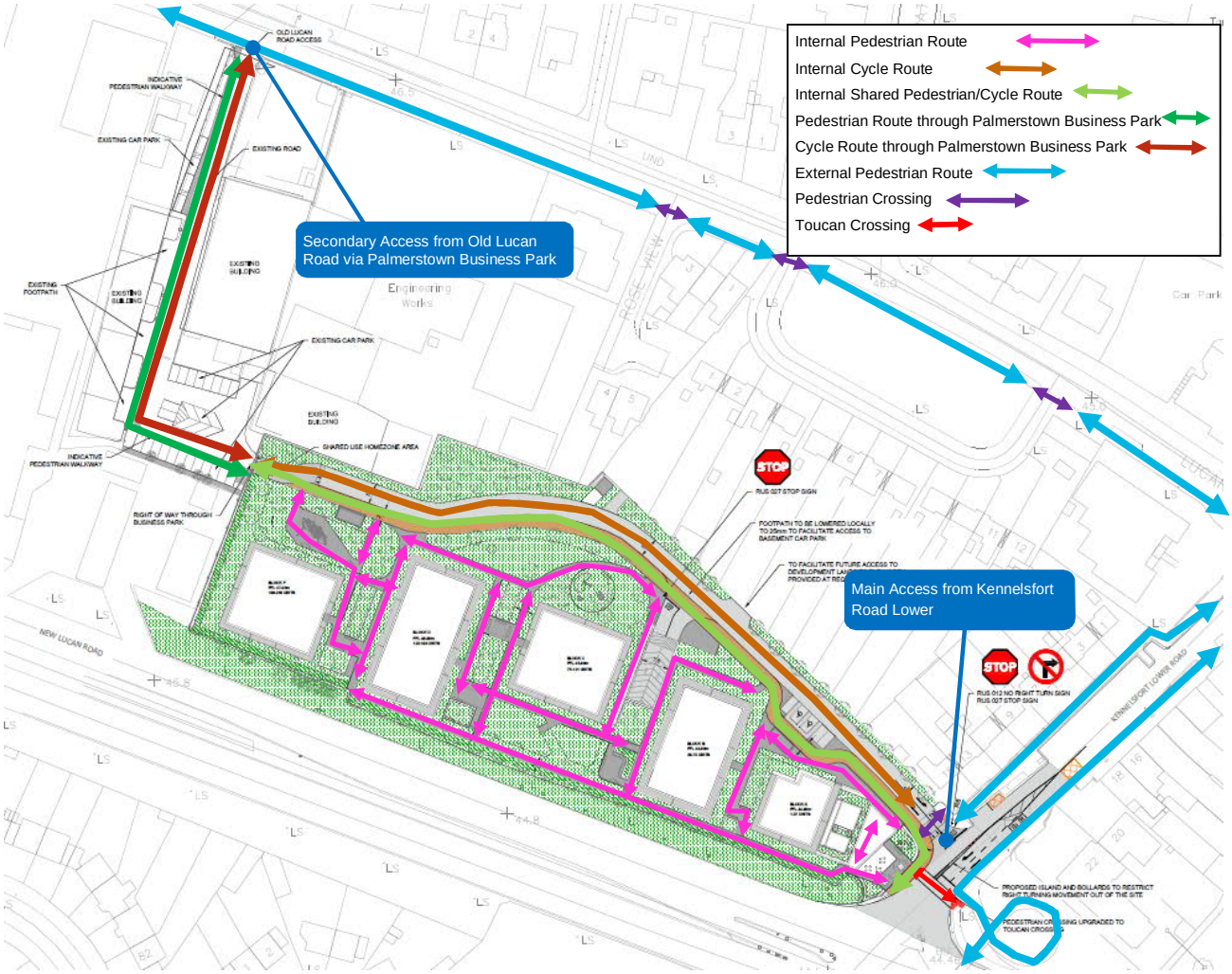


Figure 1 – Pedestrian & Cycle Access Locations

Extent of Car Parking with regards to SPPR 8

As detailed within Section 3.8.1 of the Traffic and Transport Assessment submitted with the planning application, in order to determine the appropriate quantum of vehicle parking for the proposed residential development, reference has been made to the following guidance:-

- Sustainable Urban Housing: Design Standards For New Apartments Guidelines For Planning Authorities, as published by the Department of Housing, Planning and Local Government (DHPLG), March 2018; and
- South Dublin Council County Development Plan (2016-2022).

Specific Planning Policy Requirement 8 of the DHPLG Apartment guidelines states:

'For proposals that qualify as specific BTR development in accordance with SPPR 7:

> *iii) There shall be a default of minimal or significantly reduced car parking provision on the basis of BTR development being more suitable for central locations and/or proximity to public transport services. The requirement for a BTR scheme to have a strong central management regime is intended to contribute to the capacity to establish and operate shared mobility measures;'*

In regard to the development proposals for the 250 residential apartment units, it is noted that the car parking proposals for these apartment units are approximately 43% below the SDCC maximum, (i.e. 125 parking spaces provided versus the SDCC 217 maximum permitted) and subsequently comply with the maximum standard recommended by SDCC.

Accordingly the '*significantly reduced*' development parking provision accords with SPPR 8 as outlined within the DHPLG guidelines.

ABP Item 12

'A detailed Quality Audit to include Road Safety Audit, Access Audit, Cycle Audit and Walking Audit. A Mobility Management Plan.'

AECOM Response to Item 12

Quality Audit

A Quality Audit (including Stage 1/2 Road Safety Audit, Access Audit, Cycle Audit and Walking Audit) has been carried out by an audit team who are independent of the design team in accordance with the TII publication GE-STY-01024.

The following Table details the items raised within the Audit and specifies how these items have been addressed by the design team in order to receive sign off from the independent auditors. A copy of this Audit which includes the design teams responses have been submitted with this application.

Table 1. Quality Audit Problems & Recommendations

Problem Reference	Problem	Recommendation	Measures to be implemented / Design Team Response	Accepted by Auditors / Item Resolved
3.1	There is no provision for cyclists to get from the new development to the inbound bus/cycle lane on the R148. This may lead cyclists to cross Kennelsfort Road Lower between the bollards and mingle with general traffic or the cyclists might mount the footpath and mingle with pedestrians.	It is recommended that a route be provided for cyclists from the development to access the cycle lane on the R148. This may include the upgrading of the existing signalised pedestrian crossing of Kennelsfort Road to a toucan crossing.	The existing pedestrian crossing is to be upgraded to a Toucan crossing to facilitate cycle access to the R148. Refer to AECOM drawing PR224738-ACM-00-00-DR-CE-00-0001	Yes
3.2	The 3.5m footway stops at the boundary wall of the business Park. There is a risk that pedestrians who enter the carriageway to continue towards the Old Lucan Road will not be anticipated by drivers and this could lead to collisions. There may also be a lack of inter-visibility between pedestrians and drivers due to the presence of the boundary wall.	It is recommended that a transition zone be provided for pedestrians to join a shared use area for vehicles, cyclists and pedestrians on the approach to the business park. The shared use area should be distinguishable by a different surface material and the use of suitable road markings.	A shared use area compliant with DMURS has been provided to enable pedestrians/cyclists to transition between the subject site and Palmerstown Business Park. The shared use are is distinguished by the provision of a raised area with a contrasting surface treatment. Refer to AECOM drawing PR224738-ACM-00-00-DR-CE-00-0001	Yes
3.3	There are no dedicated pedestrian or cyclist facilities through the business park. Users of the business park may not anticipate the increased usage by vulnerable road users when the development is complete and may travel at inappropriate speed around the 90 degree bend, not be as vigilant when exiting car parking spaces, or may park at inappropriate locations.	It is recommended that road markings be provided in the business park indicating the presence of pedestrians and cyclists along the route.	Enhanced Public Lighting is being provided within the Palmerstown Business Park. A design has been prepared (subject to agreement) for the provision of a demarcated pedestrian route within Palmerstown Business Park.	Yes

Problem Reference	Problem	Recommendation	Measures to be implemented / Design Team Response	Accepted by Auditors / Item Resolved
3.4	During the site visit it was observed that there is a pedestrian desire line from Kennelsfort Road Lower to the Circle K shop along the grassed verge of the R148. There will be a similar desire line from the proposed development. Without a suitable surface pedestrian could slip and fall on the grassed verge especially in wet or icy conditions.	It is recommended that a footpath be provided at the R148 boundary of the development connecting Kennelsfort Road Lower with the Circle K shop.	The boundary of the subject site along the R148 will consist of a low wall and rail with hedging, therefore, will restrict pedestrians entering/ exiting the site at this location. Should a footpath link be provided by SDCC at a later date, the Client will be happy to provide a connection from the site to this future footpath link. It should also be noted that the café element of the subject development will attract a local walk-in catchment from both the subject development and the surrounding local area, and as such the existing desire line to the Circle K premises may no longer exist with the opening of the café on site .	Yes
3.5	The internal footpath parallel to the R148 is shown as being 1.2m wide. A narrow footpath can lead to pedestrians having to enter the grassed verge when they meet another pedestrian perhaps in a wheelchair or pushing a buggy.	It is recommended that internal footpaths be at least 1.8m wide.	The footpath facilitates a potential desire line between amenity/soft landscaped areas within the site. It is not likely to generate a high footfall as it is not located along the main through- route of the site. Accordingly the provision of a 1.2m footway is deemed appropriate at this location.	Yes
3.6	It is unclear what route cyclists and pedestrians are to take from the base of the ramp of the basement to the bicycle parking and car parking spaces to the right or left of the vehicular ramp. Without a dedicated route or routes pedestrians and cyclists may encounter kerbs which could be trip/slip hazards. In addition, if pedestrians or cyclists cross in front of vehicles drivers could have adequate inter-visibility to those vulnerable road users, taking into account the steep descent on the ramp and the greater effort required to stop.	It is recommended that the routes for cyclists and pedestrians and clear and marked where required by suitable road markings and signage.	Pedestrians have been provided with clear delineated routes through the basement car park to guide them to/from internal entrances and cycle parking locations. Refer to the Downey PLANNING & ARCHITECTURE drawing no. PL-008 submitted with the planning application.	Yes
3.7	It is unclear if there is to be any external bicycle parking within the development. Without external bicycle parking, short term visitors to the development may park their bicycles against street furniture which may become hazards for pedestrians.	It is recommended that that adequate, sheltered, external bicycle parking be provided.	26 no. cycle parking spaces are provided at surface level of the development. Refer to the Downey PLANNING & ARCHITECTURE drawing no. PL-003 submitted with the planning application.	Yes
3.8	There is a motorcycle parking space that blocks access to the most westerly lift and stairs for users.	It is recommended that the motorcycle parking space be relocated and that a clear space be provided to the door of the lift shaft.	The motorcycle parking space has been relocated to ensure clear access to the door is maintained. Refer to the Downey PLANNING & ARCHITECTURE drawing no. PL-008 submitted with the planning application.	Yes
3.9	Access to the stairwell to the West of the vehicular access of the basement may be restricted if the single parking space is occupied by a large saloon/SUV or if the vehicle in the adjacent space overhangs the defined space.	It is recommended that the car parking space be relocated to ensure adequate access width for pedestrians including the mobility impaired.	The car parking space has been relocated to ensure clear access to the door is maintained. Refer to the Downey PLANNING & ARCHITECTURE drawing no. PL-008 submitted with the planning application.	Yes

Problem Reference	Problem	Recommendation	Measures to be implemented / Design Team Response	Accepted by Auditors / Item Resolved
3.10	It is unclear what route the refuse truck will take to get to the collection point and if a truck can undertake the movements needed with sufficient room to avoid other vehicles (parked or otherwise). It is also unclear where the refuse bins will be left on collection days and whether they could be hazards to pedestrians or other road users.	It is recommended that a swept path analysis be carried out for the truck movements from entry to exit of the development including the stationary location for refuse collection. The refuse collection point should be such that it does not create a hazard for pedestrians or other road users.	A swept path analysis has been undertaken to ensure that a refuse vehicle can service the site and the associated waste collection areas. In addition, an Operational Waste Management and Recycling Management Strategy has been prepared and is included with the planning application. The Strategy demonstrates how waste and recycling management have been taken into account for the operational phase of the Proposed Development. Refer to AECOM drawing PR224738-ACM-00-00-DR-CE-00-0102 submitted with the planning application for details of the vehicle tracking analysis.	Yes

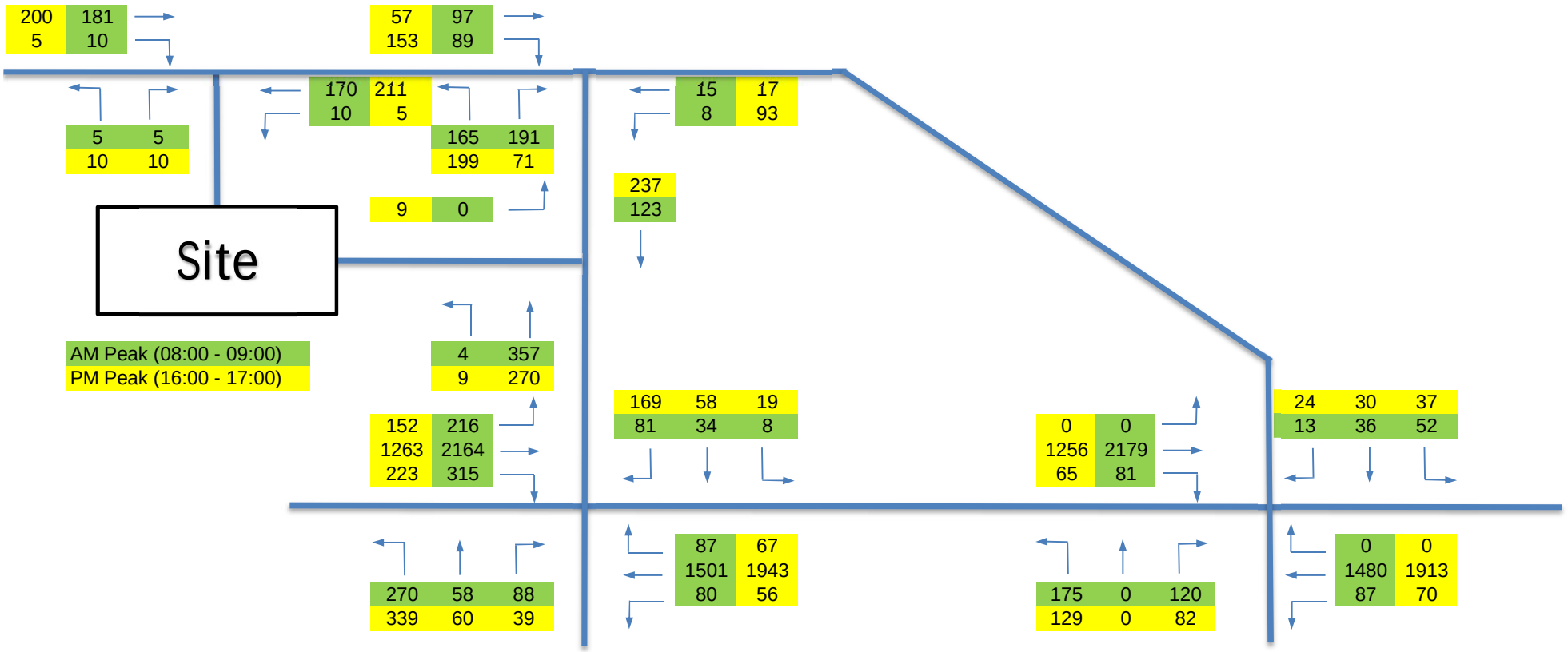
Mobility Management Plan

AECOM have prepared a Mobility Management Plan to accompany this application. This Mobility Management Plan details the existing travel trends for residents in the Palmerstown Area along with car ownership and the existing public transport services in the area.

The plan outlines the modal split targets for the development upon opening and measures which can be implemented by the Mobility Management Plan Coordinator to help achieve these targets for sustainable forms of transport. A copy of this report has been included with this application.

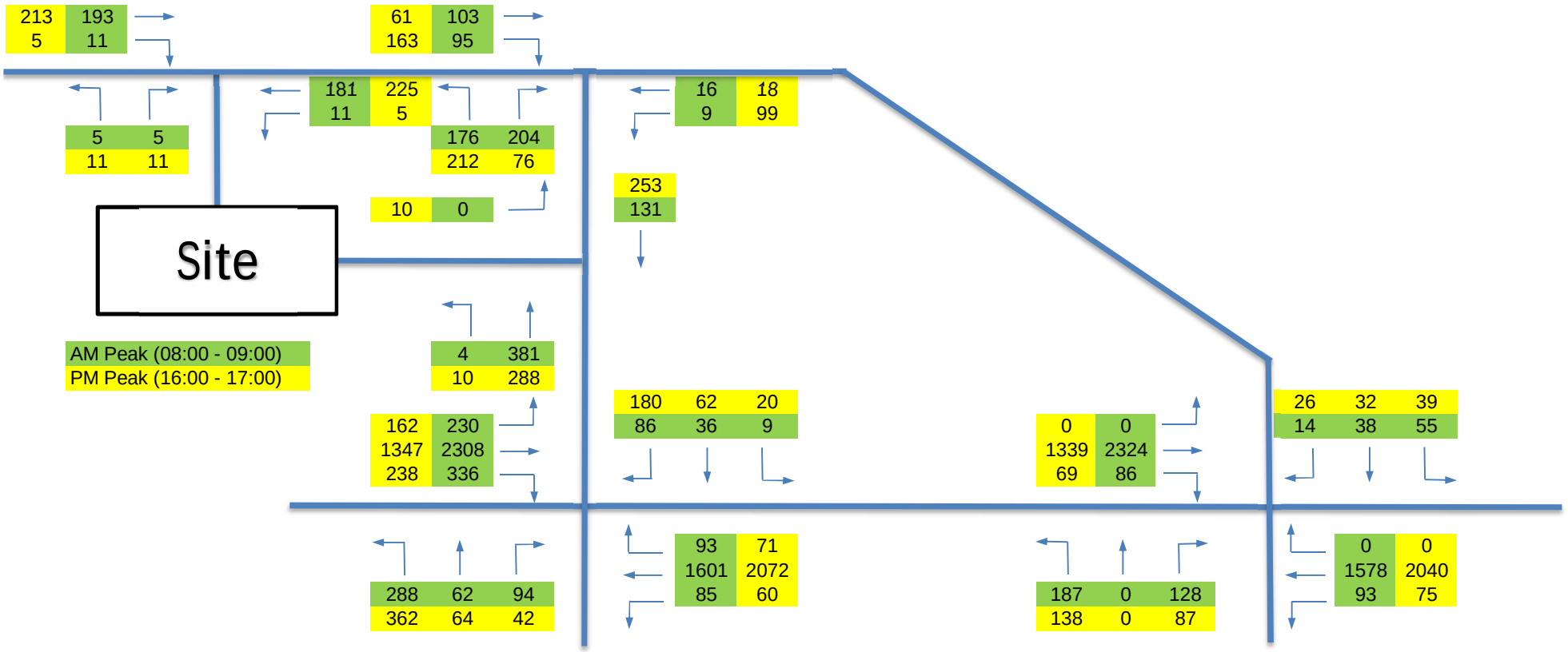
Appendix B Network Flow Diagrams

2017 Baseline Trips

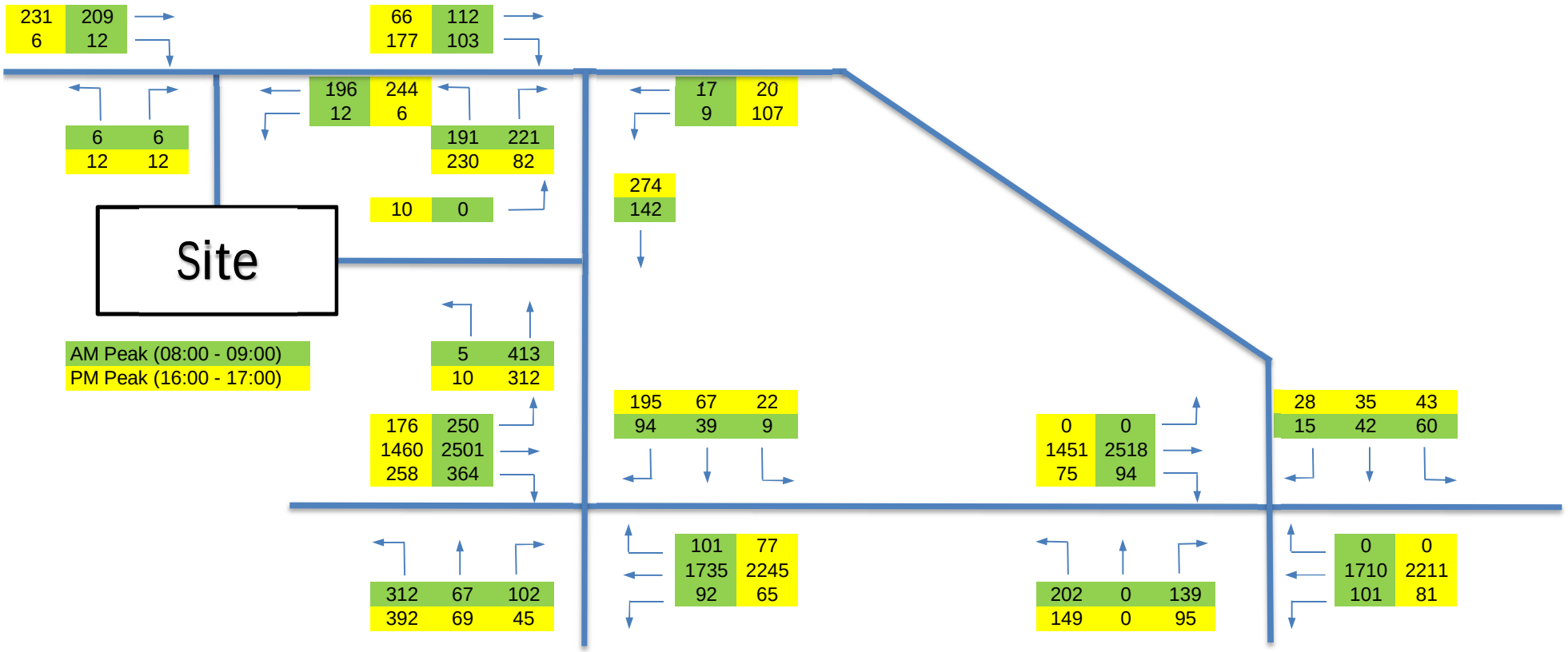


2021 Without Development

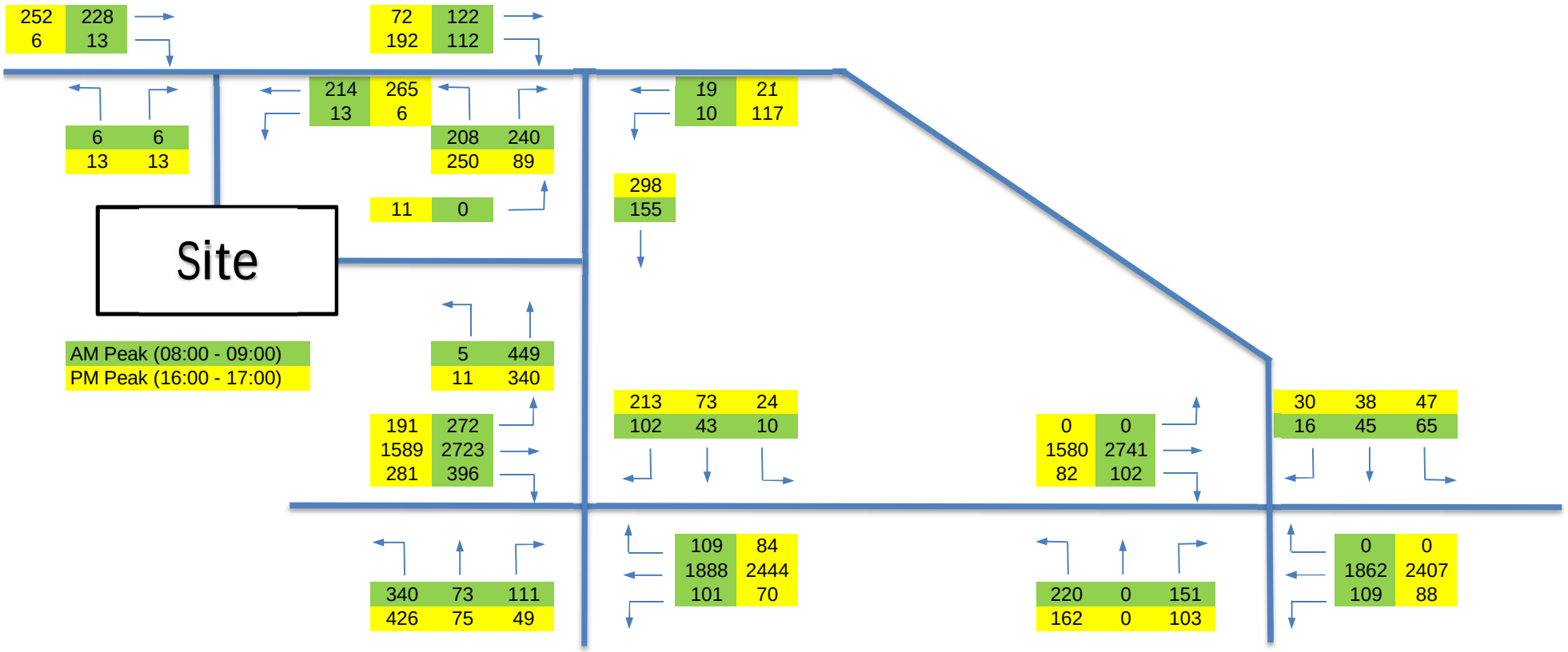
Growth Factor = 1.066



2026 Without Development
Growth Factor = 1.156

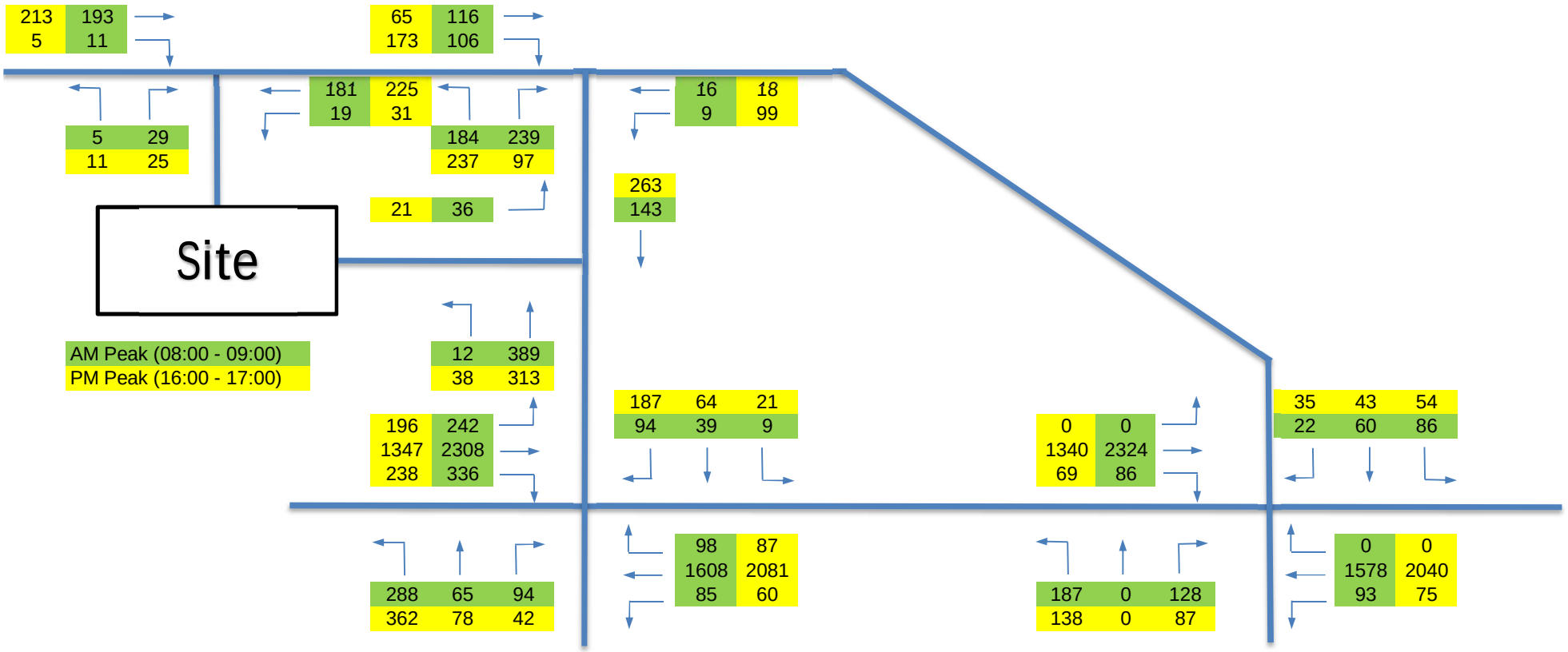


2036 Without Development
Growth Factor = 1.258



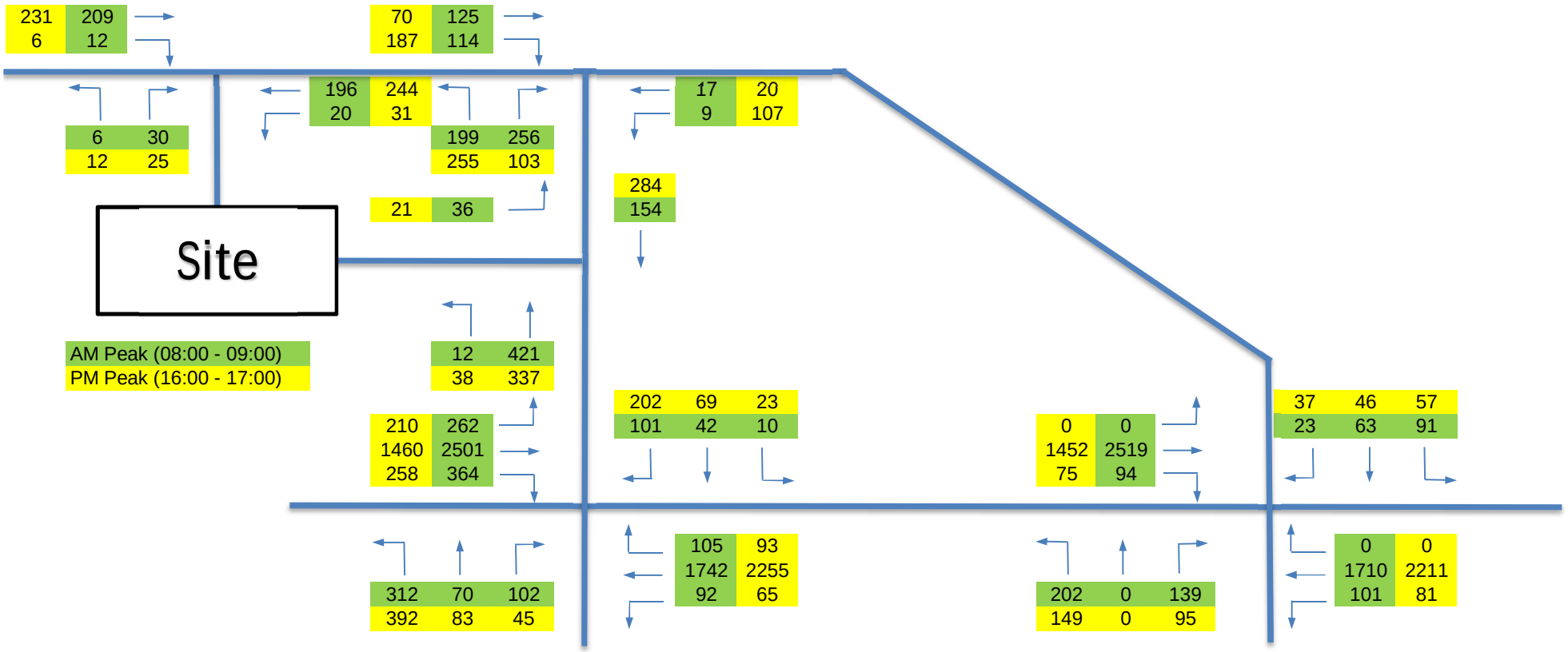
2021 With Development

Growth Factor = 1.066



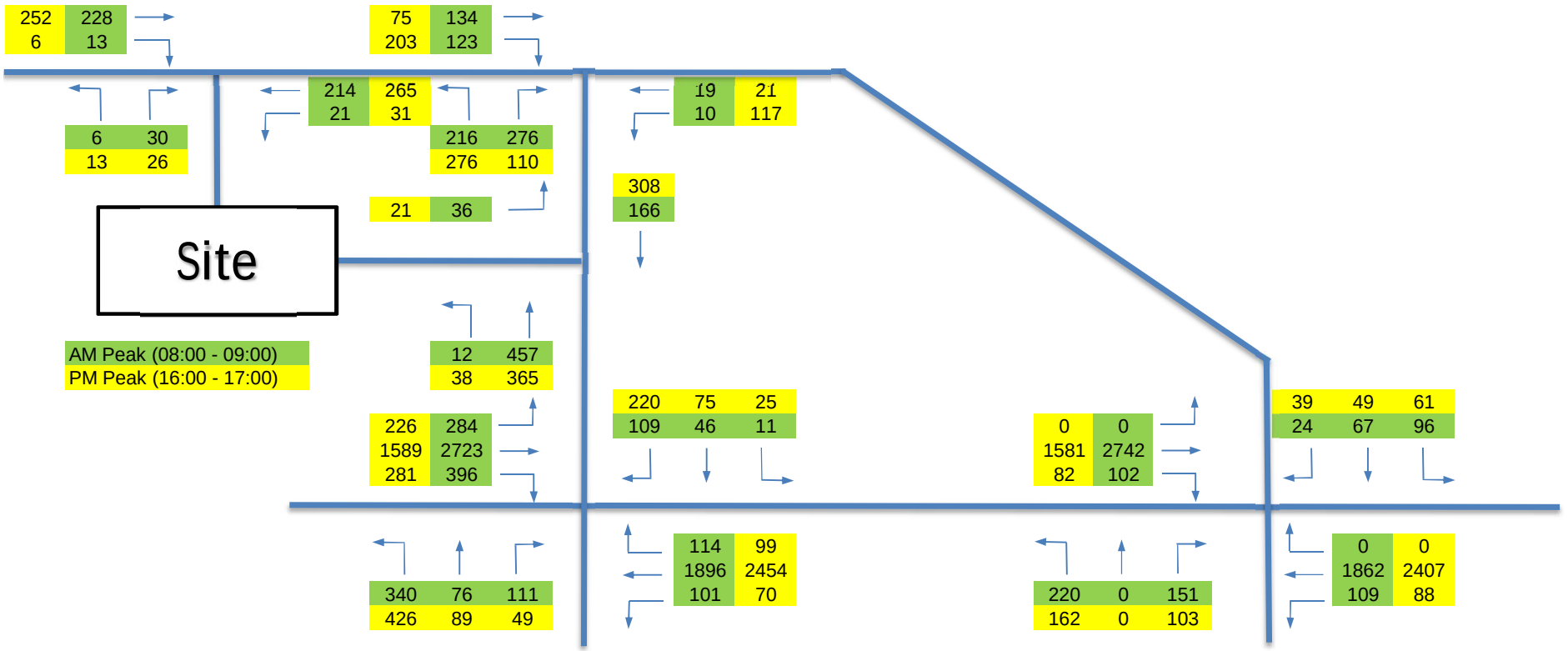
2026 With Development

Growth Factor = 1.16



2036 With Development

Growth Factor = 1.258



Appendix C Car Club Letter of Support

To Whom It May Concern,

This letter is to confirm that GoCar is willing to provide 2-3 shared car club vehicles in the proposed residential development at Kennelsfort Road Lower, Palmerstown, Dublin 20, with final terms to be agreed.

GoCar launched in 2008, and is Ireland's leading car sharing service with 30,000 members and over 450 vehicles in 15 counties in Ireland. Every GoCar replaces up to 20 private cars.

The Department Of Housing's Design Standards for New Apartments - Guidelines for Planning Authorities 2018 outline: "For all types of location, where it is sought to eliminate or reduce car parking provision, it is necessary to ensure... provision is also to be made for alternative mobility solutions including facilities for car sharing club vehicles."

GoCar members sign up online and send in a photo of their license. After we verify their account, they can then book cars or vans via the website or mobile app. They unlock the car with their phone or GoCard, and the keys are waiting securely in the glovebox. Rates start from €4 for half an hour, with fuel, insurance and maintenance included. We ask the members to return the car how they would like to find it; returned on time, clean, and with enough fuel. If the fuel drops below a quarter, the members use a fuel card in the car to refuel it, which GoCar pays.

Carsharing is both convenient and cost effective. It allows individuals to have the benefits of a private car, without having the large costs and hassle associated with car ownership. With pay as you go pricing and no subscription charges, GoCar ideal for people or organisations who only need occasional access to a car but don't want to own one, families who need a second car sometimes, as well as others who would like occasional access to a vehicle of a different type than they use day-to-day, like our GoVans. Carsharing is also a sustainable service. By allowing multiple people to use the same vehicle at different times, car sharing reduces car ownership & car dependency, congestion, noise and air pollution, and frees up land traditionally used for parking spaces. Each GoCar replaces approximately 20 private cars, is environmentally friendly, and creates more liveable cities by encouraging people to sell their cars and only use a car when essential, while walking and using public transport more often too. International studies have also shown a reduction in the number of KMs travelled per year of more than 60% for car-sharing users.

GoCar car club is ideal for commercial and residential developments, as management companies can give staff and residents access to a selection of vehicles with each driver being insured through GoCar, with similar terms to car rental insurance. GoCar can offer these vehicles to be open to the public or dedicated to residents, which would allow property developers and management companies offer a pool car only to residents or companies in their buildings. If a management company wished to arrange this themselves, they would need to take out a personal policy for each person who may be driving the car, and manually keep a log of each time the car is used in case of an accident. GoCar's bespoke software removes these issues and provides management companies and users with a simple solution to get them on the road.

Regards,

Darragh Genockey
Sales & Operations Manager,
GoCar Carsharing Limited

Appendix D LinSig Analysis

Basic Results Summary

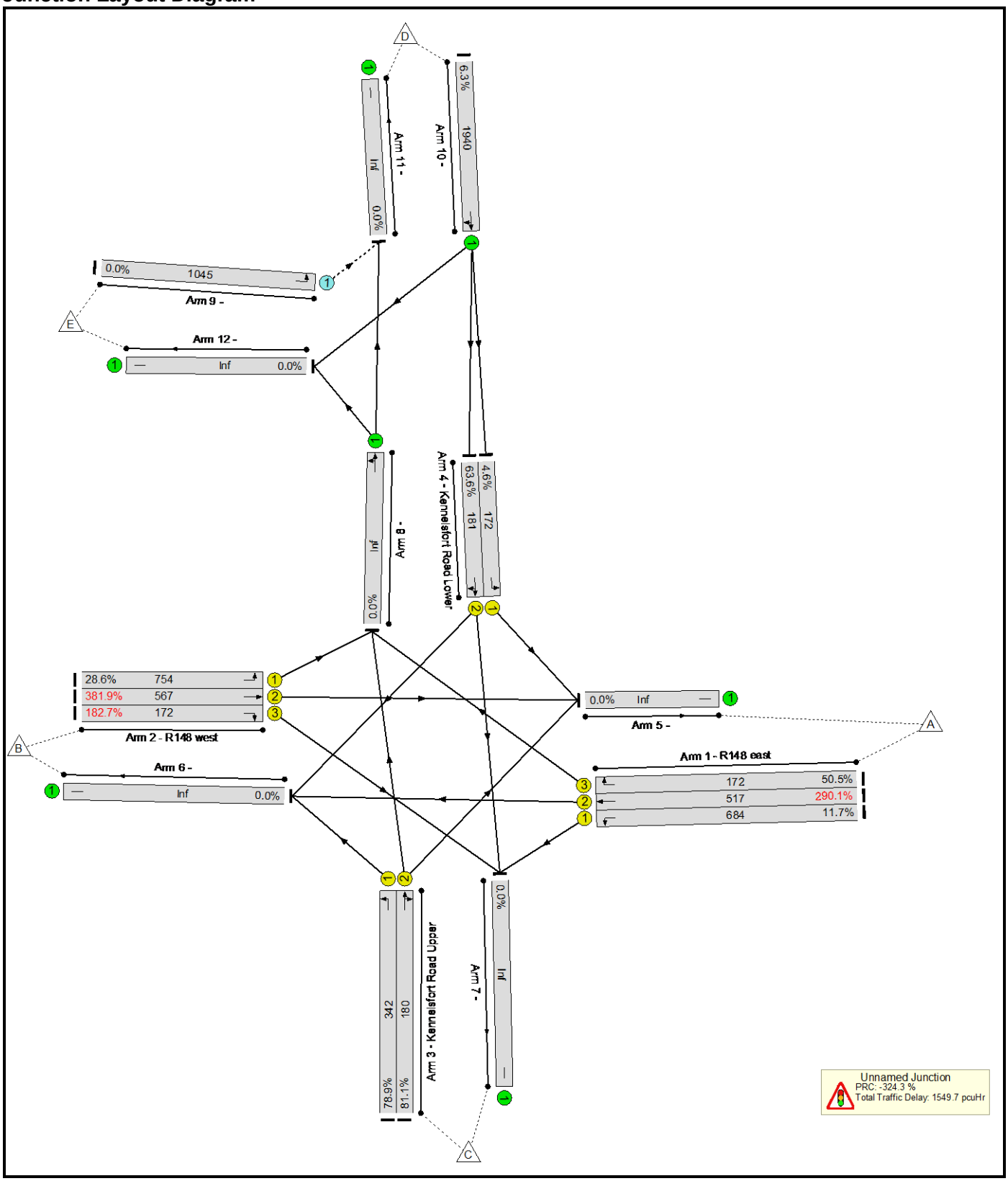
User and Project Details

Project:	
Title:	
Location:	
Additional detail:	
File name:	N4 Kennelsfort Road Junction.lsg3x
Author:	
Company:	
Address:	

Basic Results Summary

Scenario 1: '2017 AM Baseline' (FG1: '2017 Base AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**381.9%**	**0**	**0**	**0**	**1549.7**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**381.9%**	**0**	**0**	**0**	**1549.7**	-	-
1/1	R148 east Left	U	B		2	30	-	80	1925	684	11.7%	-	-	-	0.3	14.7	1.0
1/2	R148 east Ahead	U	A		1	23	-	1501	1940	517	290.1%	-	-	-	554.9	1330.9	567.6
1/3	R148 east Right	U	J		1	7	-	87	1940	172	50.5%	-	-	-	1.4	59.9	2.6
2/1	R148 west Left	U	E		1	35	-	216	1885	754	28.6%	-	-	-	1.3	21.6	3.8
2/2	R148 west Ahead	U	F		1	23	-	2164	2125	567	381.9%	-	-	-	900.2	1497.5	919.1
2/3	R148 west Right	U	K		1	7	-	315	1940	172	182.7%	-	-	-	82.5	942.8	86.0
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	270	1925	342	78.9%	-	-	-	3.2	42.1	5.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	146	2025	180	81.1%	-	-	-	3.6	87.8	5.5
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	8	1940	172	4.6%	-	-	-	0.1	48.8	0.2
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	115	2035	181	63.6%	-	-	-	2.1	66.2	3.6
9/1	Left	O	-		-	-	-	0	Inf	1045	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	123	1940	1940	6.3%	-	-	-	0.0	1.0	0.0

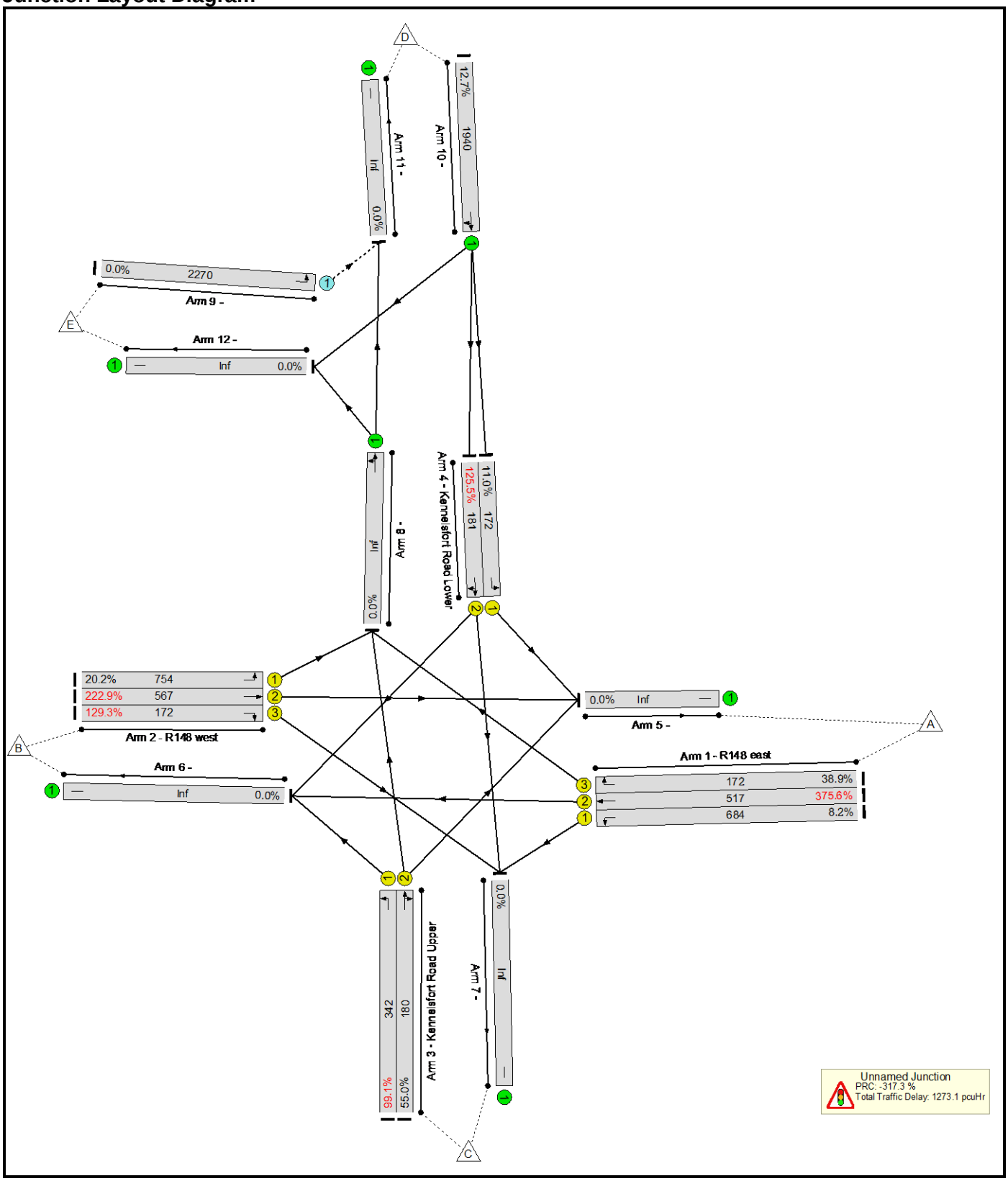
C1 PRC for Signalled Lanes (%): -324.3 Total Delay for Signalled Lanes (pcuHr): 1549.62 Cycle Time (s): 90

PRC Over All Lanes (%): -324.3 Total Delay Over All Lanes(pcuHr): 1549.66

Basic Results Summary

Scenario 2: '2017 PM Baseline' (FG2: '2017 Base PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

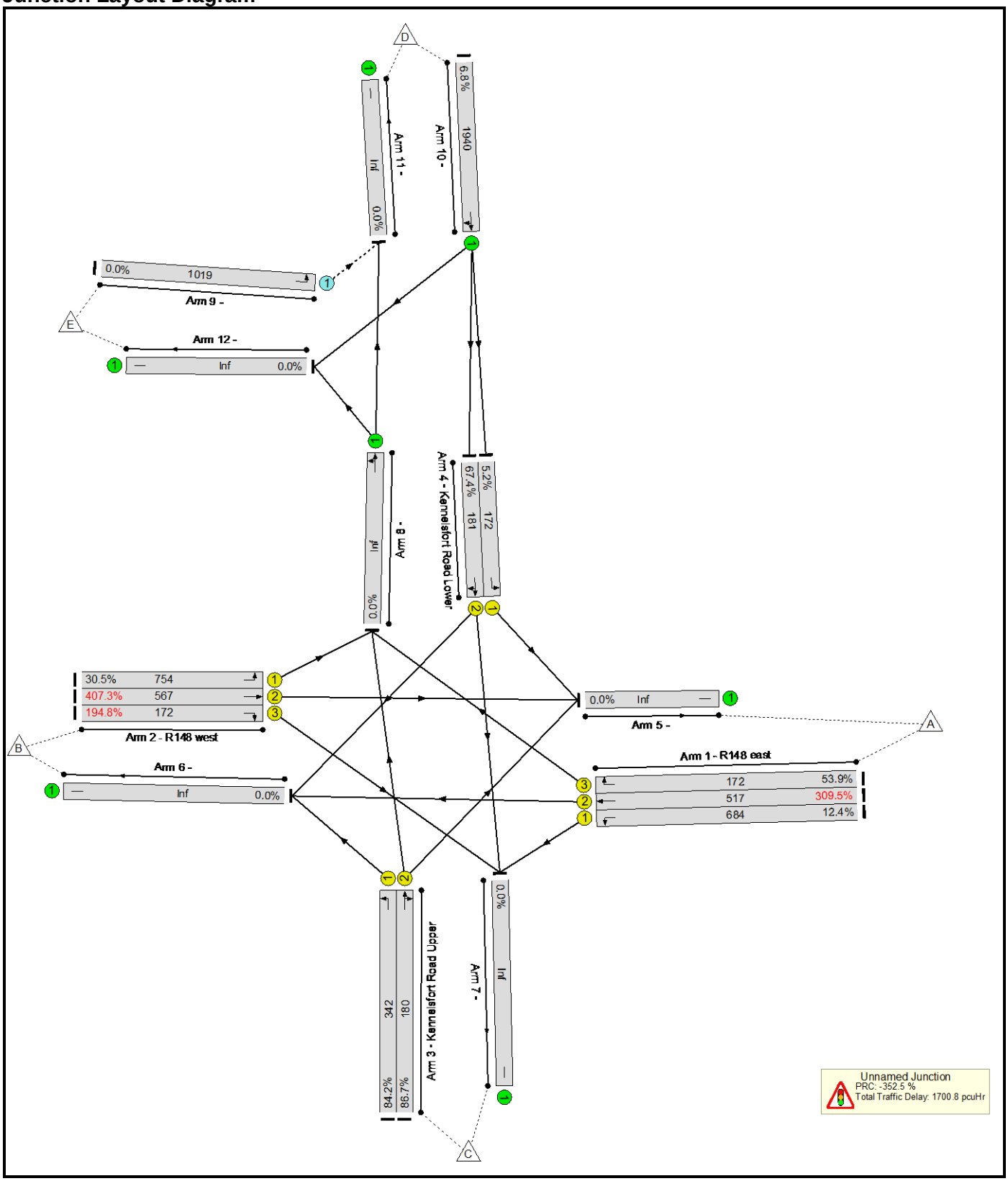
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**375.6%**	**0**	**0**	**0**	**1273.1**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**375.6%**	**0**	**0**	**0**	**1273.1**	-	-
1/1	R148 east Left	U	B		2	30	-	56	1925	684	8.2%	-	-	-	0.2	14.5	0.7
1/2	R148 east Ahead	U	A		1	23	-	1943	1940	517	375.6%	-	-	-	803.5	1488.8	820.4
1/3	R148 east Right	U	J		1	7	-	67	1940	172	38.9%	-	-	-	1.0	55.7	1.9
2/1	R148 west Left	U	E		1	35	-	152	1885	754	20.2%	-	-	-	0.9	20.6	2.6
2/2	R148 west Ahead	U	F		1	23	-	1263	2125	567	222.9%	-	-	-	393.5	1121.5	405.6
2/3	R148 west Right	U	K		1	7	-	223	1940	172	129.3%	-	-	-	31.7	511.5	34.4
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	339	1925	342	99.1%	-	-	-	10.5	111.4	13.3
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	99	2025	180	55.0%	-	-	-	1.7	61.2	3.0
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	19	1940	172	11.0%	-	-	-	0.3	49.5	0.5
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	227	2035	181	125.5%	-	-	-	29.8	472.8	32.1
9/1	Left	O	-		-	-	-	0	Inf	2270	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	246	1940	1940	12.7%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -317.3 Total Delay for Signalled Lanes (pcuHr): 1273.07 Cycle Time (s): 90
PRC Over All Lanes (%): -317.3 Total Delay Over All Lanes(pcuHr): 1273.14

Basic Results Summary

Scenario 3: '2021 AM Without Dev' (FG5: '2021 AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**407.3%**	**0**	**0**	**0**	**1700.8**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**407.3%**	**0**	**0**	**0**	**1700.8**	-	-
1/1	R148 east Left	U	B		2	30	-	85	1925	684	12.4%	-	-	-	0.3	14.8	1.1
1/2	R148 east Ahead	U	A		1	23	-	1601	1940	517	309.5%	-	-	-	611.2	1374.3	624.3
1/3	R148 east Right	U	J		1	7	-	93	1940	172	53.9%	-	-	-	1.6	61.6	2.8
2/1	R148 west Left	U	E		1	35	-	230	1885	754	30.5%	-	-	-	1.4	21.9	4.1
2/2	R148 west Ahead	U	F		1	23	-	2308	2125	567	407.3%	-	-	-	981.2	1530.5	1001.9
2/3	R148 west Right	U	K		1	7	-	336	1940	172	194.8%	-	-	-	94.2	1009.7	97.9
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	288	1925	342	84.2%	-	-	-	3.9	49.0	6.5
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	156	2025	180	86.7%	-	-	-	4.4	101.9	6.5
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	9	1940	172	5.2%	-	-	-	0.1	48.8	0.2
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	122	2035	181	67.4%	-	-	-	2.3	69.3	4.0
9/1	Left	O	-		-	-	-	0	Inf	1019	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	131	1940	1940	6.8%	-	-	-	0.0	1.0	0.0

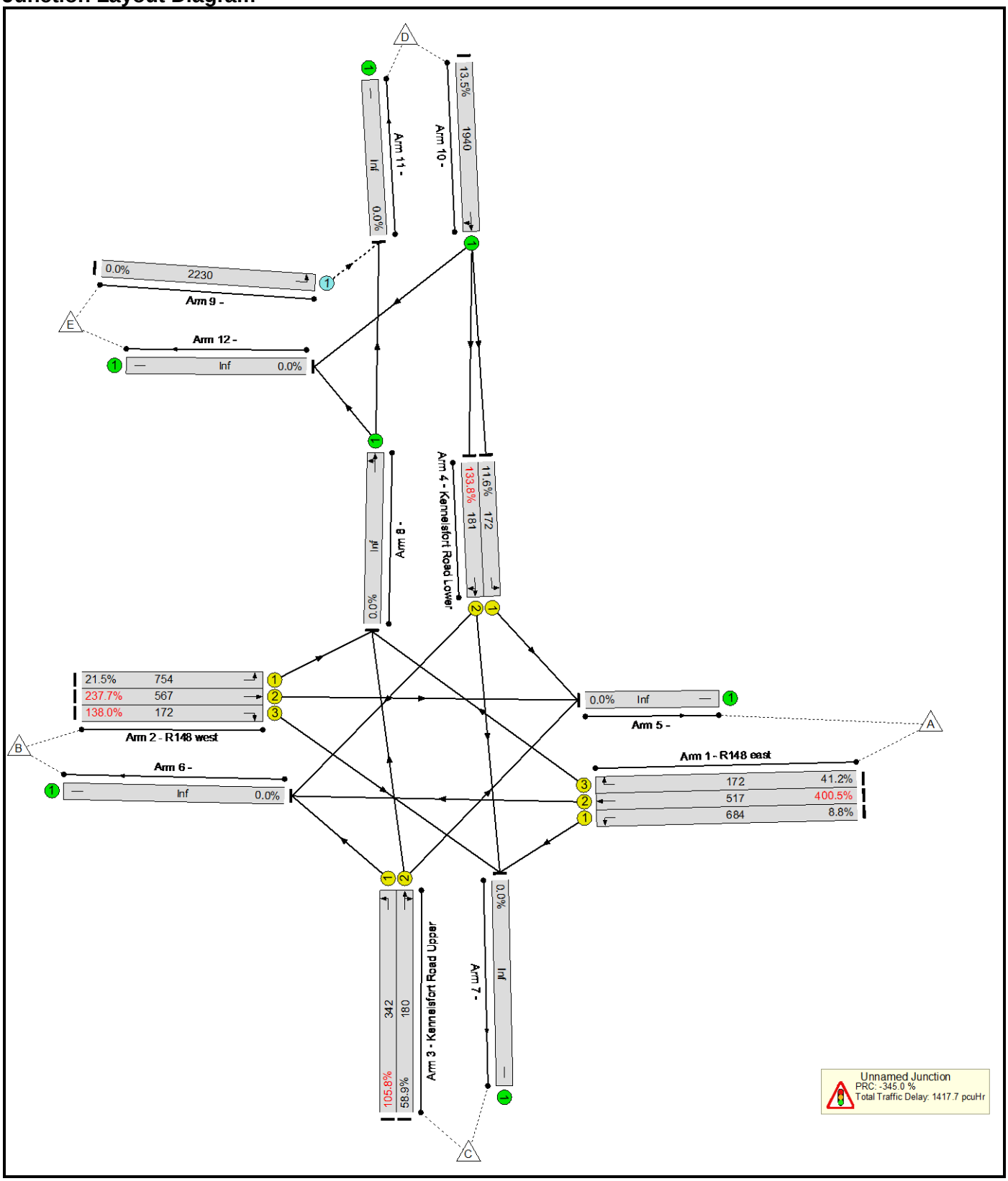
C1 PRC for Signalled Lanes (%): -352.5 Total Delay for Signalled Lanes (pcuHr): 1700.74 Cycle Time (s): 90

PRC Over All Lanes (%): -352.5 Total Delay Over All Lanes(pcuHr): 1700.78

Basic Results Summary

Scenario 4: '2021 PM Without Dev' (FG6: '2021 PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

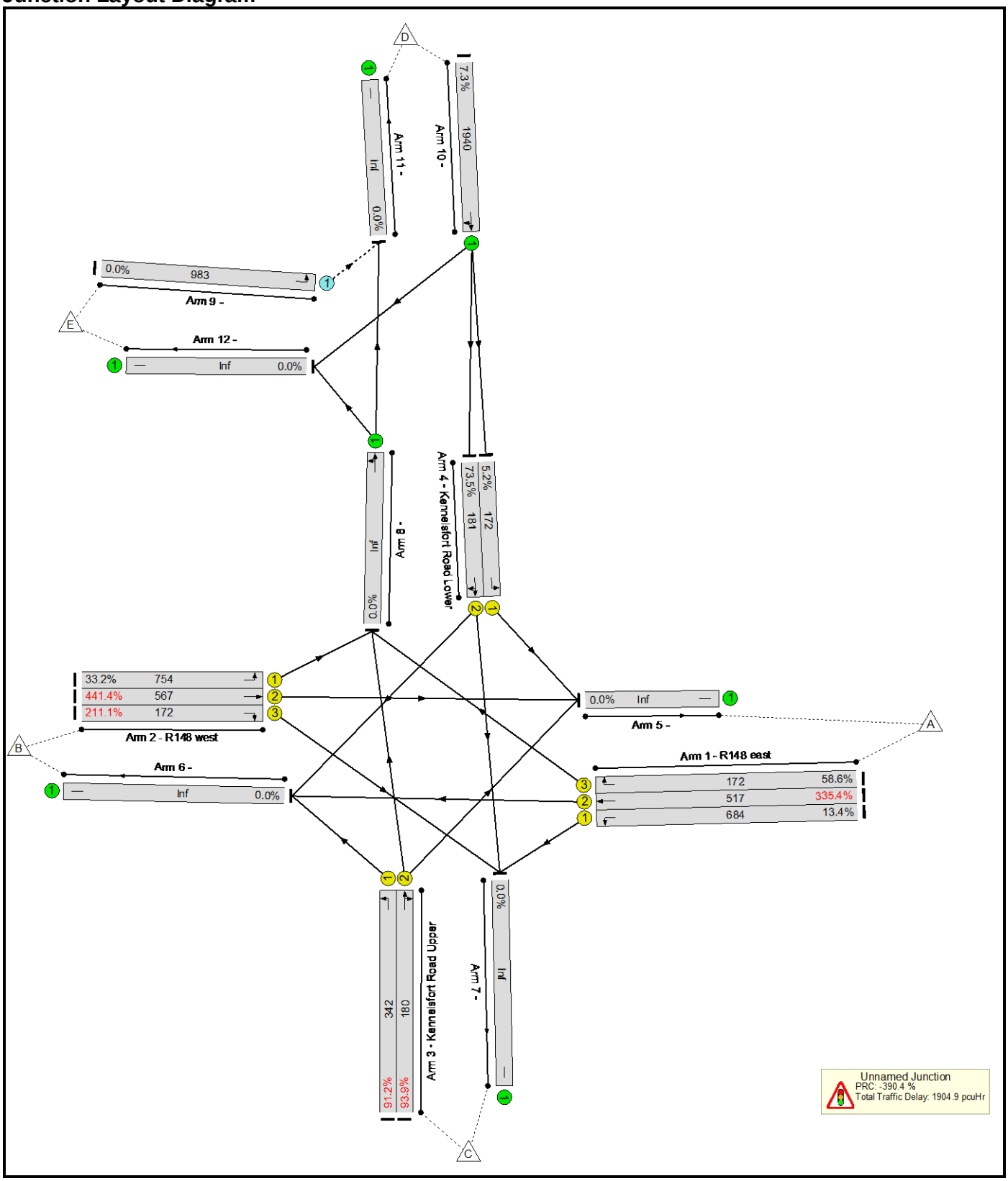
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**400.5%**	**0**	**0**	**0**	**1417.7**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**400.5%**	**0**	**0**	**0**	**1417.7**	-	-
1/1	R148 east Left	U	B		2	30	-	60	1925	684	8.8%	-	-	-	0.2	14.5	0.8
1/2	R148 east Ahead	U	A		1	23	-	2072	1940	517	400.5%	-	-	-	876.1	1522.2	894.6
1/3	R148 east Right	U	J		1	7	-	71	1940	172	41.2%	-	-	-	1.1	56.4	2.0
2/1	R148 west Left	U	E		1	35	-	162	1885	754	21.5%	-	-	-	0.9	20.8	2.8
2/2	R148 west Ahead	U	F		1	23	-	1347	2125	567	237.7%	-	-	-	440.7	1177.8	453.2
2/3	R148 west Right	U	K		1	7	-	238	1940	172	138.0%	-	-	-	39.8	602.1	42.7
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	362	1925	342	105.8%	-	-	-	18.9	187.7	21.9
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	106	2025	180	58.9%	-	-	-	1.9	63.3	3.2
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	20	1940	172	11.6%	-	-	-	0.3	49.6	0.5
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	242	2035	181	133.8%	-	-	-	37.7	561.3	40.0
9/1	Left	O	-		-	-	-	0	Inf	2230	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	262	1940	1940	13.5%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -345.0 Total Delay for Signalled Lanes (pcuHr): 1417.64 Cycle Time (s): 90
PRC Over All Lanes (%): -345.0 Total Delay Over All Lanes(pcuHr): 1417.72

Basic Results Summary

Scenario 5: '2026 AM Without Dev' (FG7: '2026 AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

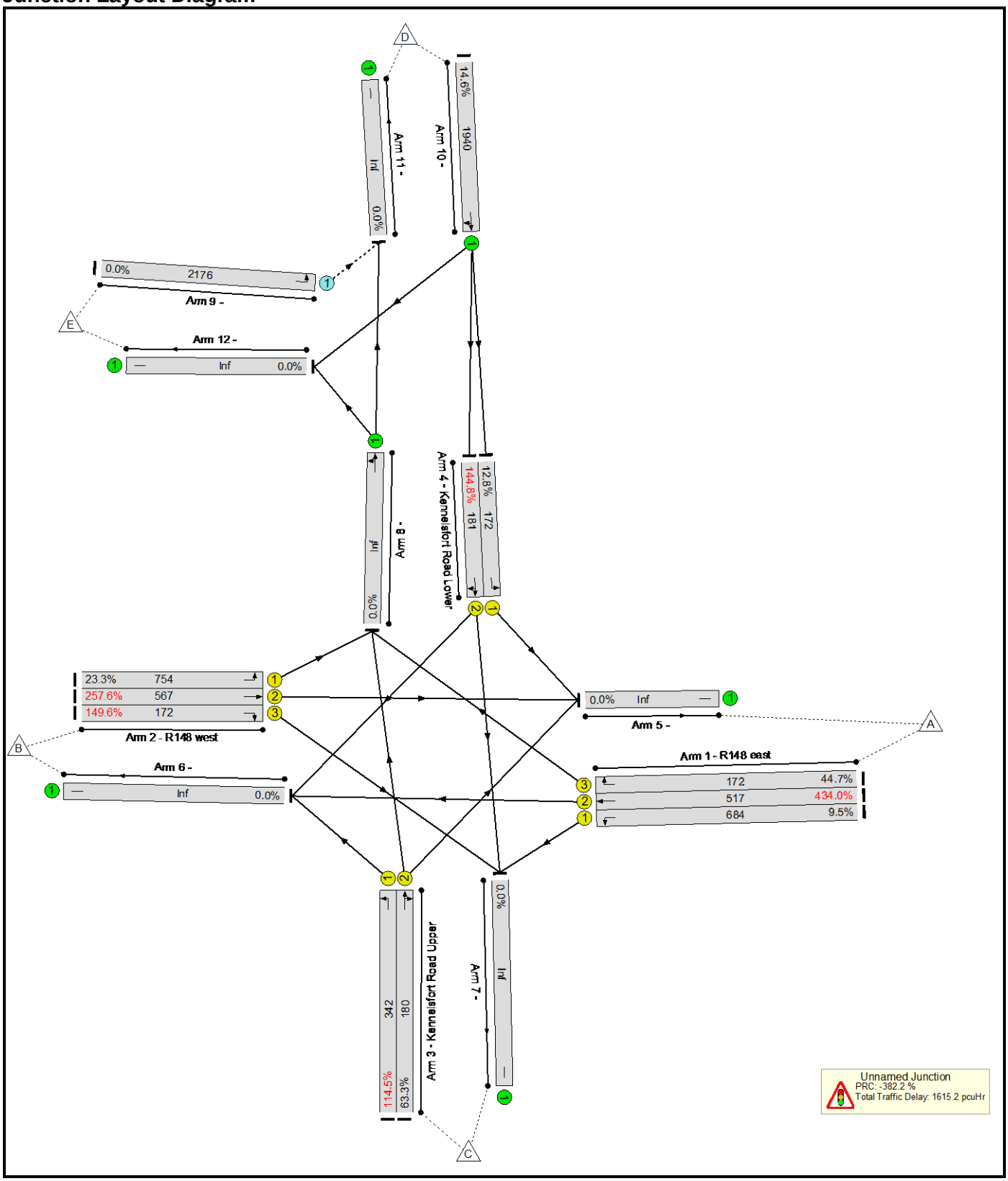
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**441.4%**	**0**	**0**	**0**	**1904.9**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**441.4%**	**0**	**0**	**0**	**1904.9**	-	-
1/1	R148 east Left	U	B		2	30	-	92	1925	684	13.4%	-	-	-	0.4	14.9	1.2
1/2	R148 east Ahead	U	A		1	23	-	1735	1940	517	335.4%	-	-	-	686.5	1424.5	700.9
1/3	R148 east Right	U	J		1	7	-	101	1940	172	58.6%	-	-	-	1.8	64.1	3.1
2/1	R148 west Left	U	E		1	35	-	250	1885	754	33.2%	-	-	-	1.5	22.3	4.6
2/2	R148 west Ahead	U	F		1	23	-	2501	2125	567	441.4%	-	-	-	1089.8	1568.6	1112.9
2/3	R148 west Right	U	K		1	7	-	364	1940	172	211.1%	-	-	-	109.9	1087.1	113.8
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	312	1925	342	91.2%	-	-	-	5.8	66.8	8.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	169	2025	180	93.9%	-	-	-	6.2	132.5	8.5
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	9	1940	172	5.2%	-	-	-	0.1	48.8	0.2
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	133	2035	181	73.5%	-	-	-	2.8	75.6	4.5
9/1	Left	O	-		-	-	-	0	Inf	983	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	142	1940	1940	7.3%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): -390.4 Total Delay for Signalled Lanes (pcuHr): 1904.87 Cycle Time (s): 90
PRC Over All Lanes (%): -390.4 Total Delay Over All Lanes(pcuHr): 1904.91

Basic Results Summary

Scenario 6: '2026 PM Without Dev' (FG8: '2026 PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**434.0%**	**0**	**0**	**0**	**1615.2**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**434.0%**	**0**	**0**	**0**	**1615.2**	-	-
1/1	R148 east Left	U	B		2	30	-	65	1925	684	9.5%	-	-	-	0.3	14.6	0.8
1/2	R148 east Ahead	U	A		1	23	-	2245	1940	517	434.0%	-	-	-	973.4	1560.9	994.1
1/3	R148 east Right	U	J		1	7	-	77	1940	172	44.7%	-	-	-	1.2	57.6	2.2
2/1	R148 west Left	U	E		1	35	-	176	1885	754	23.3%	-	-	-	1.0	21.0	3.0
2/2	R148 west Ahead	U	F		1	23	-	1460	2125	567	257.6%	-	-	-	504.2	1243.3	517.3
2/3	R148 west Right	U	K		1	7	-	258	1940	172	149.6%	-	-	-	50.8	708.7	53.8
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	392	1925	342	114.5%	-	-	-	33.3	305.4	36.5
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	114	2025	180	63.3%	-	-	-	2.1	66.2	3.6
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	22	1940	172	12.8%	-	-	-	0.3	49.8	0.6
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	262	2035	181	144.8%	-	-	-	48.5	666.2	50.7
9/1	Left	O	-		-	-	-	0	Inf	2176	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	284	1940	1940	14.6%	-	-	-	0.1	1.1	0.1

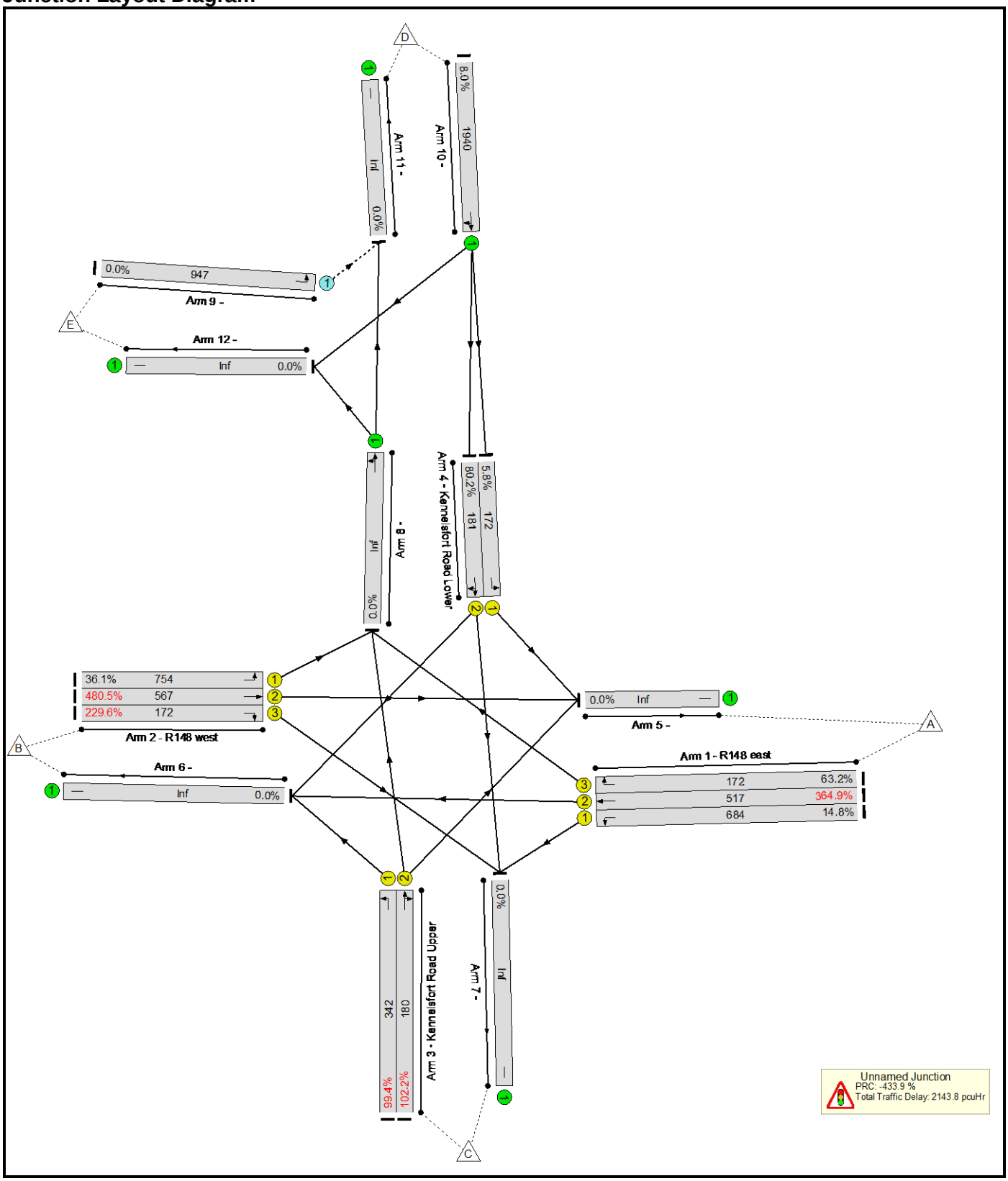
C1 PRC for Signalled Lanes (%): -382.2 Total Delay for Signalled Lanes (pcuHr): 1615.10 Cycle Time (s): 90

PRC Over All Lanes (%): -382.2 Total Delay Over All Lanes(pcuHr): 1615.19

Basic Results Summary

Scenario 7: '2036 AM Without Dev' (FG9: '2036 AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**480.5%**	**0**	**0**	**0**	**2143.8**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**480.5%**	**0**	**0**	**0**	**2143.8**	-	-
1/1	R148 east Left	U	B		2	30	-	101	1925	684	14.8%	-	-	-	0.4	15.0	1.3
1/2	R148 east Ahead	U	A		1	23	-	1888	1940	517	364.9%	-	-	-	772.6	1473.2	788.8
1/3	R148 east Right	U	J		1	7	-	109	1940	172	63.2%	-	-	-	2.0	67.2	3.4
2/1	R148 west Left	U	E		1	35	-	272	1885	754	36.1%	-	-	-	1.7	22.7	5.0
2/2	R148 west Ahead	U	F		1	23	-	2723	2125	567	480.5%	-	-	-	1214.7	1605.9	1240.5
2/3	R148 west Right	U	K		1	7	-	396	1940	172	229.6%	-	-	-	127.9	1162.3	132.0
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	340	1925	342	99.4%	-	-	-	10.7	113.8	13.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	184	2025	180	102.2%	-	-	-	10.1	198.2	12.6
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	10	1940	172	5.8%	-	-	-	0.1	48.9	0.3
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	145	2035	181	80.2%	-	-	-	3.5	85.7	5.4
9/1	Left	O	-		-	-	-	0	Inf	947	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	155	1940	1940	8.0%	-	-	-	0.0	1.0	0.0

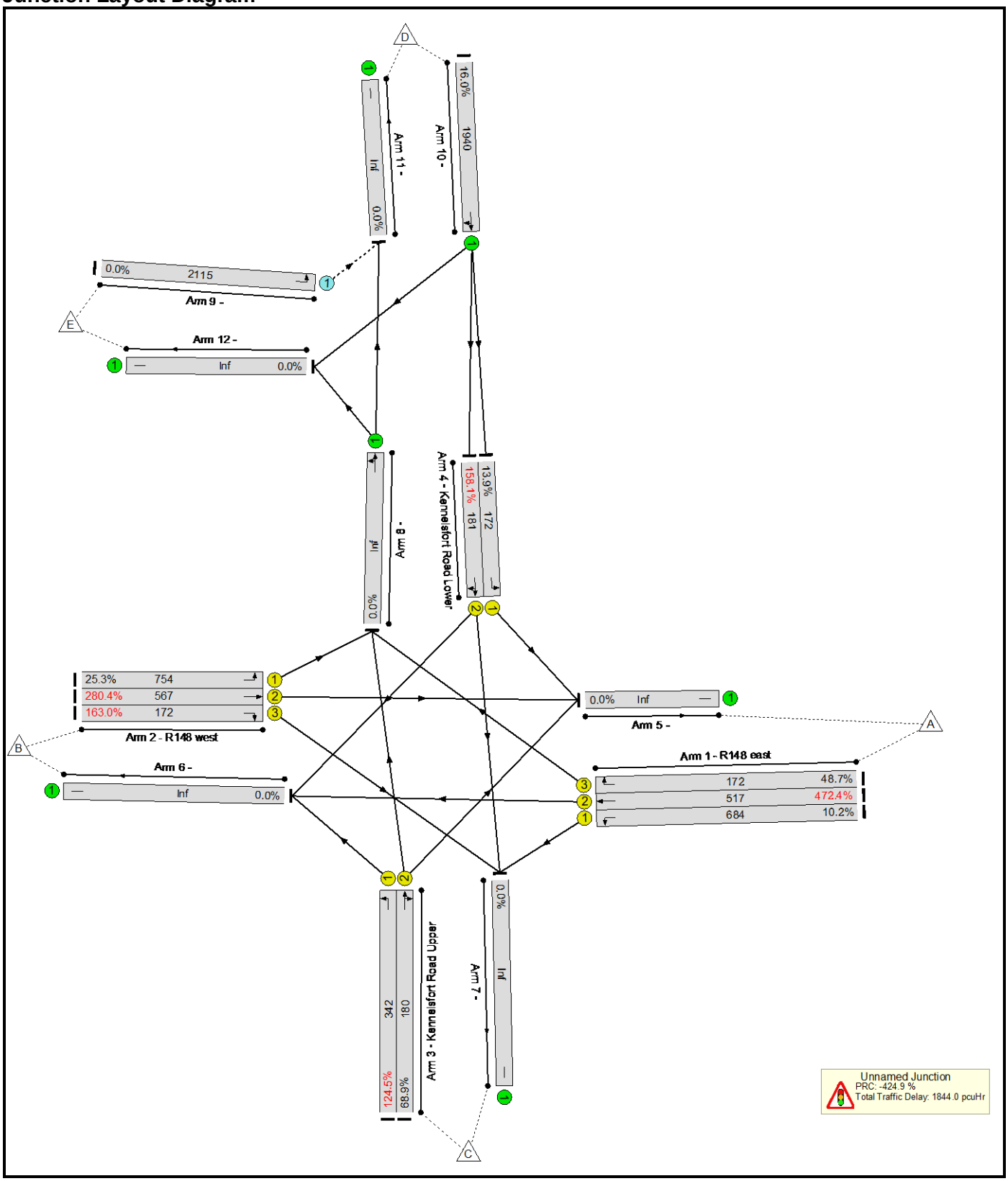
C1 PRC for Signalled Lanes (%): -433.9 Total Delay for Signalled Lanes (pcuHr): 2143.74 Cycle Time (s): 90

PRC Over All Lanes (%): -433.9 Total Delay Over All Lanes(pcuHr): 2143.79

Basic Results Summary

Scenario 8: '2036 PM Without Dev' (FG10: '2036 PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

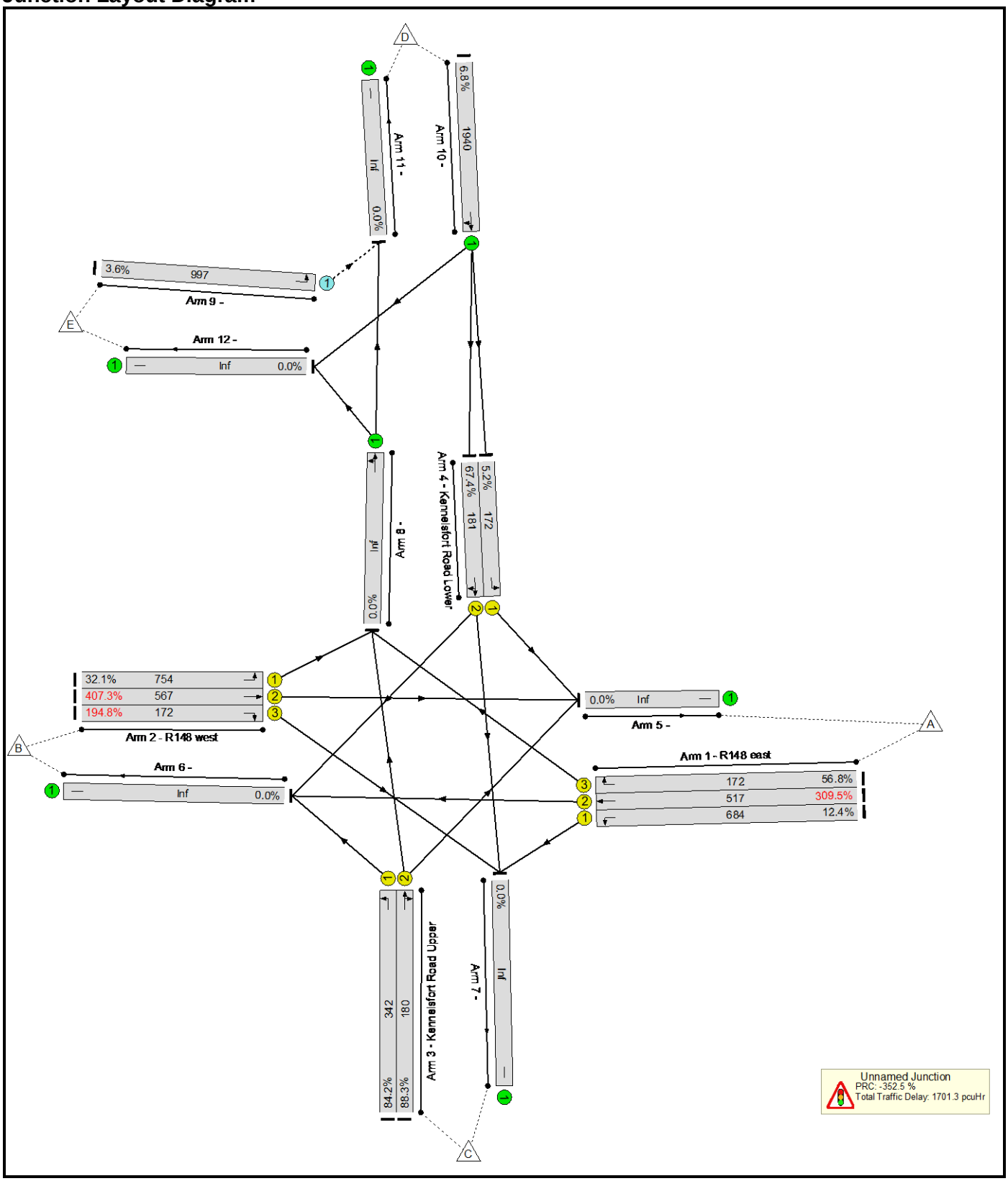
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**472.4%**	**0**	**0**	**0**	**1844.0**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**472.4%**	**0**	**0**	**0**	**1844.0**	-	-
1/1	R148 east Left	U	B		2	30	-	70	1925	684	10.2%	-	-	-	0.3	14.6	0.9
1/2	R148 east Ahead	U	A		1	23	-	2444	1940	517	472.4%	-	-	-	1085.4	1598.7	1108.5
1/3	R148 east Right	U	J		1	7	-	84	1940	172	48.7%	-	-	-	1.4	59.2	2.5
2/1	R148 west Left	U	E		1	35	-	191	1885	754	25.3%	-	-	-	1.1	21.2	3.4
2/2	R148 west Ahead	U	F		1	23	-	1589	2125	567	280.4%	-	-	-	576.8	1306.7	590.4
2/3	R148 west Right	U	K		1	7	-	281	1940	172	163.0%	-	-	-	63.5	814.0	66.7
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	426	1925	342	124.5%	-	-	-	51.1	432.0	54.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	124	2025	180	68.9%	-	-	-	2.4	70.8	4.1
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	24	1940	172	13.9%	-	-	-	0.3	49.9	0.6
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	286	2035	181	158.1%	-	-	-	61.5	774.6	63.7
9/1	Left	O	-		-	-	-	0	Inf	2115	0.0%	0	0	0	0.0	0.0	0.0
10/1	Ahead Right	U	-		-	-	-	310	1940	1940	16.0%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -424.9 PRC Over All Lanes (%): -424.9 Total Delay for Signalled Lanes (pcuHr): 1843.90 Total Delay Over All Lanes(pcuHr): 1843.99 Cycle Time (s): 90

Basic Results Summary

Scenario 9: '2021 AM Base + Dev' (FG11: '2021+DEV AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

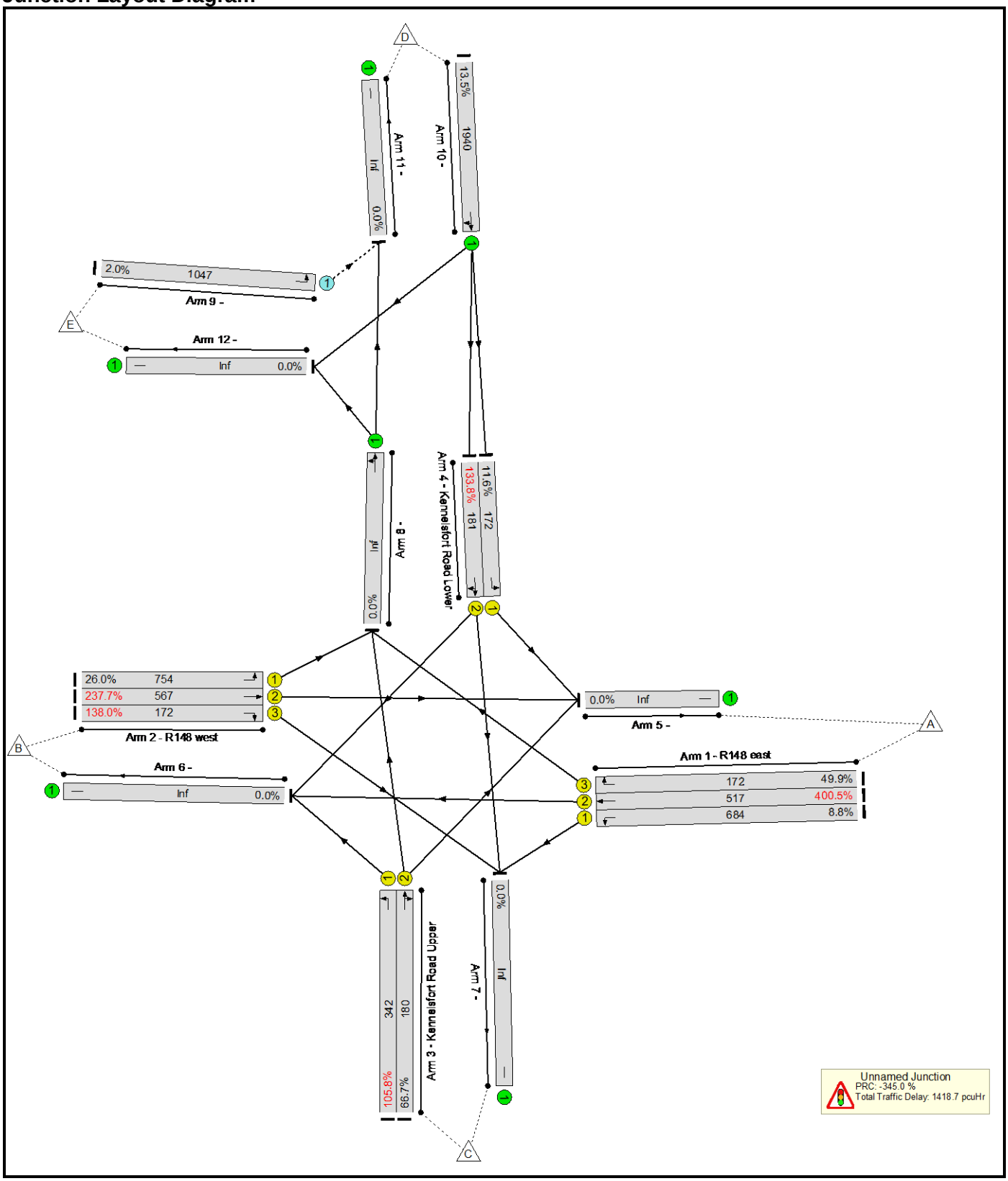
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**407.3%**	**36**	**0**	**0**	**1701.3**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**407.3%**	**36**	**0**	**0**	**1701.3**	-	-
1/1	R148 east Left	U	B		2	30	-	85	1925	684	12.4%	-	-	-	0.3	14.8	1.1
1/2	R148 east Ahead	U	A		1	23	-	1601	1940	517	309.5%	-	-	-	611.2	1374.3	624.3
1/3	R148 east Right	U	J		1	7	-	98	1940	172	56.8%	-	-	-	1.7	63.1	3.0
2/1	R148 west Left	U	E		1	35	-	242	1885	754	32.1%	-	-	-	1.5	22.1	4.3
2/2	R148 west Ahead	U	F		1	23	-	2308	2125	567	407.3%	-	-	-	981.2	1530.5	1001.9
2/3	R148 west Right	U	K		1	7	-	336	1940	172	194.8%	-	-	-	94.2	1009.7	97.9
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	288	1925	342	84.2%	-	-	-	3.9	49.0	6.5
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	159	2025	180	88.3%	-	-	-	4.7	107.4	6.8
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	9	1940	172	5.2%	-	-	-	0.1	48.8	0.2
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	122	2035	181	67.4%	-	-	-	2.3	69.3	4.0
9/1	Left	O	-		-	-	-	36	Inf	997	3.6%	36	0	0	0.0	1.9	0.0
10/1	Ahead Right	U	-		-	-	-	131	1940	1940	6.8%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): -352.5 Total Delay for Signalled Lanes (pcuHr): 1701.28 Cycle Time (s): 90
PRC Over All Lanes (%): -352.5 Total Delay Over All Lanes(pcuHr): 1701.34

Basic Results Summary

Scenario 10: '2021 PM Base + Dev' (FG12: '2021+DEV PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

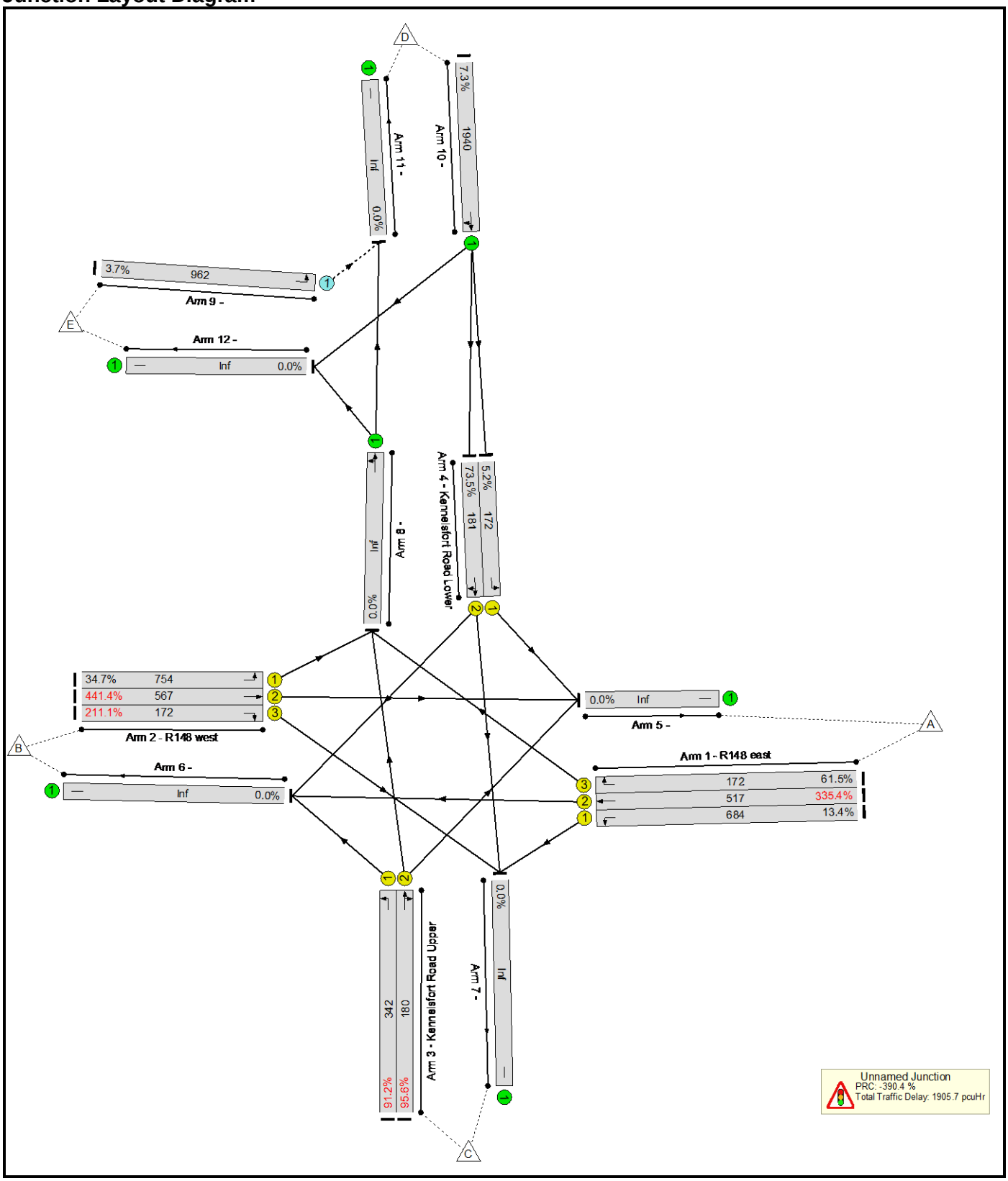
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**400.5%**	**21**	**0**	**0**	**1418.7**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**400.5%**	**21**	**0**	**0**	**1418.7**	-	-
1/1	R148 east Left	U	B		2	30	-	60	1925	684	8.8%	-	-	-	0.2	14.5	0.8
1/2	R148 east Ahead	U	A		1	23	-	2072	1940	517	400.5%	-	-	-	876.1	1522.2	894.6
1/3	R148 east Right	U	J		1	7	-	86	1940	172	49.9%	-	-	-	1.4	59.7	2.5
2/1	R148 west Left	U	E		1	35	-	196	1885	754	26.0%	-	-	-	1.2	21.3	3.4
2/2	R148 west Ahead	U	F		1	23	-	1347	2125	567	237.7%	-	-	-	440.7	1177.8	453.2
2/3	R148 west Right	U	K		1	7	-	238	1940	172	138.0%	-	-	-	39.8	602.1	42.7
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	362	1925	342	105.8%	-	-	-	18.9	187.7	21.9
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	120	2025	180	66.7%	-	-	-	2.3	68.8	3.9
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	20	1940	172	11.6%	-	-	-	0.3	49.6	0.5
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	242	2035	181	133.8%	-	-	-	37.7	561.3	40.0
9/1	Left	O	-		-	-	-	21	Inf	1047	2.0%	21	0	0	0.0	1.8	0.0
10/1	Ahead Right	U	-		-	-	-	262	1940	1940	13.5%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -345.0 Total Delay for Signalled Lanes (pcuHr): 1418.61 Cycle Time (s): 90
PRC Over All Lanes (%): -345.0 Total Delay Over All Lanes(pcuHr): 1418.69

Basic Results Summary

Scenario 11: '2026 AM Base + Dev' (FG13: '2026+DEV AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

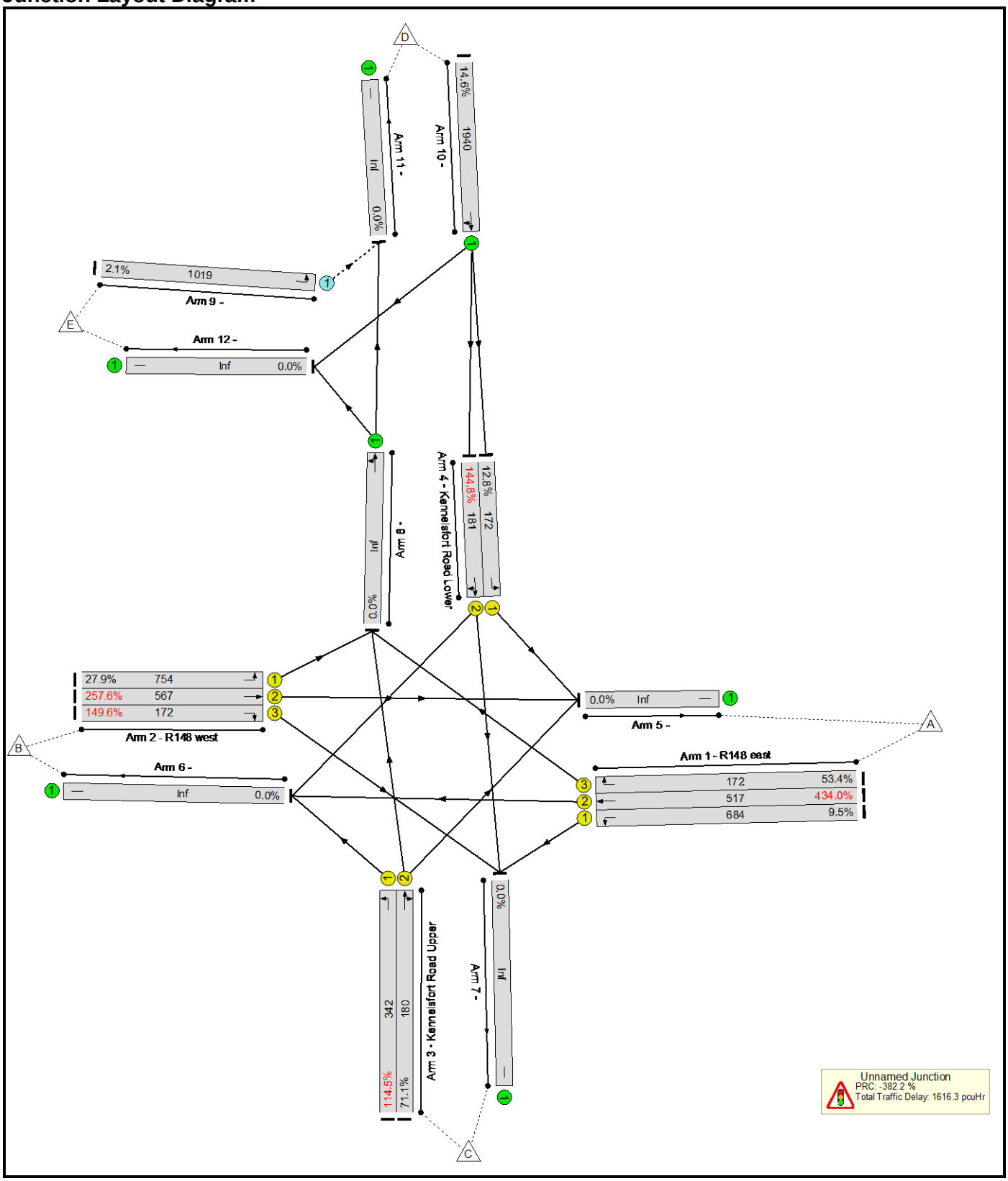
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**441.4%**	**36**	**0**	**0**	**1905.7**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**441.4%**	**36**	**0**	**0**	**1905.7**	-	-
1/1	R148 east Left	U	B		2	30	-	92	1925	684	13.4%	-	-	-	0.4	14.9	1.2
1/2	R148 east Ahead	U	A		1	23	-	1735	1940	517	335.4%	-	-	-	686.5	1424.5	700.9
1/3	R148 east Right	U	J		1	7	-	106	1940	172	61.5%	-	-	-	1.9	66.0	3.3
2/1	R148 west Left	U	E		1	35	-	262	1885	754	34.7%	-	-	-	1.6	22.5	4.8
2/2	R148 west Ahead	U	F		1	23	-	2501	2125	567	441.4%	-	-	-	1089.8	1568.6	1112.9
2/3	R148 west Right	U	K		1	7	-	364	1940	172	211.1%	-	-	-	109.9	1087.1	113.8
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	312	1925	342	91.2%	-	-	-	5.8	66.8	8.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	172	2025	180	95.6%	-	-	-	6.8	142.5	9.1
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	9	1940	172	5.2%	-	-	-	0.1	48.8	0.2
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	133	2035	181	73.5%	-	-	-	2.8	75.6	4.5
9/1	Left	O	-		-	-	-	36	Inf	962	3.7%	36	0	0	0.0	2.0	0.0
10/1	Ahead Right	U	-		-	-	-	142	1940	1940	7.3%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): -390.4 Total Delay for Signalled Lanes (pcuHr): 1905.69 Cycle Time (s): 90
PRC Over All Lanes (%): -390.4 Total Delay Over All Lanes(pcuHr): 1905.74

Basic Results Summary

Scenario 12: '2026 PM Base + Dev' (FG14: '2026+DEV PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

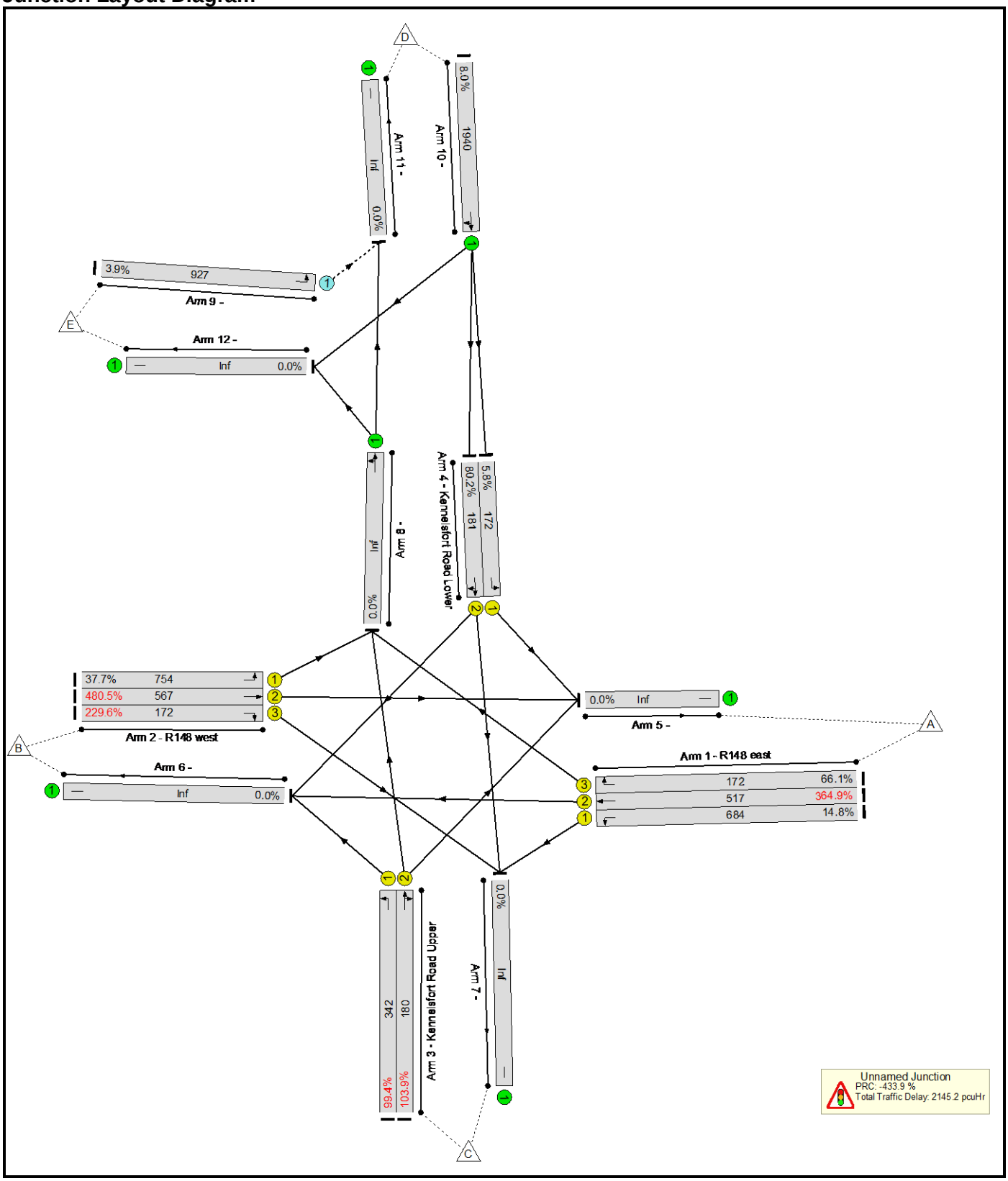
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**434.0%**	**21**	**0**	**0**	**1616.3**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**434.0%**	**21**	**0**	**0**	**1616.3**	-	-
1/1	R148 east Left	U	B		2	30	-	65	1925	684	9.5%	-	-	-	0.3	14.6	0.8
1/2	R148 east Ahead	U	A		1	23	-	2245	1940	517	434.0%	-	-	-	973.4	1560.9	994.1
1/3	R148 east Right	U	J		1	7	-	92	1940	172	53.4%	-	-	-	1.6	61.3	2.8
2/1	R148 west Left	U	E		1	35	-	210	1885	754	27.9%	-	-	-	1.3	21.5	3.7
2/2	R148 west Ahead	U	F		1	23	-	1460	2125	567	257.6%	-	-	-	504.2	1243.3	517.3
2/3	R148 west Right	U	K		1	7	-	258	1940	172	149.6%	-	-	-	50.8	708.7	53.8
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	392	1925	342	114.5%	-	-	-	33.3	305.4	36.5
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	128	2025	180	71.1%	-	-	-	2.6	73.0	4.3
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	22	1940	172	12.8%	-	-	-	0.3	49.8	0.6
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	262	2035	181	144.8%	-	-	-	48.5	666.2	50.7
9/1	Left	O	-		-	-	-	21	Inf	1019	2.1%	21	0	0	0.0	1.8	0.0
10/1	Ahead Right	U	-		-	-	-	284	1940	1940	14.6%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -382.2 Total Delay for Signalled Lanes (pcuHr): 1616.16 Cycle Time (s): 90
PRC Over All Lanes (%): -382.2 Total Delay Over All Lanes(pcuHr): 1616.26

Basic Results Summary

Scenario 13: '2036 AM Base + Dev' (FG15: '2036+DEV AM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

Link Results

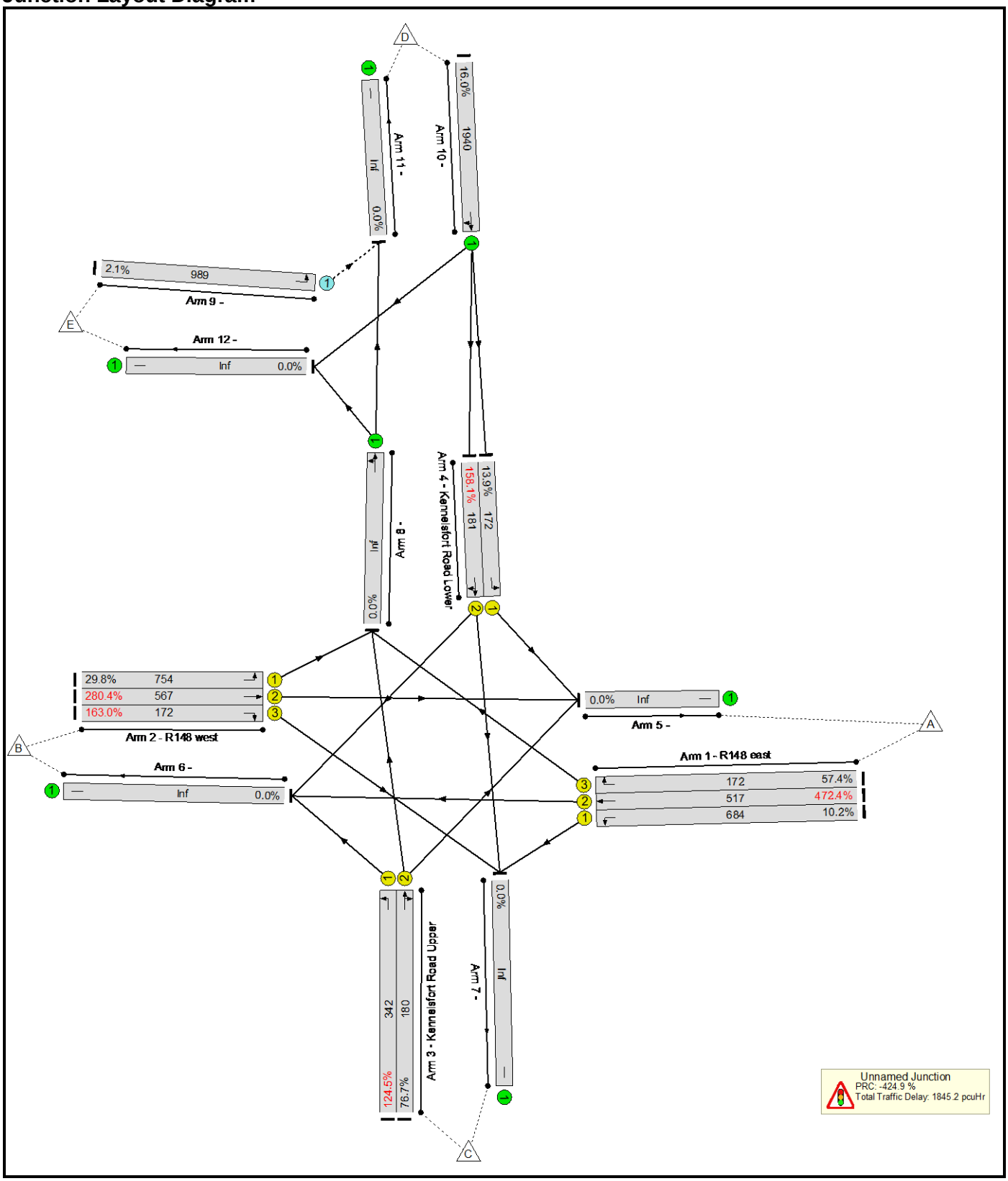
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**480.5%**	**36**	**0**	**0**	**2145.2**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**480.5%**	**36**	**0**	**0**	**2145.2**	-	-
1/1	R148 east Left	U	B		2	30	-	101	1925	684	14.8%	-	-	-	0.4	15.0	1.3
1/2	R148 east Ahead	U	A		1	23	-	1888	1940	517	364.9%	-	-	-	772.6	1473.2	788.8
1/3	R148 east Right	U	J		1	7	-	114	1940	172	66.1%	-	-	-	2.2	69.5	3.7
2/1	R148 west Left	U	E		1	35	-	284	1885	754	37.7%	-	-	-	1.8	22.9	5.3
2/2	R148 west Ahead	U	F		1	23	-	2723	2125	567	480.5%	-	-	-	1214.7	1605.9	1240.5
2/3	R148 west Right	U	K		1	7	-	396	1940	172	229.6%	-	-	-	127.9	1162.3	132.0
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	340	1925	342	99.4%	-	-	-	10.7	113.8	13.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	187	2025	180	103.9%	-	-	-	11.3	216.6	13.7
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	10	1940	172	5.8%	-	-	-	0.1	48.9	0.3
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	145	2035	181	80.2%	-	-	-	3.5	85.7	5.4
9/1	Left	O	-		-	-	-	36	Inf	927	3.9%	36	0	0	0.0	2.1	0.1
10/1	Ahead Right	U	-		-	-	-	155	1940	1940	8.0%	-	-	-	0.0	1.0	0.0

C1 PRC for Signalled Lanes (%): -433.9 Total Delay for Signalled Lanes (pcuHr): 2145.13 Cycle Time (s): 90
PRC Over All Lanes (%): -433.9 Total Delay Over All Lanes(pcuHr): 2145.19

Basic Results Summary

Scenario 14: '2036 PM Base + Dev' (FG16: '2036+DEV PM', Plan 1: 'Staging Plan No. 1')

Junction Layout Diagram



Basic Results Summary

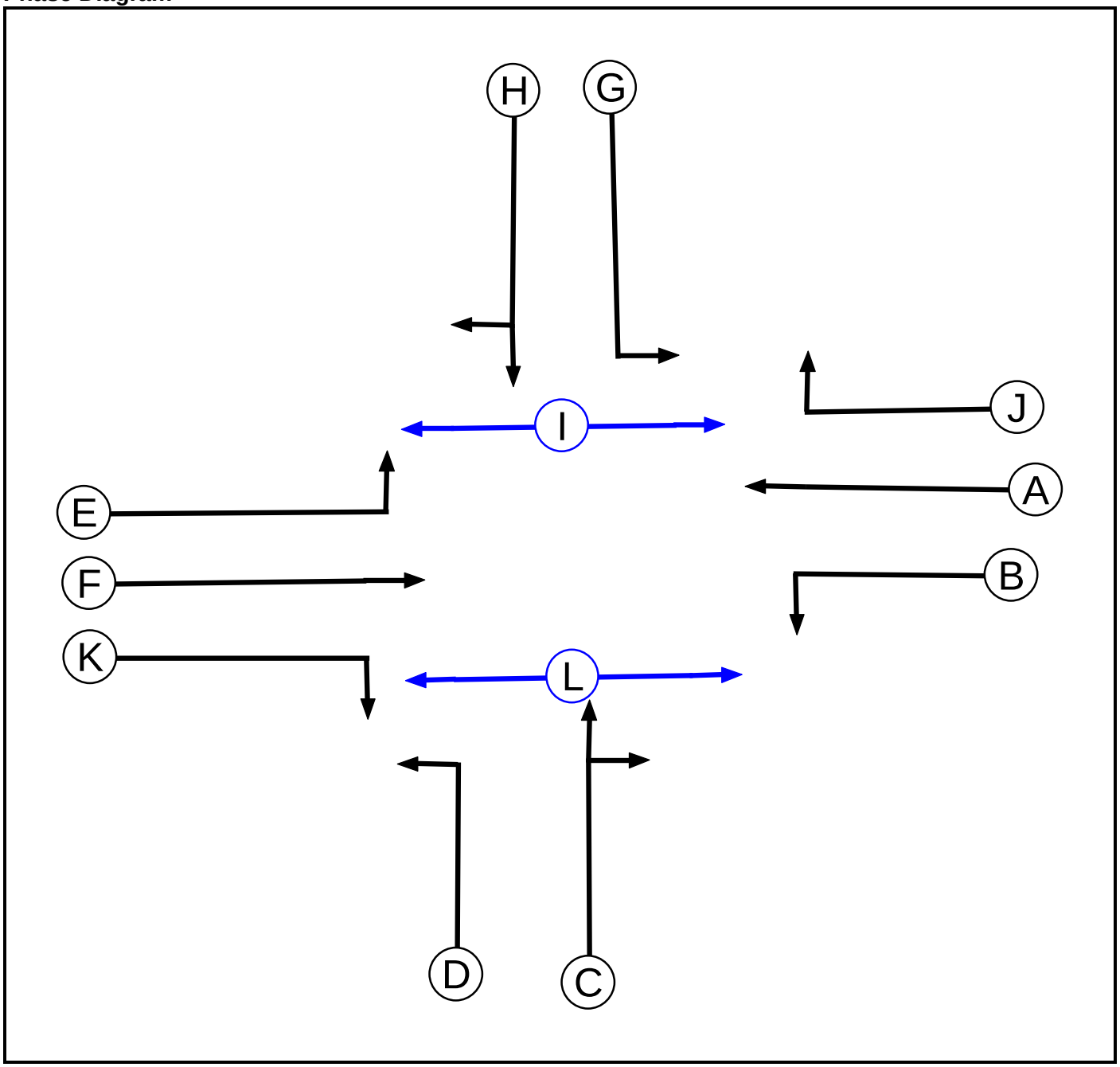
Link Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network	-	-	-		-	-	-	-	-	-	**472.4%**	**21**	**0**	**0**	**1845.2**	-	-
Unnamed Junction	-	-	-		-	-	-	-	-	-	**472.4%**	**21**	**0**	**0**	**1845.2**	-	-
1/1	R148 east Left	U	B		2	30	-	70	1925	684	10.2%	-	-	-	0.3	14.6	0.9
1/2	R148 east Ahead	U	A		1	23	-	2444	1940	517	472.4%	-	-	-	1085.4	1598.7	1108.5
1/3	R148 east Right	U	J		1	7	-	99	1940	172	57.4%	-	-	-	1.7	63.5	3.0
2/1	R148 west Left	U	E		1	35	-	225	1885	754	29.8%	-	-	-	1.4	21.8	4.0
2/2	R148 west Ahead	U	F		1	23	-	1589	2125	567	280.4%	-	-	-	576.8	1306.7	590.4
2/3	R148 west Right	U	K		1	7	-	281	1940	172	163.0%	-	-	-	63.5	814.0	66.7
3/1	Kennelsfort Road Upper Left	U	D		2	14	-	426	1925	342	124.5%	-	-	-	51.1	432.0	54.6
3/2	Kennelsfort Road Upper Right Ahead	U	C		1	7	-	138	2025	180	76.7%	-	-	-	3.1	80.0	4.9
4/1	Kennelsfort Road Lower Left	U	G		1	7	-	24	1940	172	13.9%	-	-	-	0.3	49.9	0.6
4/2	Kennelsfort Road Lower Right Ahead	U	H		1	7	-	286	2035	181	158.1%	-	-	-	61.5	774.6	63.7
9/1	Left	O	-		-	-	-	21	Inf	989	2.1%	21	0	0	0.0	1.9	0.0
10/1	Ahead Right	U	-		-	-	-	310	1940	1940	16.0%	-	-	-	0.1	1.1	0.1

C1 PRC for Signalled Lanes (%): -424.9 Total Delay for Signalled Lanes (pcuHr): 1845.13 Cycle Time (s): 90
PRC Over All Lanes (%): -424.9 Total Delay Over All Lanes(pcuHr): 1845.23

Basic Results Summary

Phase Diagram



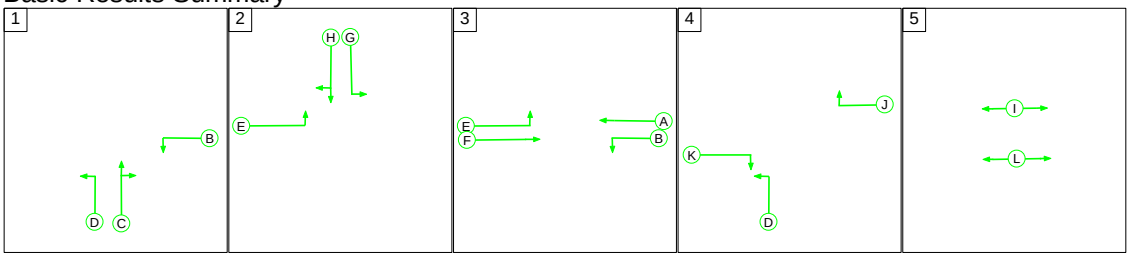
Phases in Stage

Stage No.	Phases in Stage
1	B C D
2	E G H
3	A B E F
4	D J K
5	I L

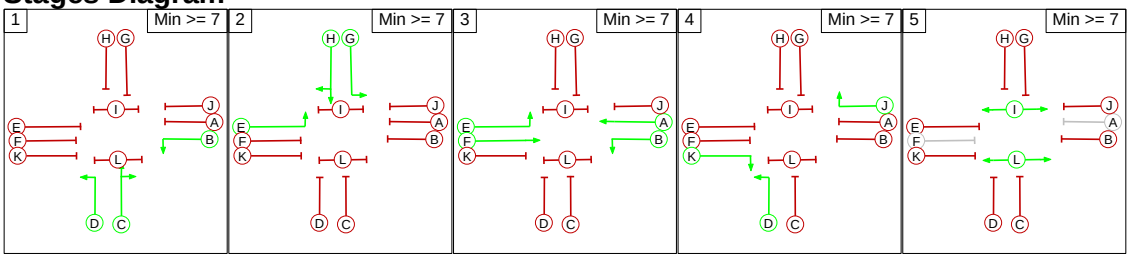
Staging Plan Summary

Stage Sequence: Staging Plan No. 1

Basic Results Summary

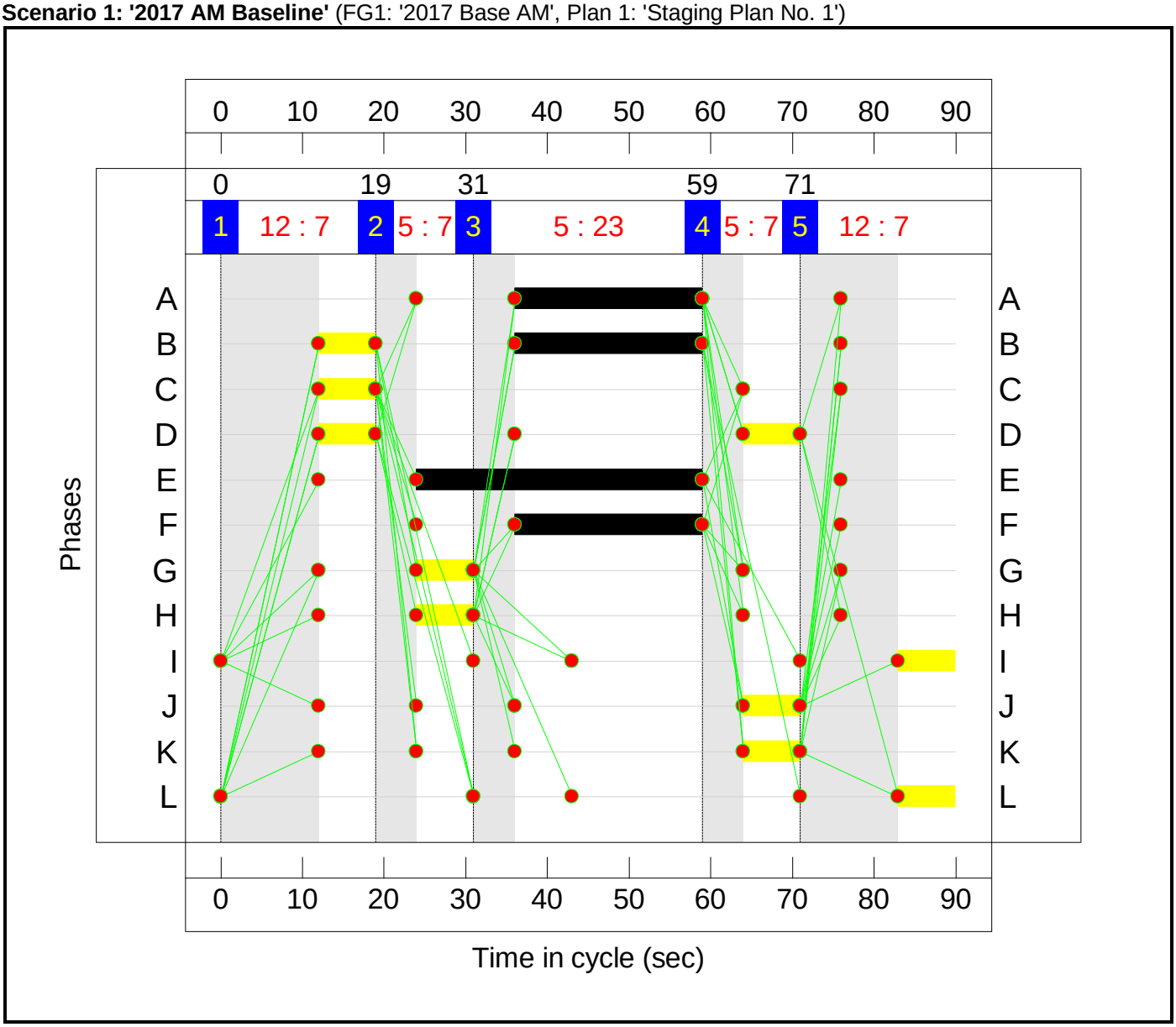


Stages Diagram



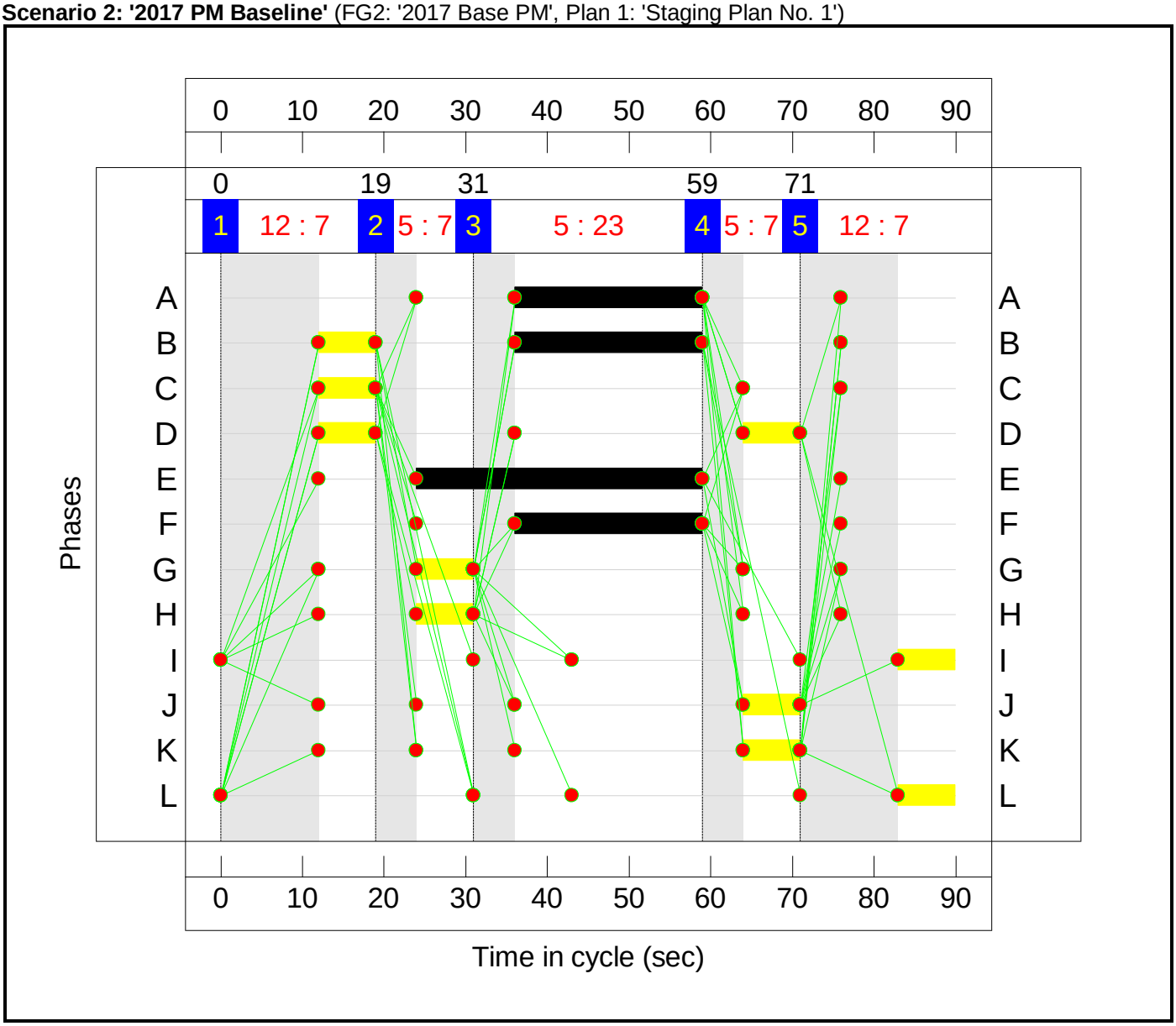
Signal Timings Diagram

Scenario 1: '2017 AM Baseline' (FG1: '2017 Base AM', Plan 1: 'Staging Plan No. 1')



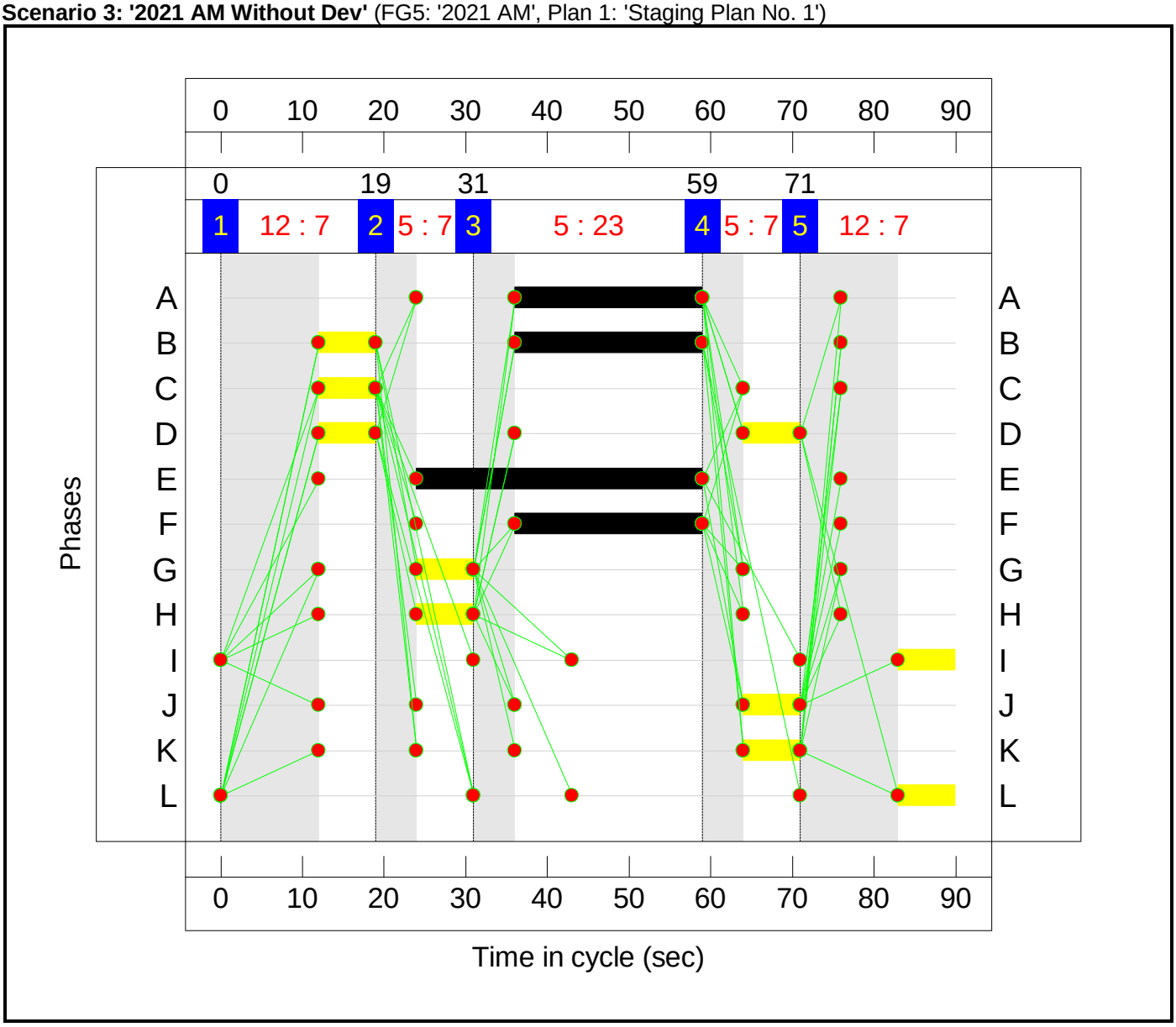
Basic Results Summary

Scenario 2: '2017 PM Baseline' (FG2: '2017 Base PM', Plan 1: 'Staging Plan No. 1')



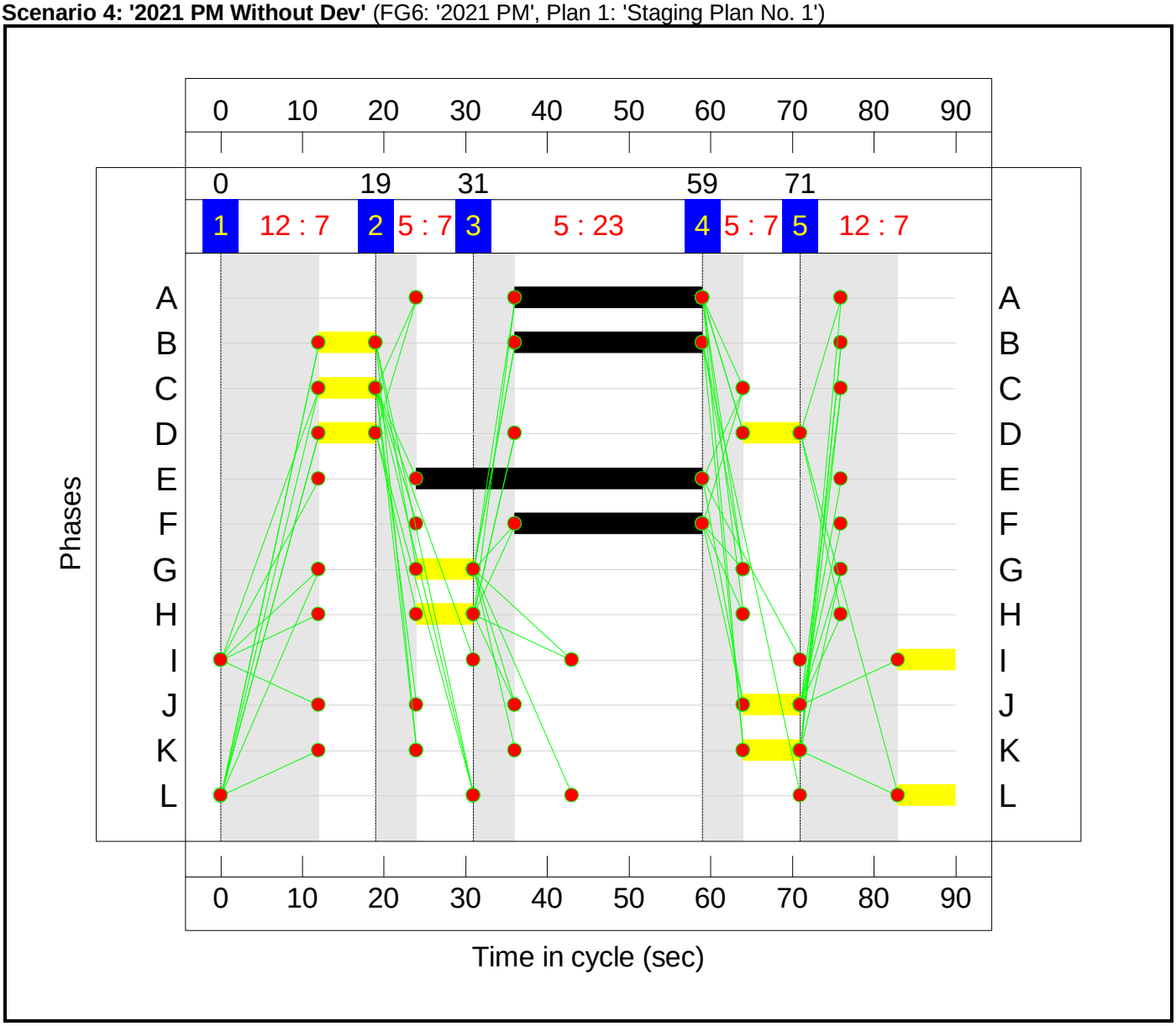
Basic Results Summary

Scenario 3: '2021 AM Without Dev' (FG5: '2021 AM', Plan 1: 'Staging Plan No. 1')



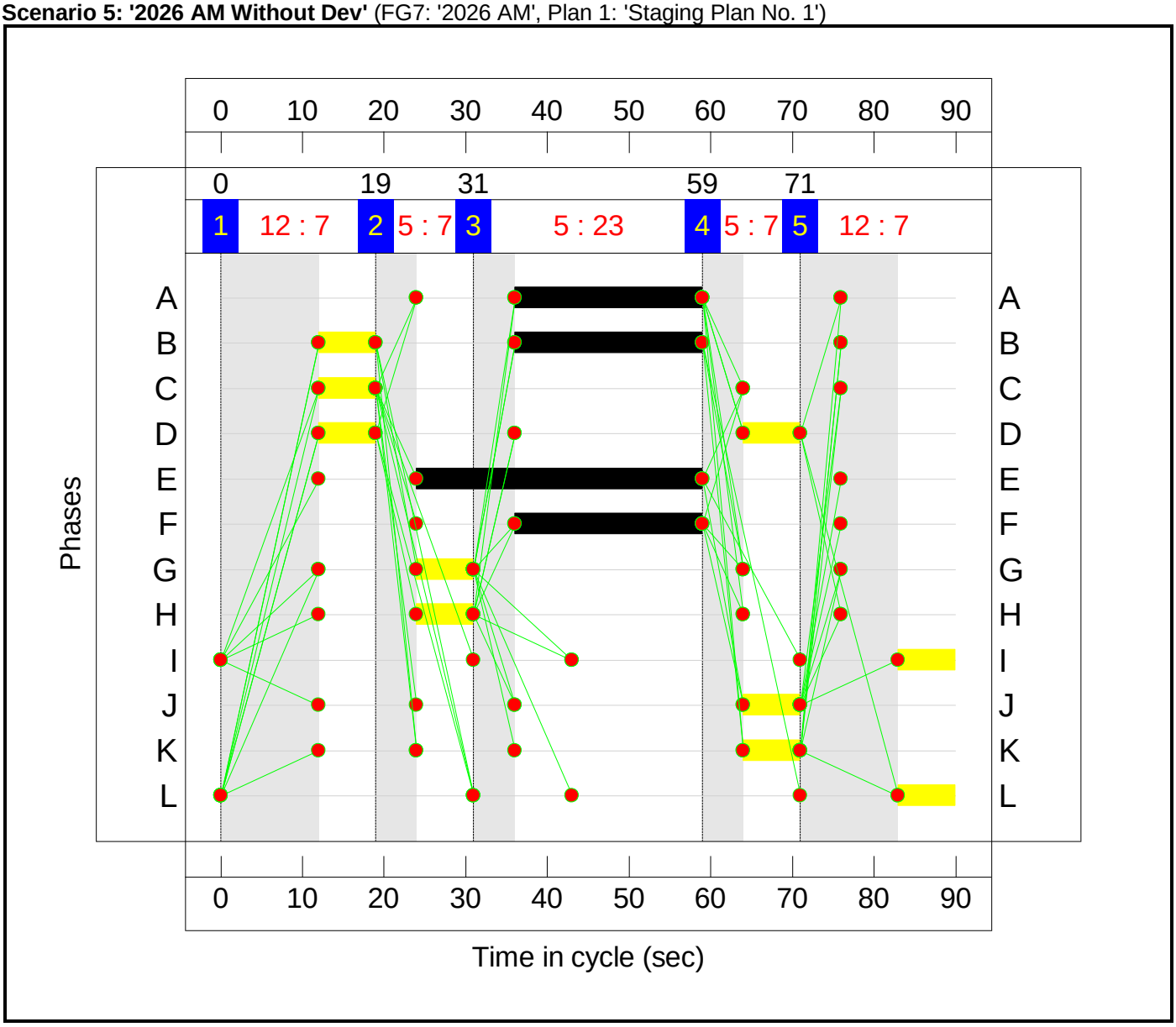
Basic Results Summary

Scenario 4: '2021 PM Without Dev' (FG6: '2021 PM', Plan 1: 'Staging Plan No. 1')



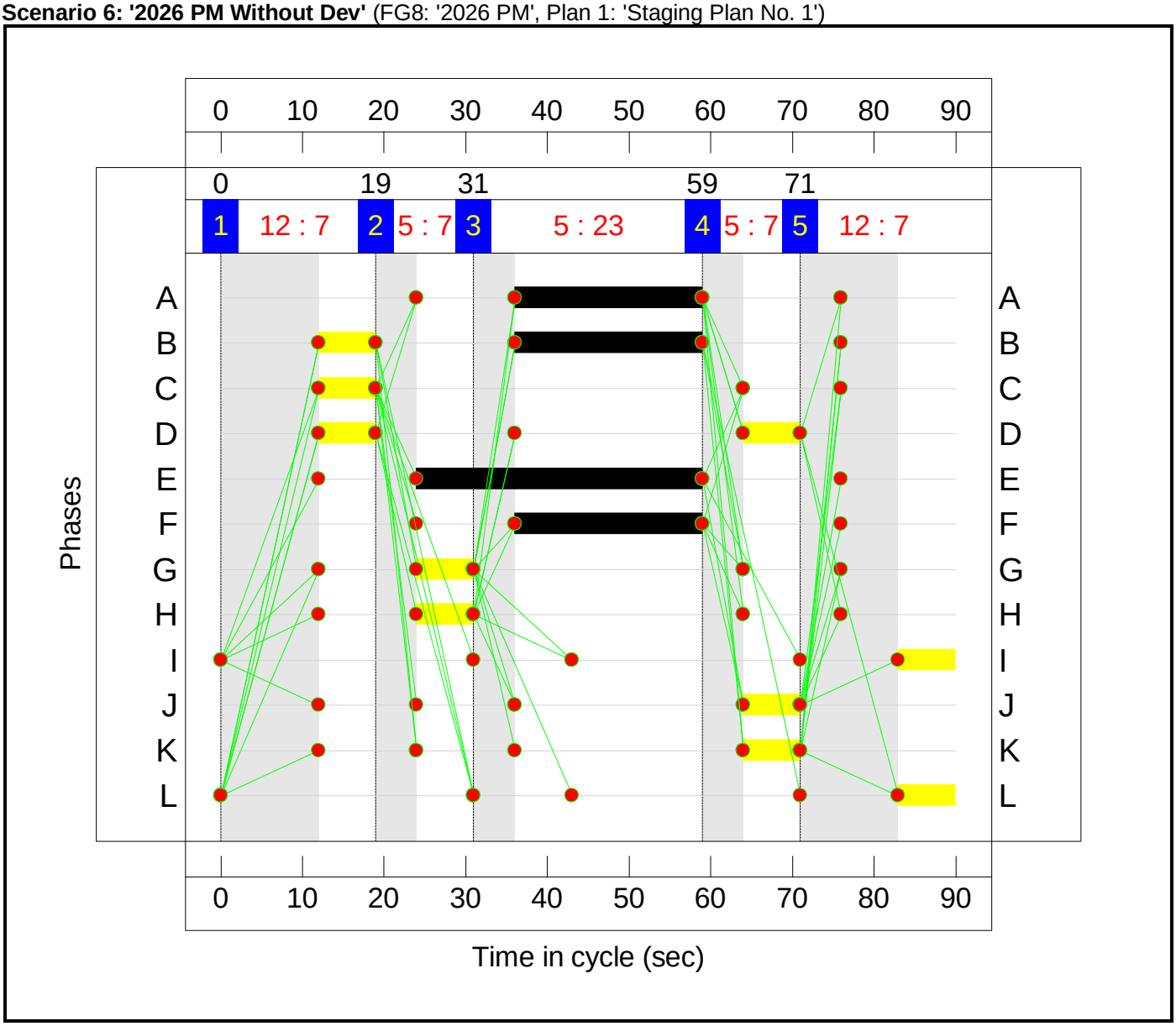
Basic Results Summary

Scenario 5: '2026 AM Without Dev' (FG7: '2026 AM', Plan 1: 'Staging Plan No. 1')



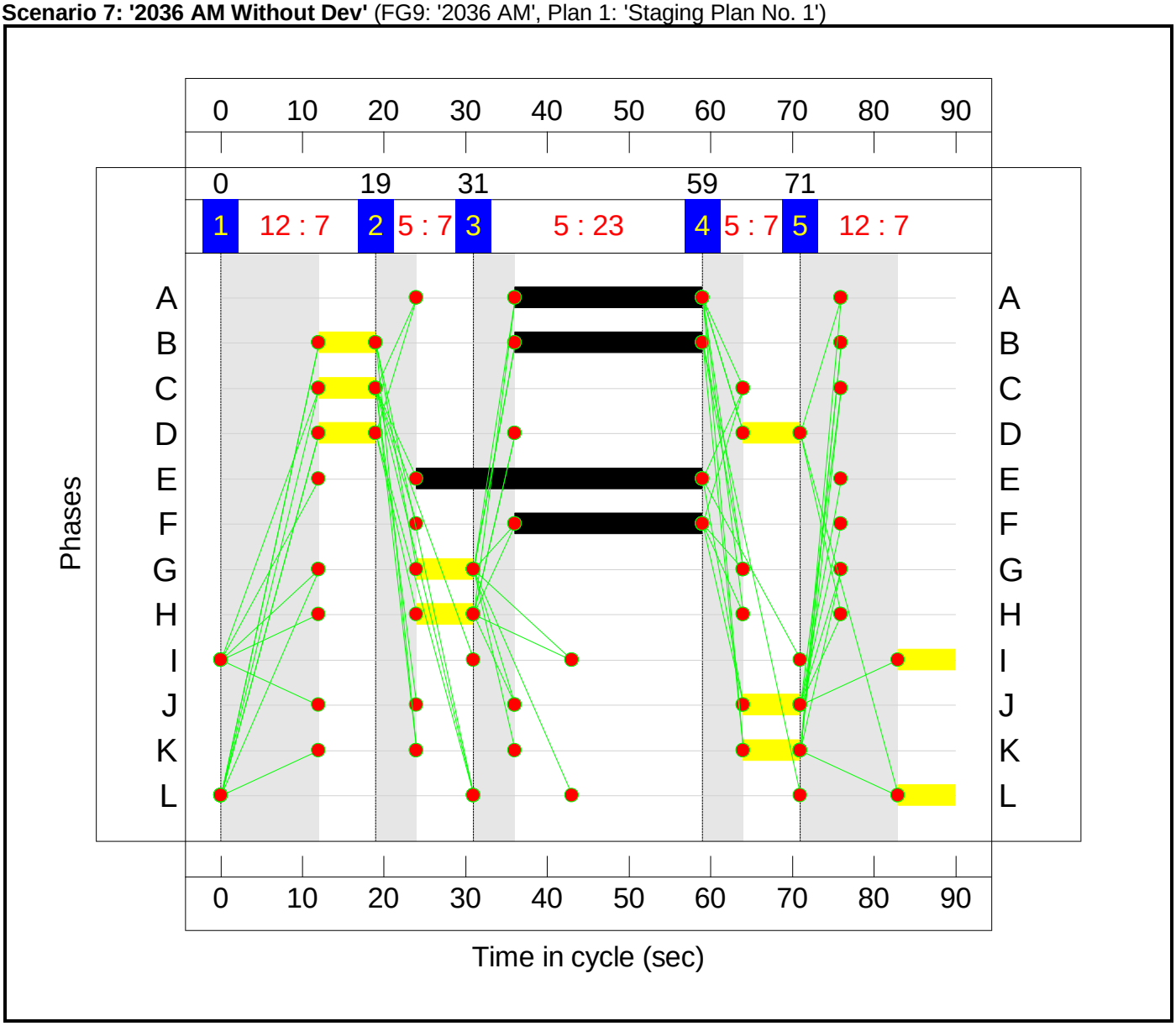
Basic Results Summary

Scenario 6: '2026 PM Without Dev' (FG8: '2026 PM', Plan 1: 'Staging Plan No. 1')



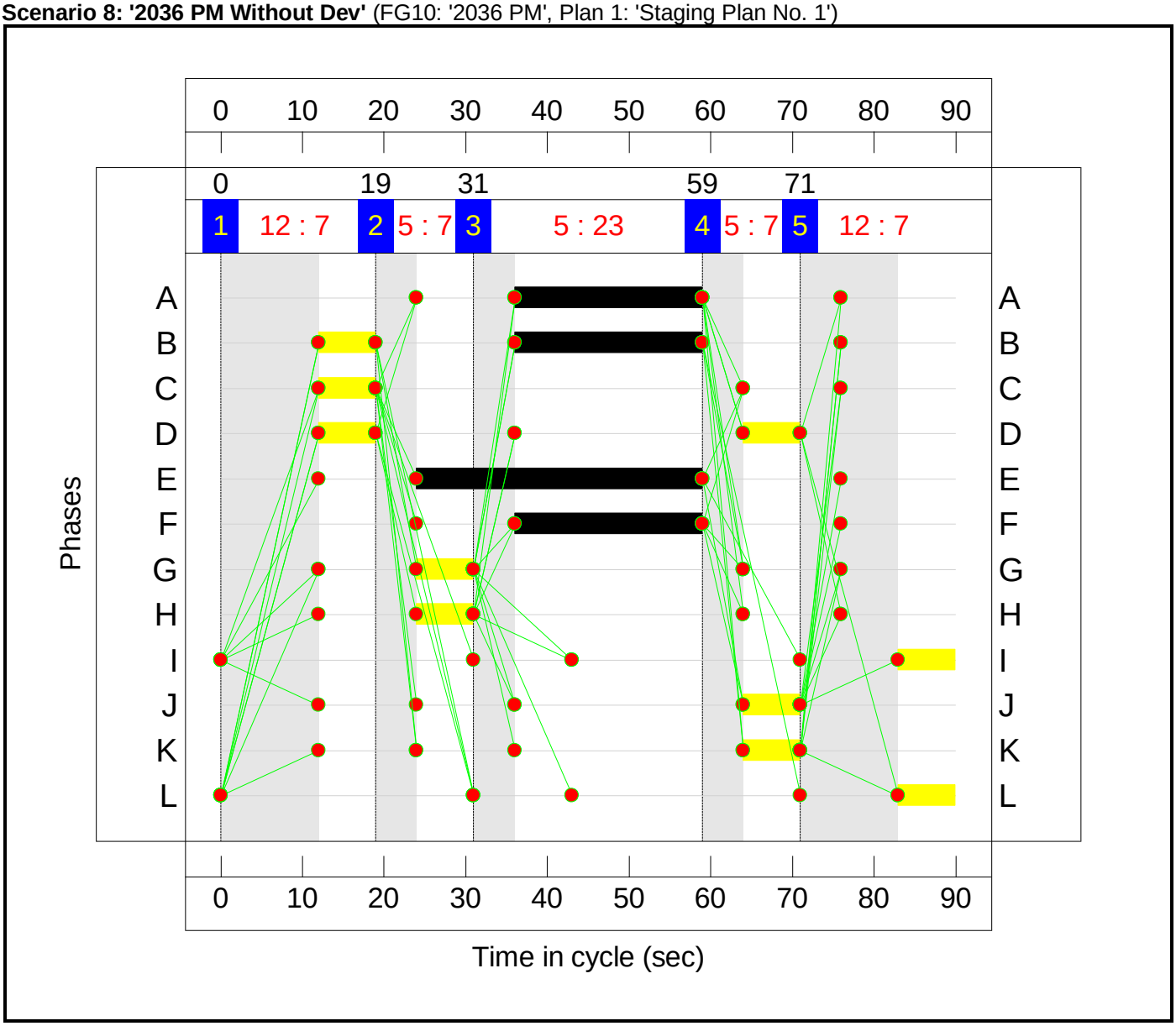
Basic Results Summary

Scenario 7: '2036 AM Without Dev' (FG9: '2036 AM', Plan 1: 'Staging Plan No. 1')



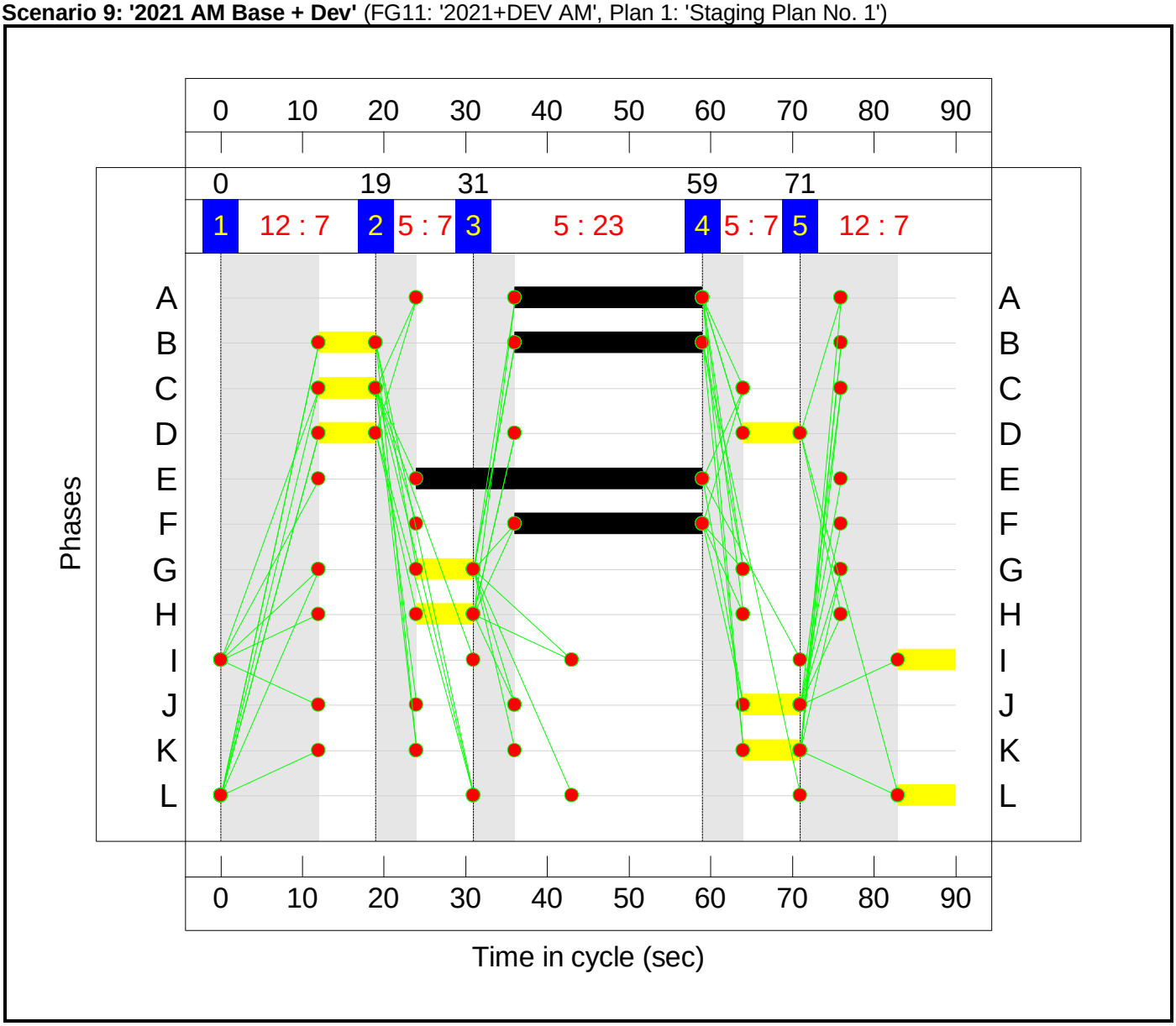
Basic Results Summary

Scenario 8: '2036 PM Without Dev' (FG10: '2036 PM', Plan 1: 'Staging Plan No. 1')



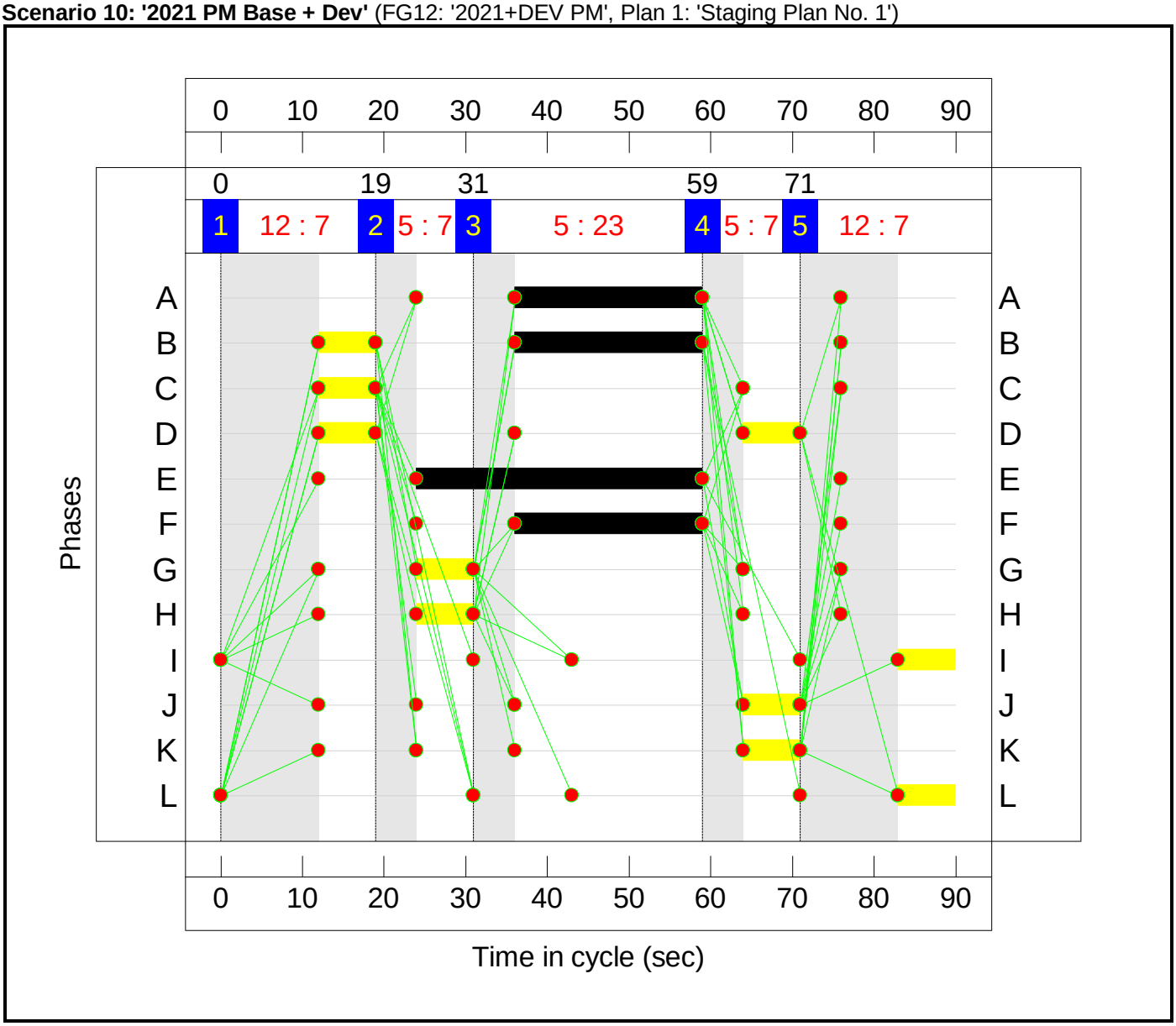
Basic Results Summary

Scenario 9: '2021 AM Base + Dev' (FG11: '2021+DEV AM', Plan 1: 'Staging Plan No. 1')



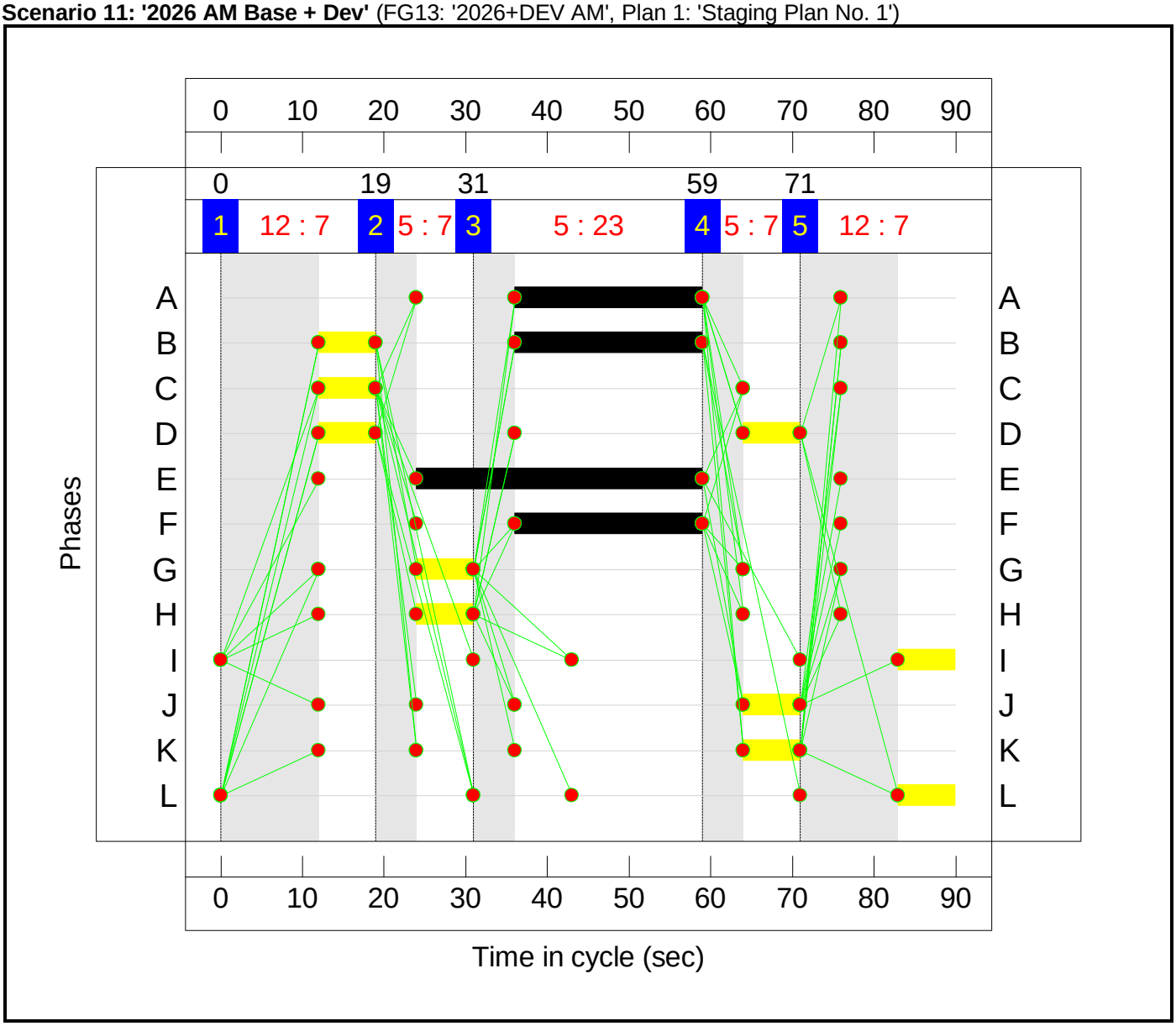
Basic Results Summary

Scenario 10: '2021 PM Base + Dev' (FG12: '2021+DEV PM', Plan 1: 'Staging Plan No. 1')



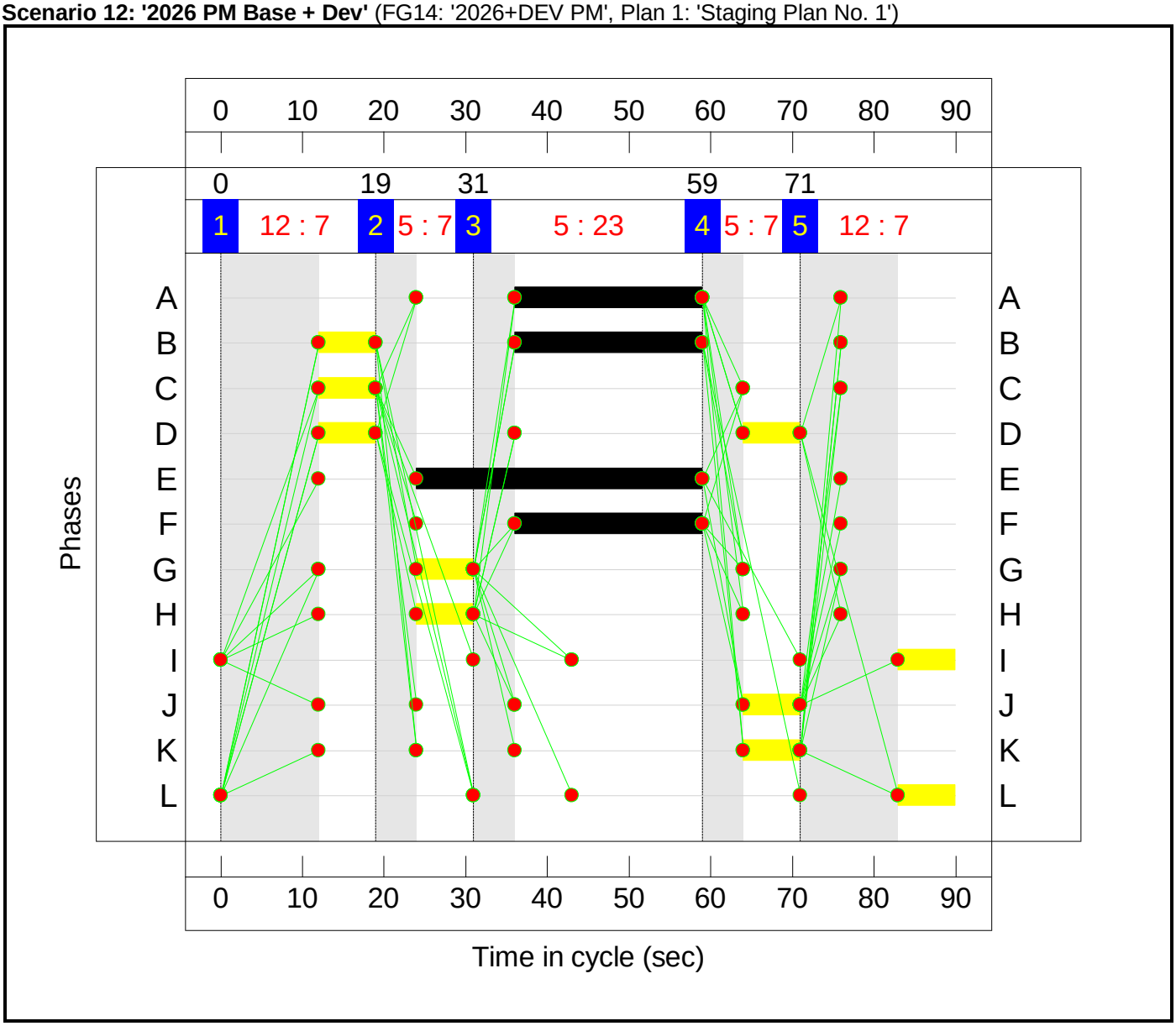
Basic Results Summary

Scenario 11: '2026 AM Base + Dev' (FG13: '2026+DEV AM', Plan 1: 'Staging Plan No. 1')



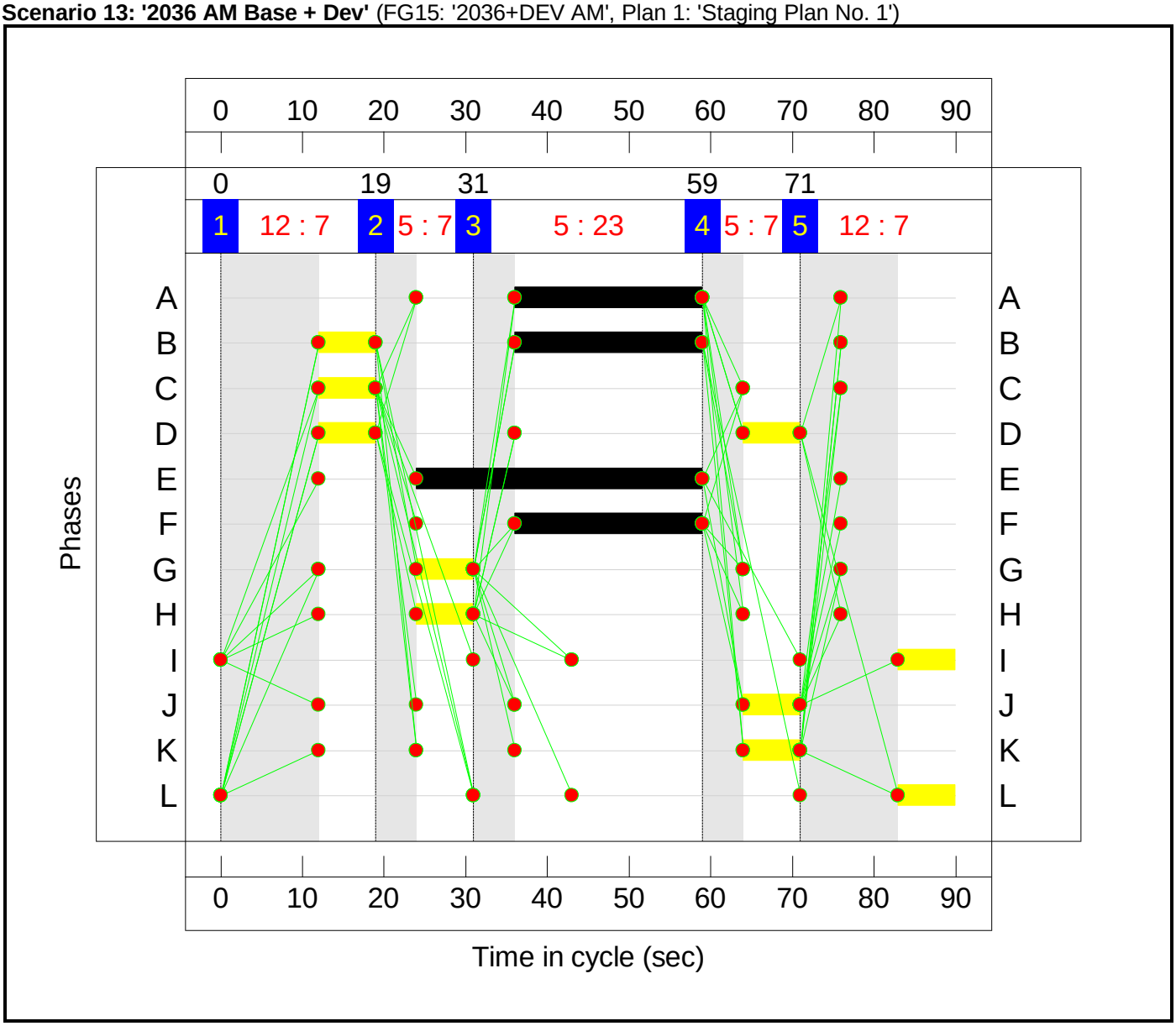
Basic Results Summary

Scenario 12: '2026 PM Base + Dev' (FG14: '2026+DEV PM', Plan 1: 'Staging Plan No. 1')



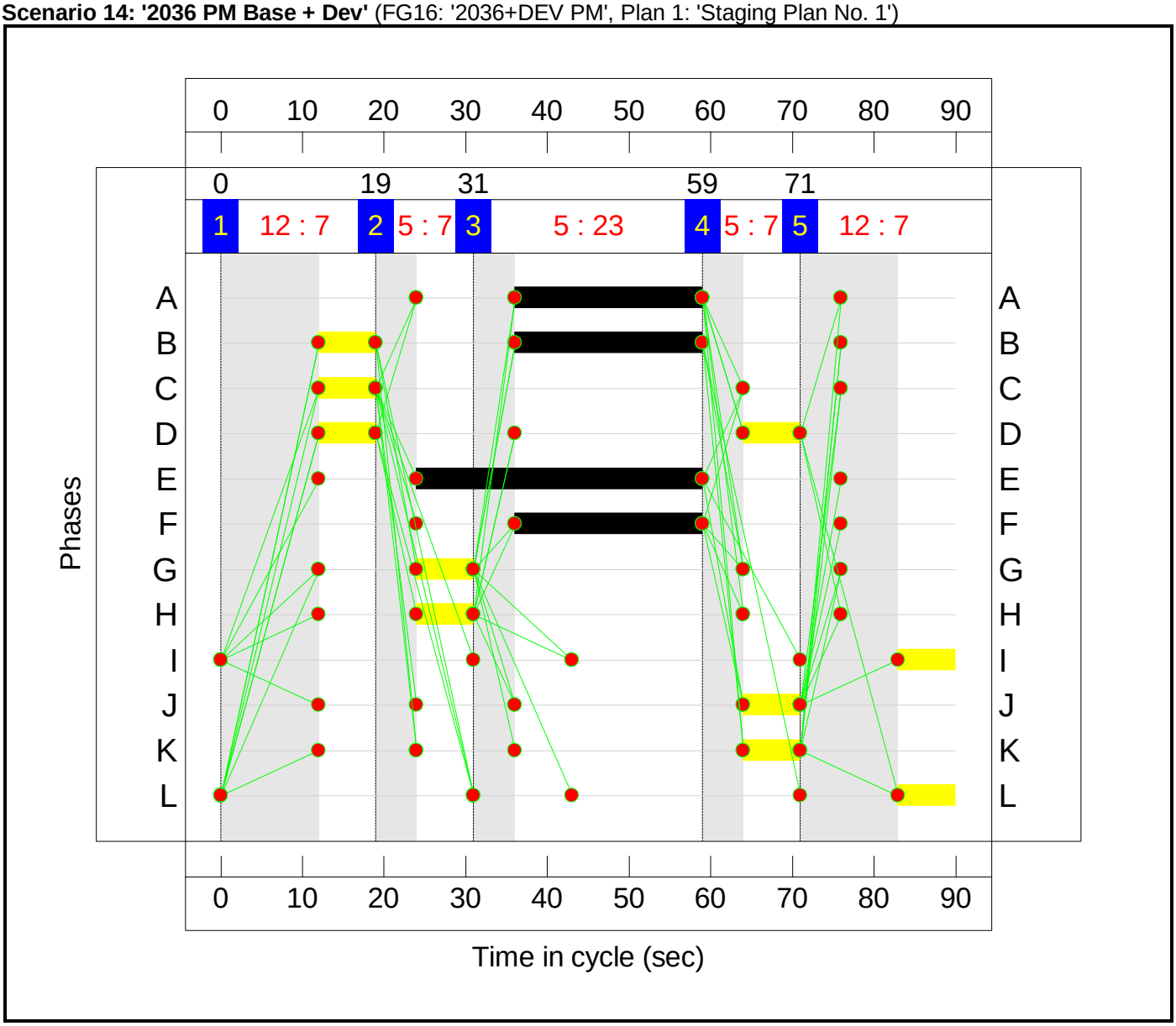
Basic Results Summary

Scenario 13: '2036 AM Base + Dev' (FG15: '2036+DEV AM', Plan 1: 'Staging Plan No. 1')



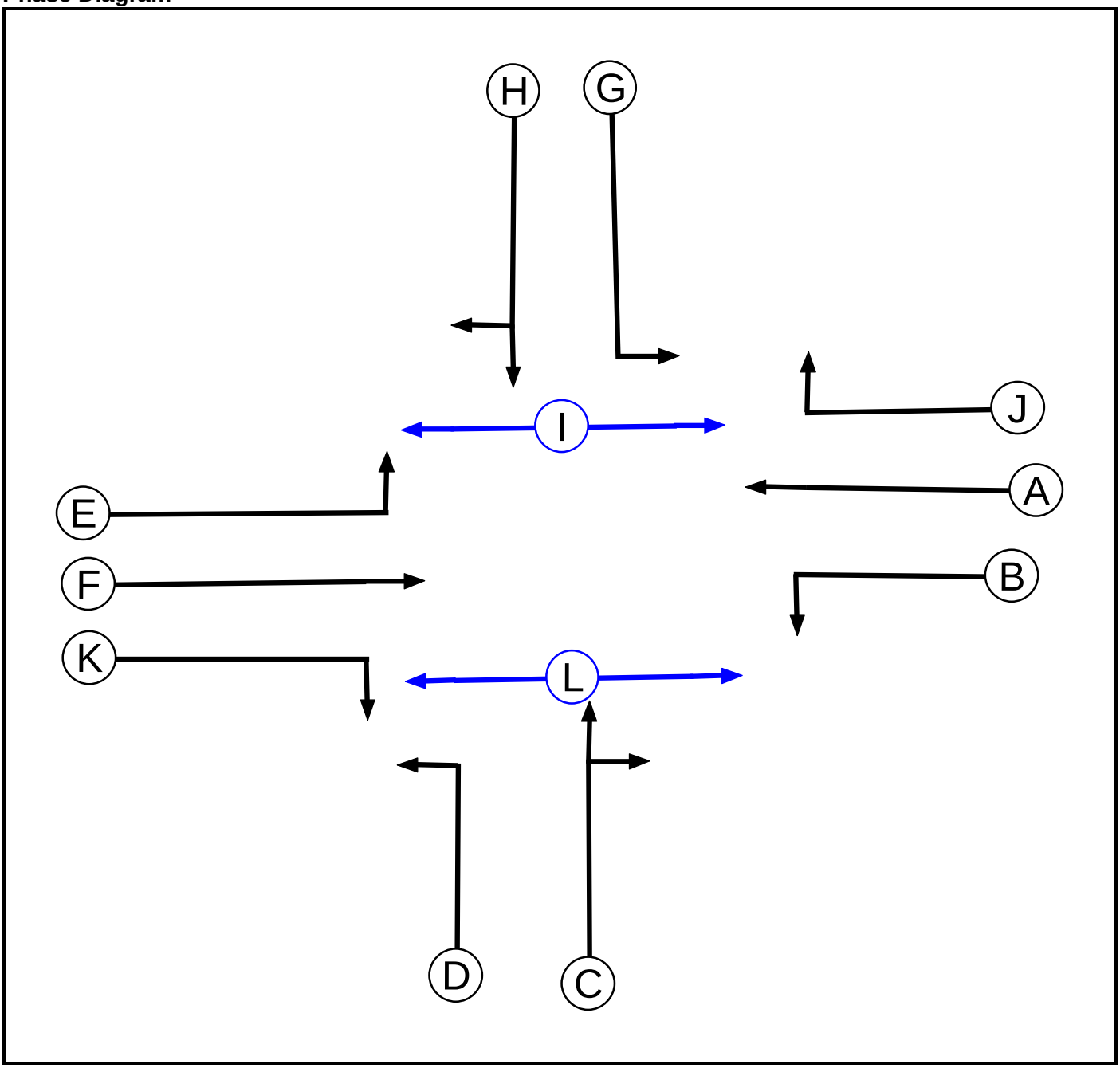
Basic Results Summary

Scenario 14: '2036 PM Base + Dev' (FG16: '2036+DEV PM', Plan 1: 'Staging Plan No. 1')



Basic Results Summary

Phase Diagram



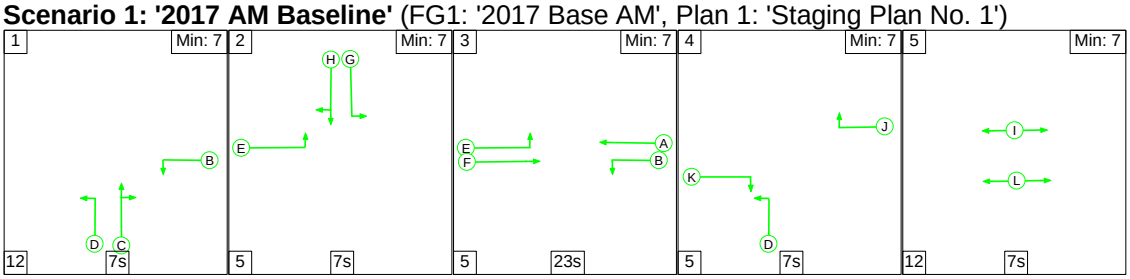
Basic Results Summary

Phase Intergreens Matrix

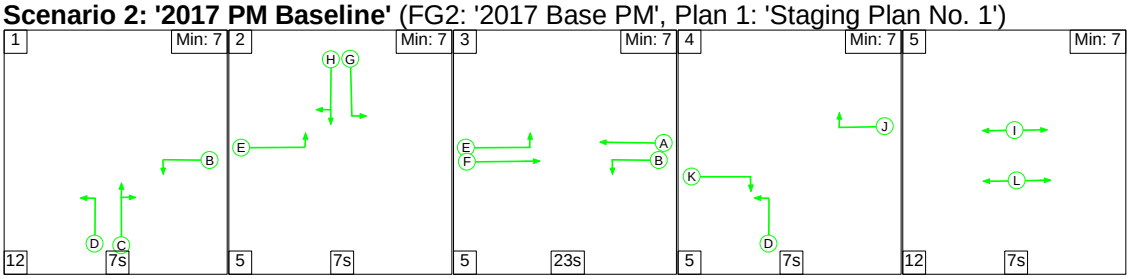
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		-	5	5	-	-	5	5	-	-	5	-
B	-		-	-	-	-	5	-	-	-	5	12
C	5	-		-	5	5	-	-	12	5	5	12
D	5	-	-		-	-	-	5	-	-	-	12
E	-	-	5	-		-	-	-	12	5	-	-
F	-	-	5	-	-		5	5	-	5	-	-
G	5	5	-	-	-	5		-	12	5	5	12
H	5	-	-	5	-	5	-		12	5	-	-
I	-	-	12	-	12	-	12	12		12	-	-
J	-	-	5	-	5	5	5	5	12		-	-
K	5	5	5	-	-	-	5	-	-	-		12
L	-	12	12	12	-	-	12	-	-	-	12	

Staging Plan Diagram

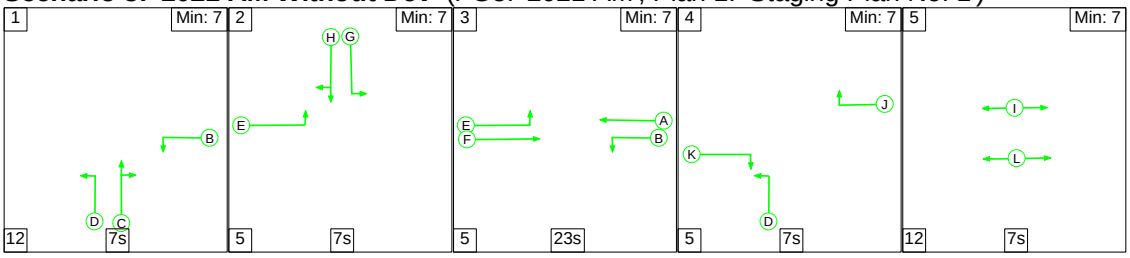
Scenario 1: '2017 AM Baseline' (FG1: '2017 Base AM', Plan 1: 'Staging Plan No. 1')



Scenario 2: '2017 PM Baseline' (FG2: '2017 Base PM', Plan 1: 'Staging Plan No. 1')

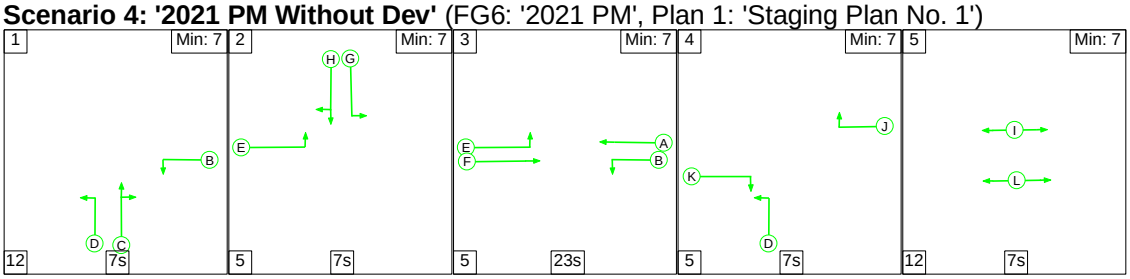


Scenario 3: '2021 AM Without Dev' (FG5: '2021 AM', Plan 1: 'Staging Plan No. 1')

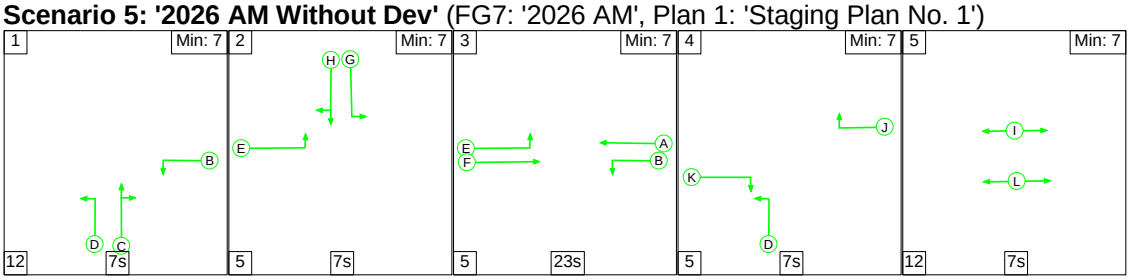


Basic Results Summary

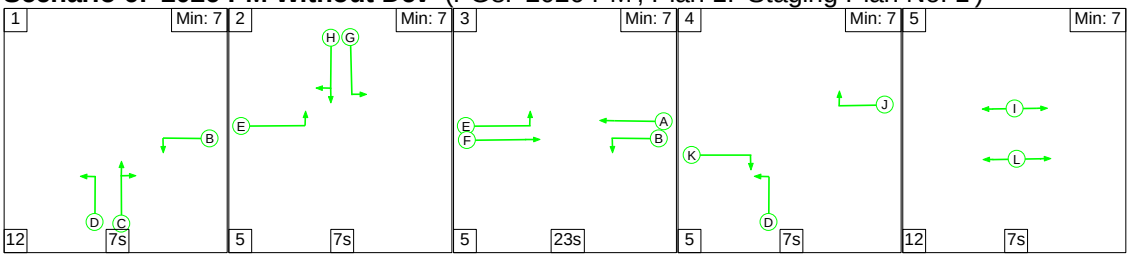
Scenario 4: '2021 PM Without Dev' (FG6: '2021 PM', Plan 1: 'Staging Plan No. 1')



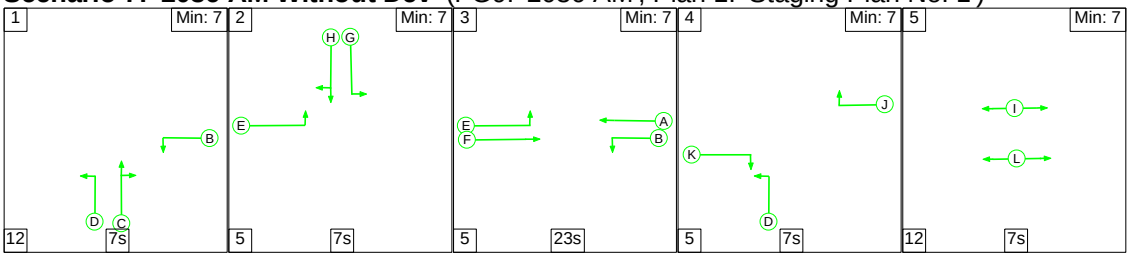
Scenario 5: '2026 AM Without Dev' (FG7: '2026 AM', Plan 1: 'Staging Plan No. 1')



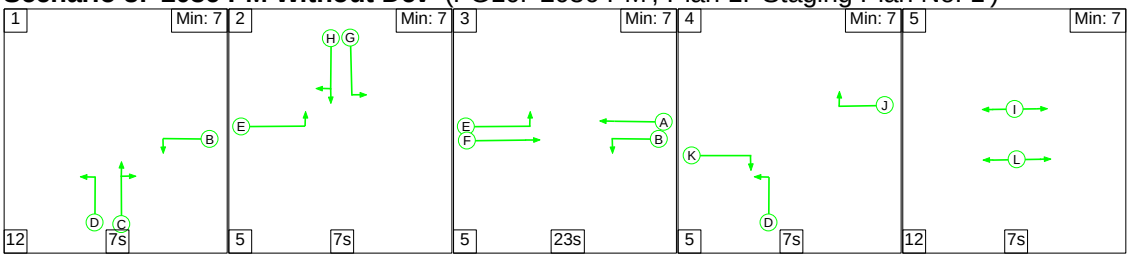
Scenario 6: '2026 PM Without Dev' (FG8: '2026 PM', Plan 1: 'Staging Plan No. 1')



Scenario 7: '2036 AM Without Dev' (FG9: '2036 AM', Plan 1: 'Staging Plan No. 1')

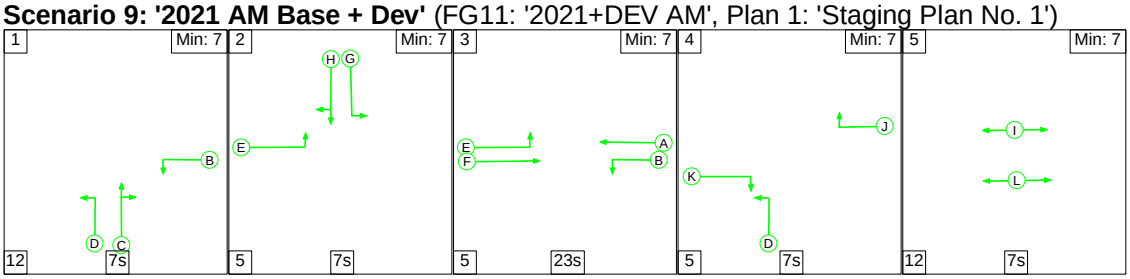


Scenario 8: '2036 PM Without Dev' (FG10: '2036 PM', Plan 1: 'Staging Plan No. 1')

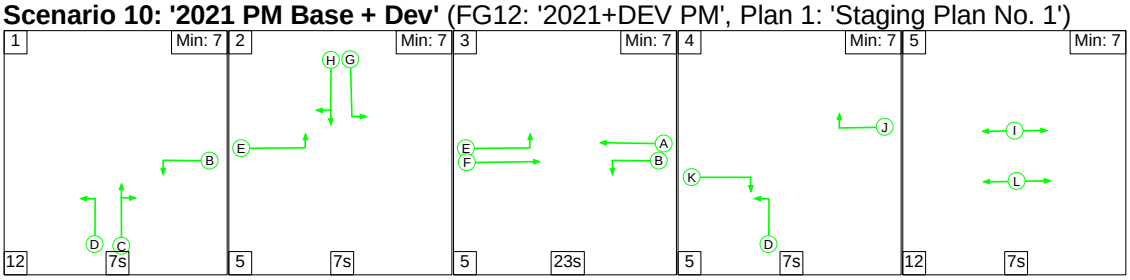


Basic Results Summary

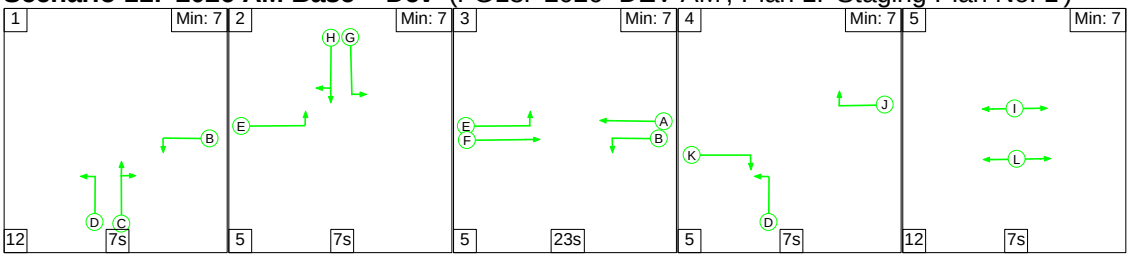
Scenario 9: '2021 AM Base + Dev' (FG11: '2021+DEV AM', Plan 1: 'Staging Plan No. 1')



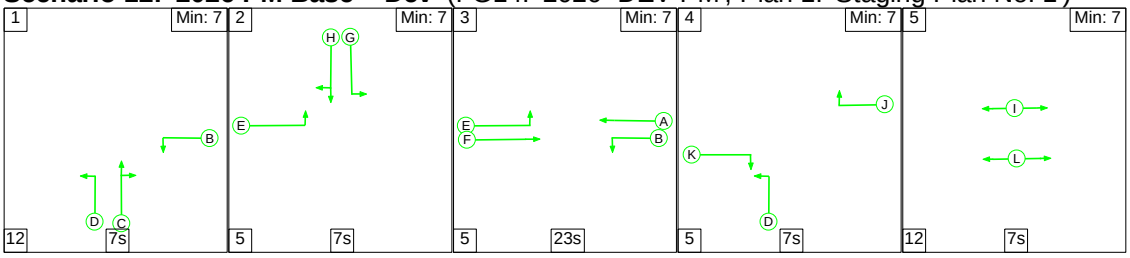
Scenario 10: '2021 PM Base + Dev' (FG12: '2021+DEV PM', Plan 1: 'Staging Plan No. 1')



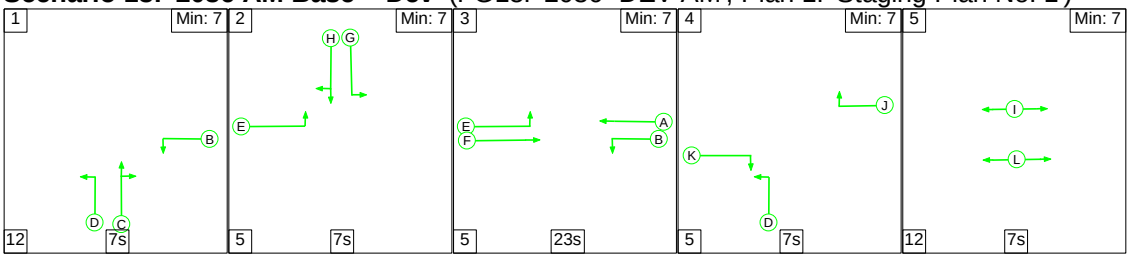
Scenario 11: '2026 AM Base + Dev' (FG13: '2026+DEV AM', Plan 1: 'Staging Plan No. 1')



Scenario 12: '2026 PM Base + Dev' (FG14: '2026+DEV PM', Plan 1: 'Staging Plan No. 1')

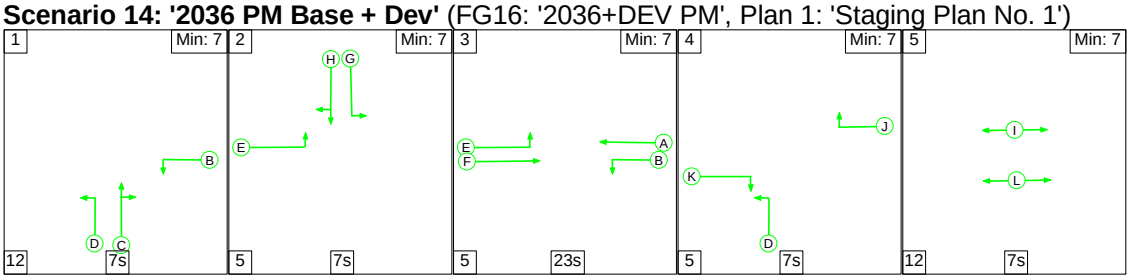


Scenario 13: '2036 AM Base + Dev' (FG15: '2036+DEV AM', Plan 1: 'Staging Plan No. 1')

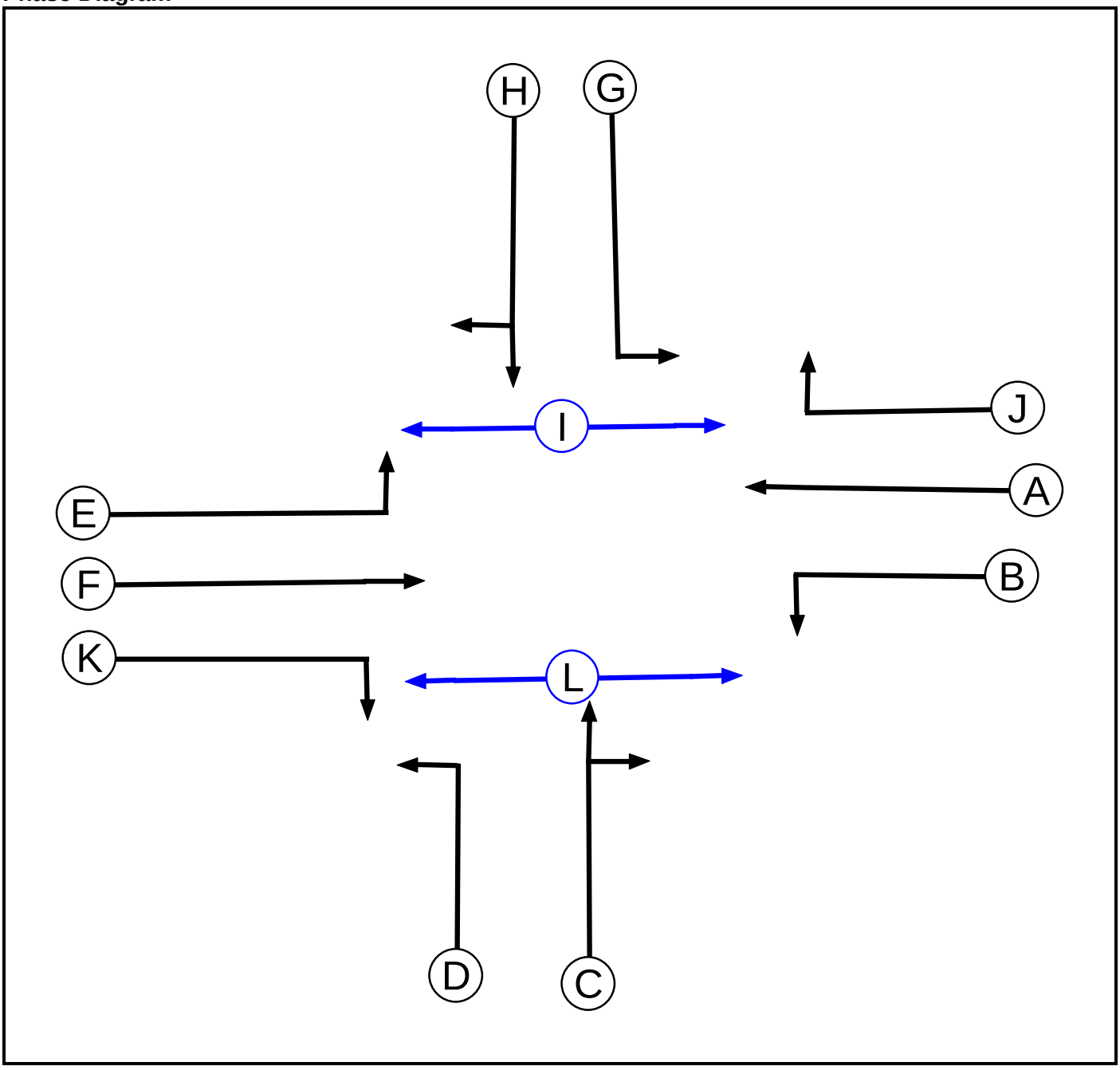


Basic Results Summary

Scenario 14: '2036 PM Base + Dev' (FG16: '2036+DEV PM', Plan 1: 'Staging Plan No. 1')



Phase Diagram



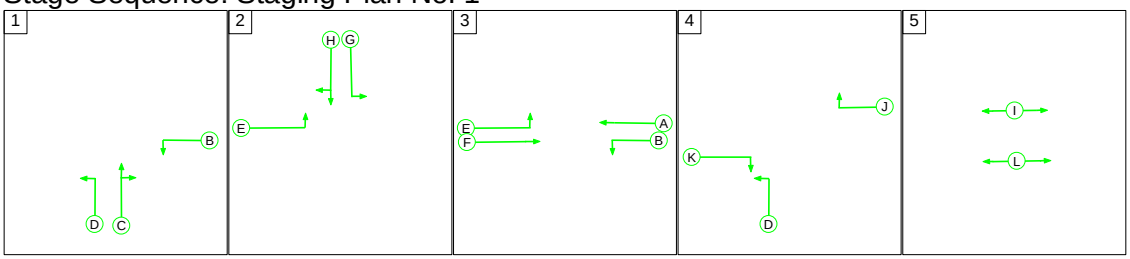
Basic Results Summary

Phase Intergreens Matrix

Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		-	5	5	-	-	5	5	-	-	5	-
B	-		-	-	-	-	5	-	-	-	5	12
C	5	-		-	5	5	-	-	12	5	5	12
D	5	-	-		-	-	-	5	-	-	-	12
E	-	-	5	-		-	-	-	12	5	-	-
F	-	-	5	-	-		5	5	-	5	-	-
G	5	5	-	-	-	5		-	12	5	5	12
H	5	-	-	5	-	5	-		12	5	-	-
I	-	-	12	-	12	-	12	12		12	-	-
J	-	-	5	-	5	5	5	5	12		-	-
K	5	5	5	-	-	-	5	-	-	-		12
L	-	12	12	12	-	-	12	-	-	-	12	

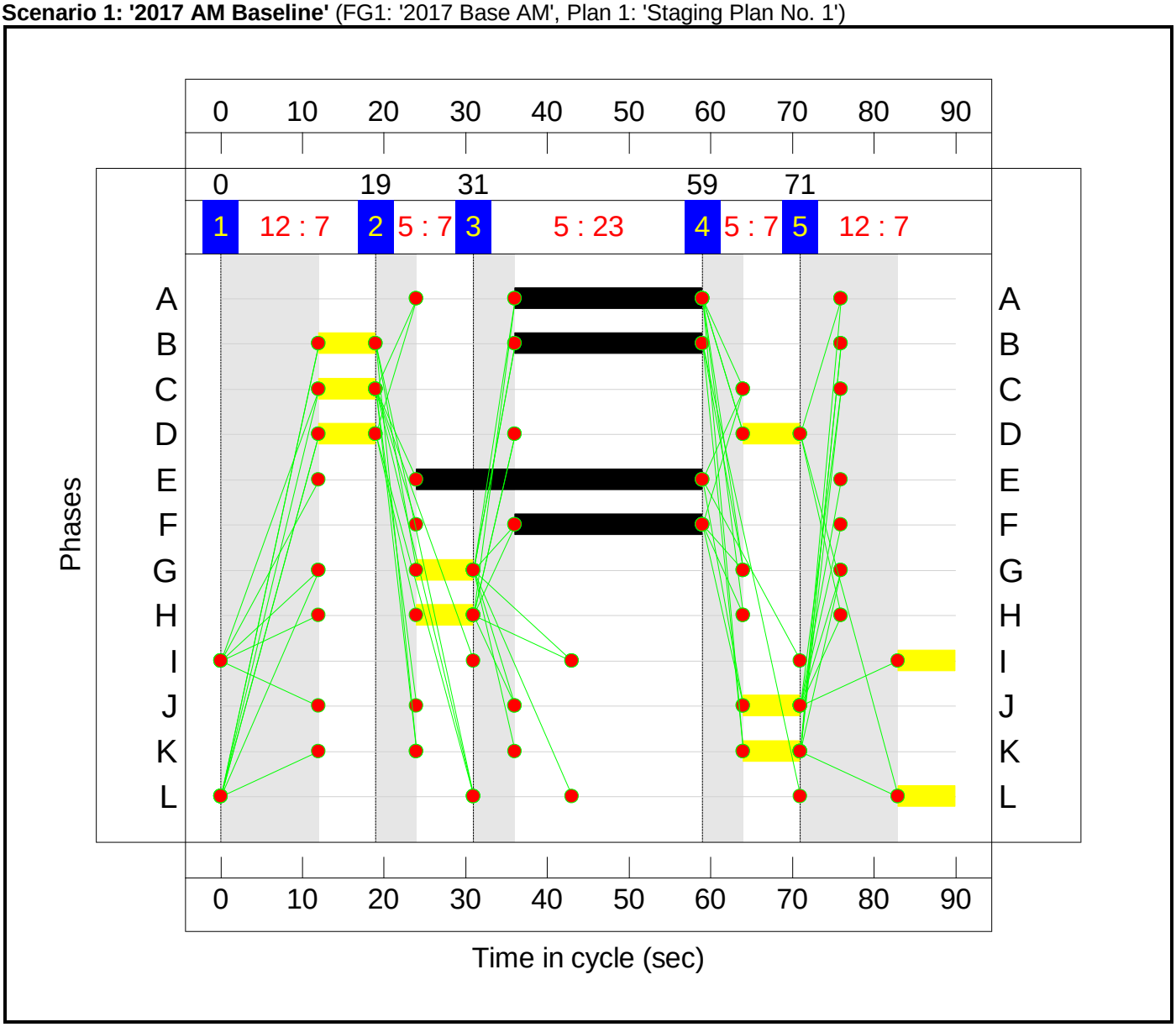
Staging Plan Summary

Stage Sequence: Staging Plan No. 1



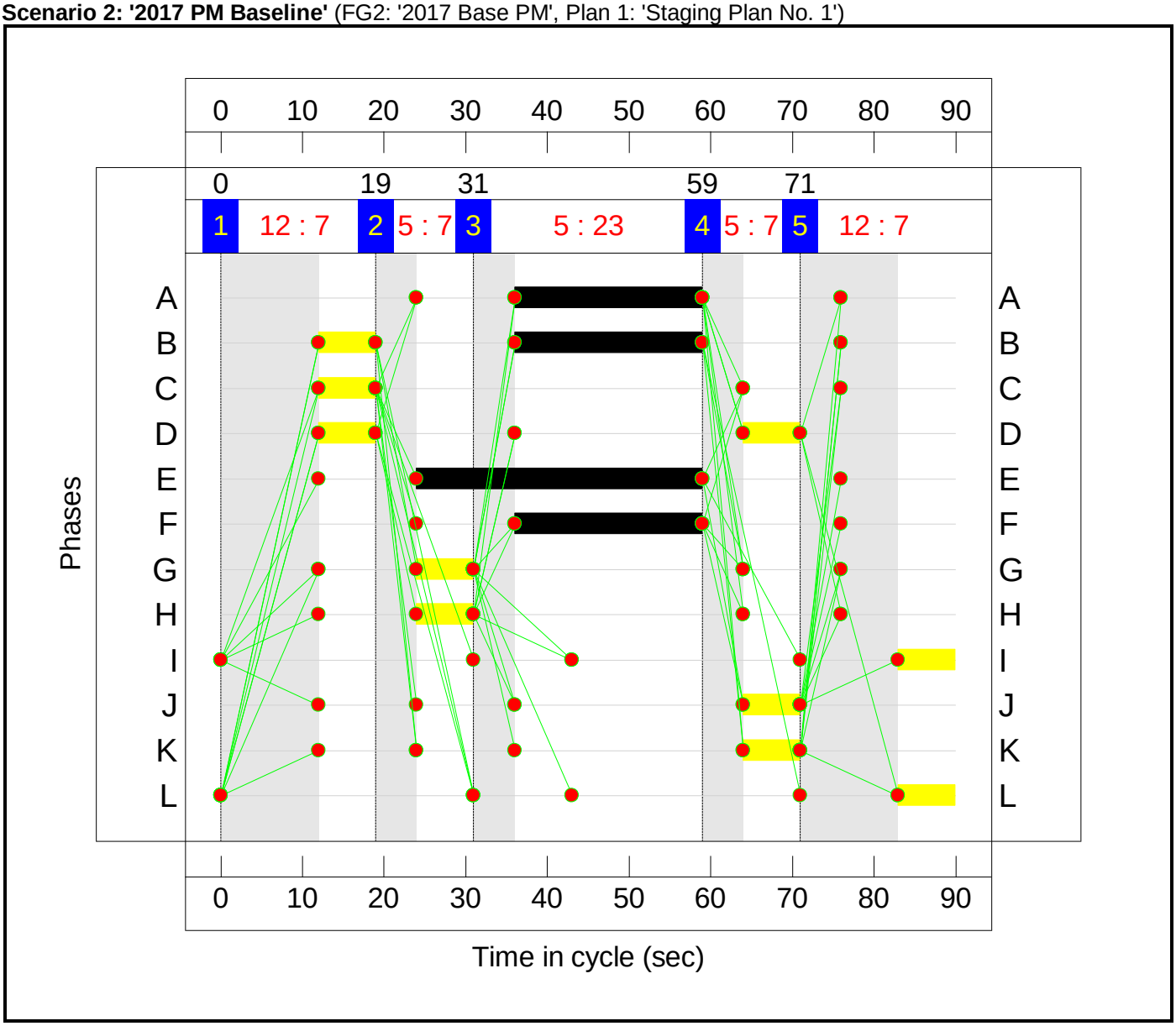
Signal Timings Diagram

Scenario 1: '2017 AM Baseline' (FG1: '2017 Base AM', Plan 1: 'Staging Plan No. 1')



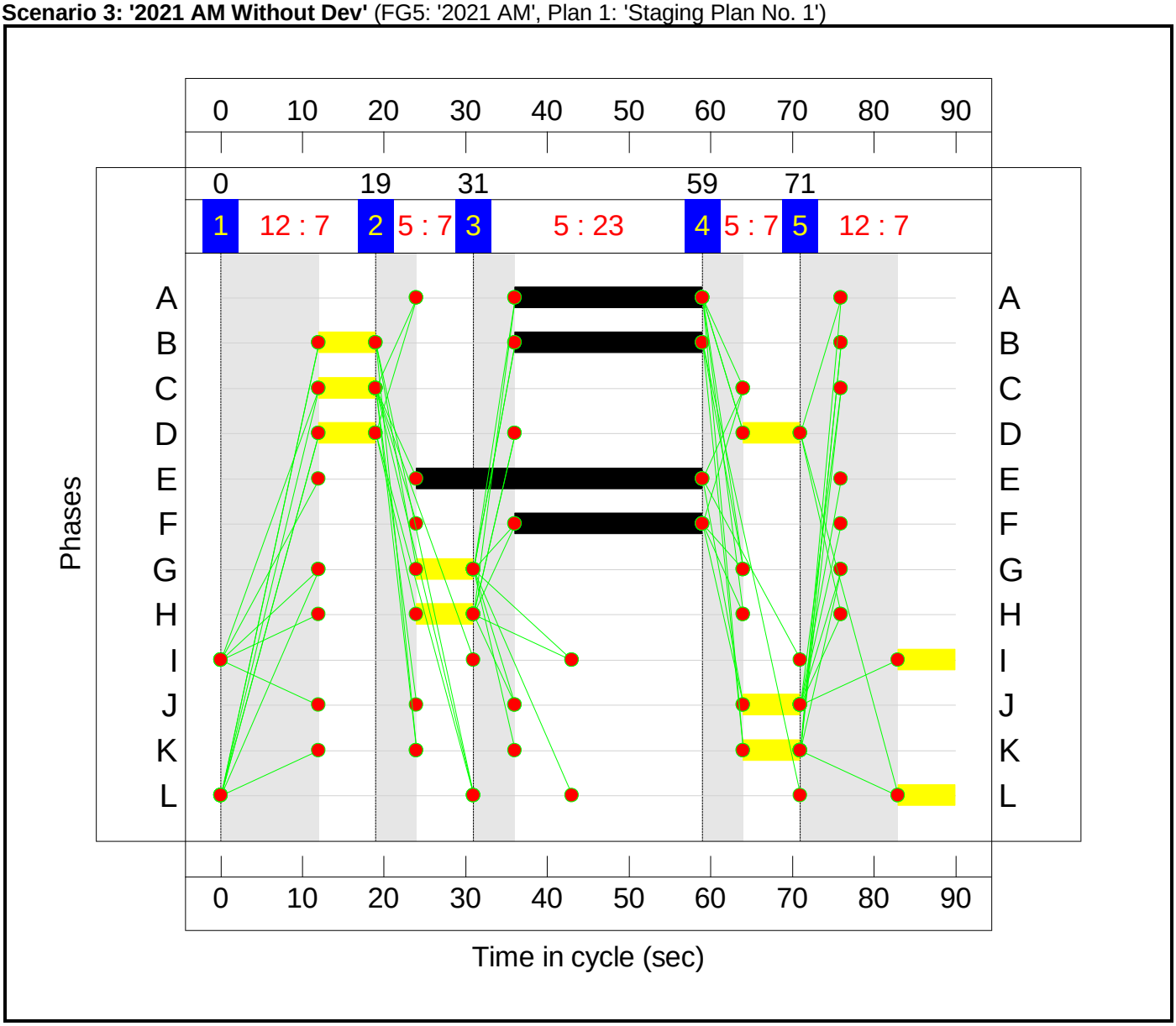
Basic Results Summary

Scenario 2: '2017 PM Baseline' (FG2: '2017 Base PM', Plan 1: 'Staging Plan No. 1')



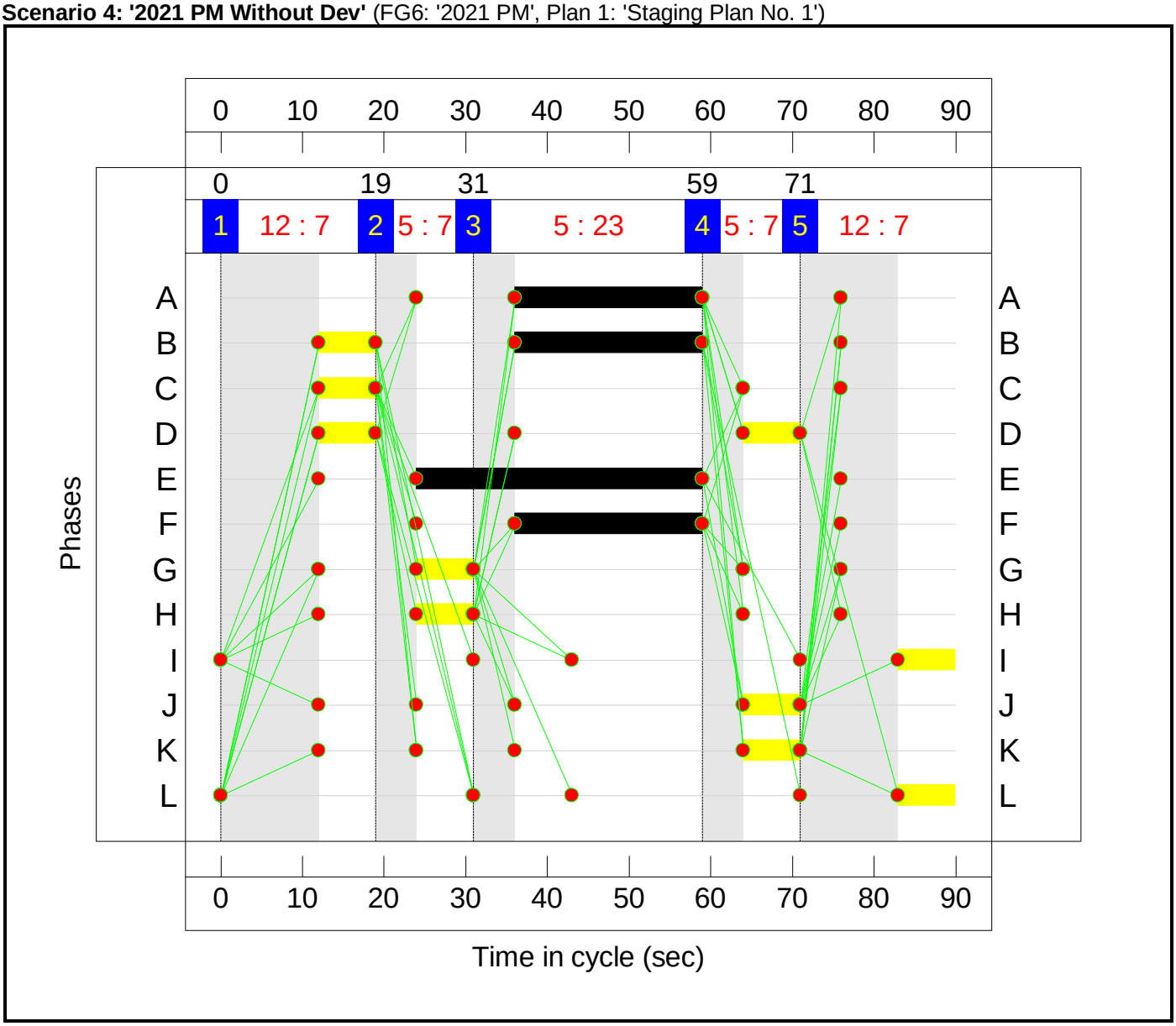
Basic Results Summary

Scenario 3: '2021 AM Without Dev' (FG5: '2021 AM', Plan 1: 'Staging Plan No. 1')



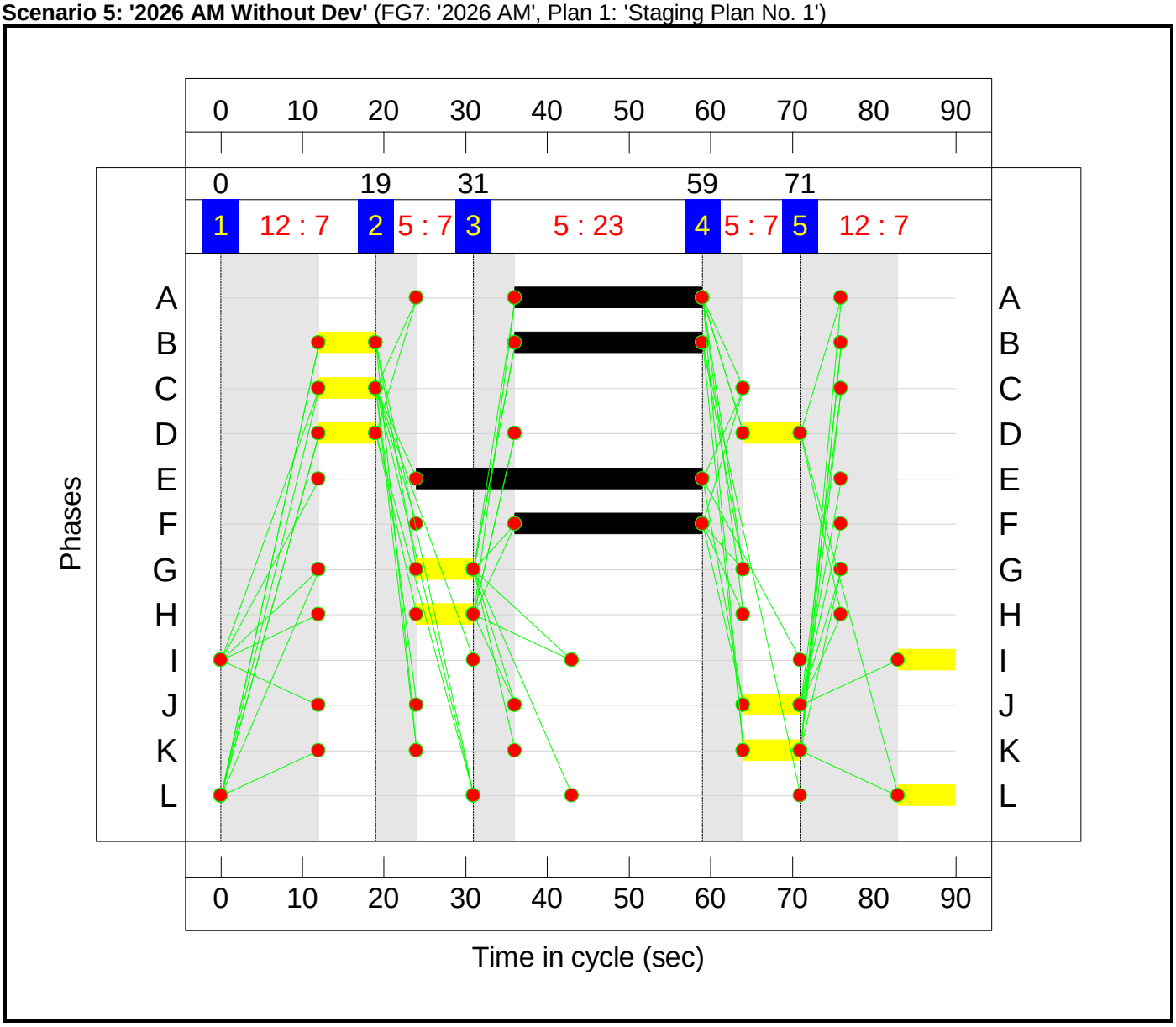
Basic Results Summary

Scenario 4: '2021 PM Without Dev' (FG6: '2021 PM', Plan 1: 'Staging Plan No. 1')



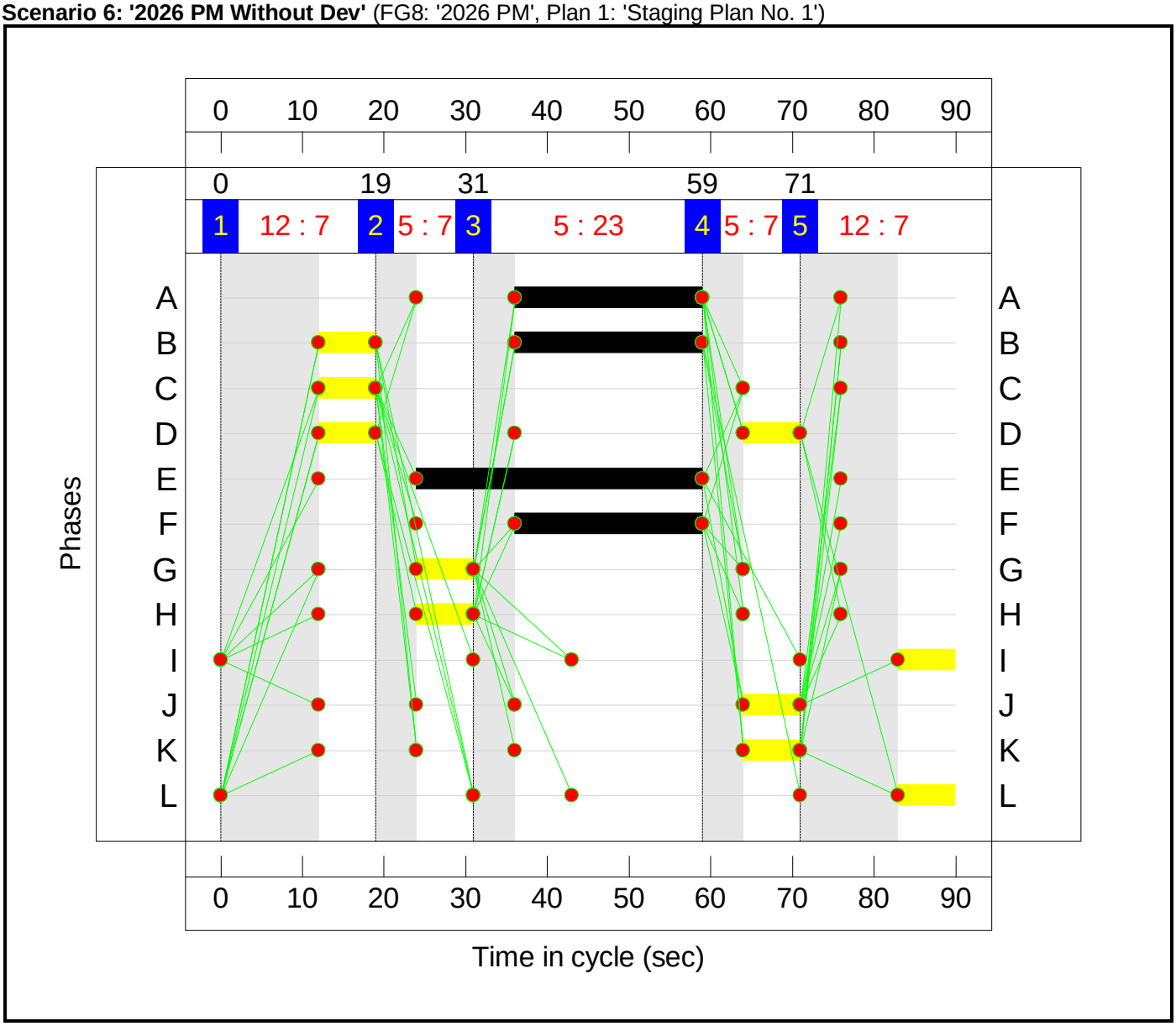
Basic Results Summary

Scenario 5: '2026 AM Without Dev' (FG7: '2026 AM', Plan 1: 'Staging Plan No. 1')



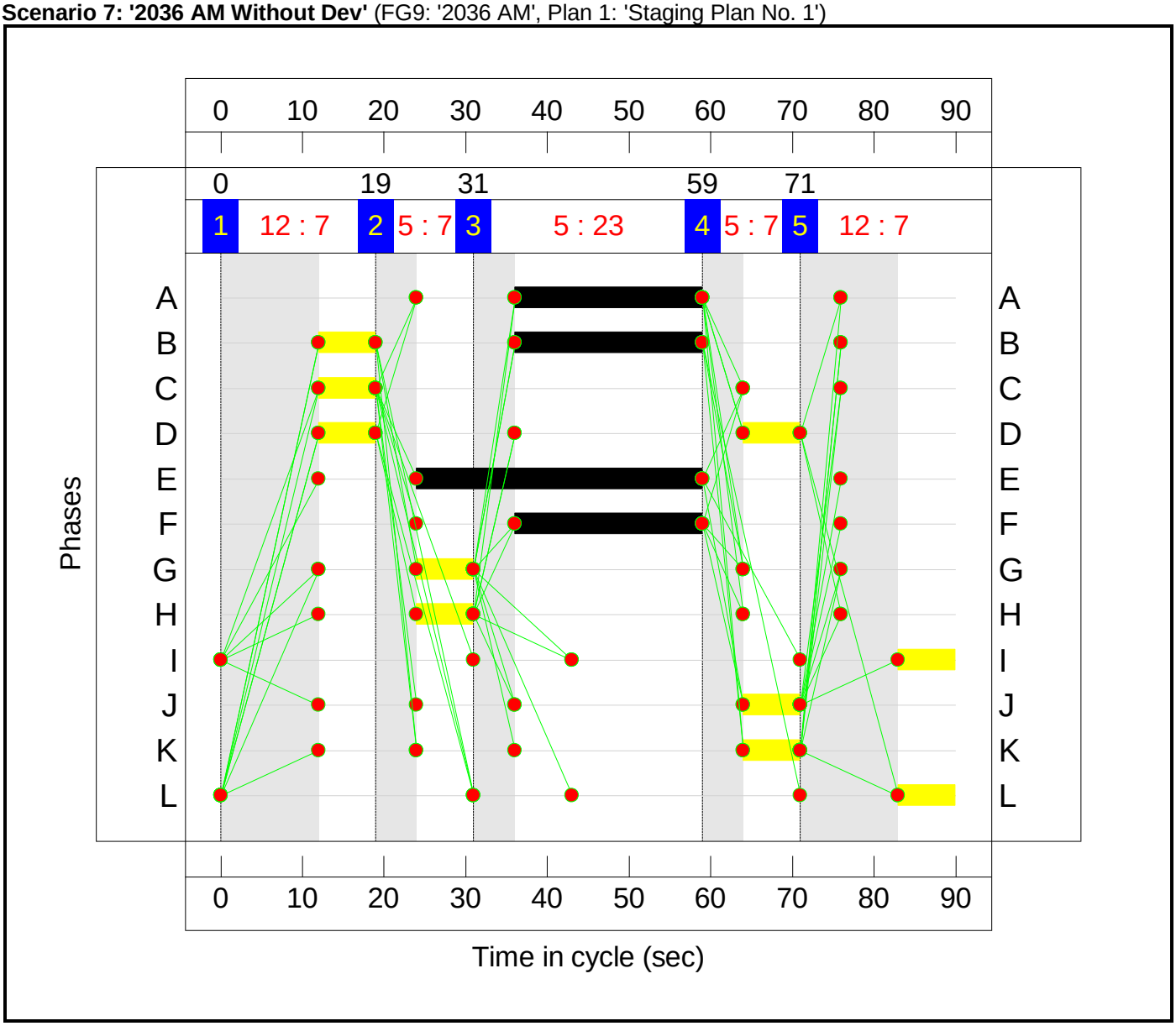
Basic Results Summary

Scenario 6: '2026 PM Without Dev' (FG8: '2026 PM', Plan 1: 'Staging Plan No. 1')



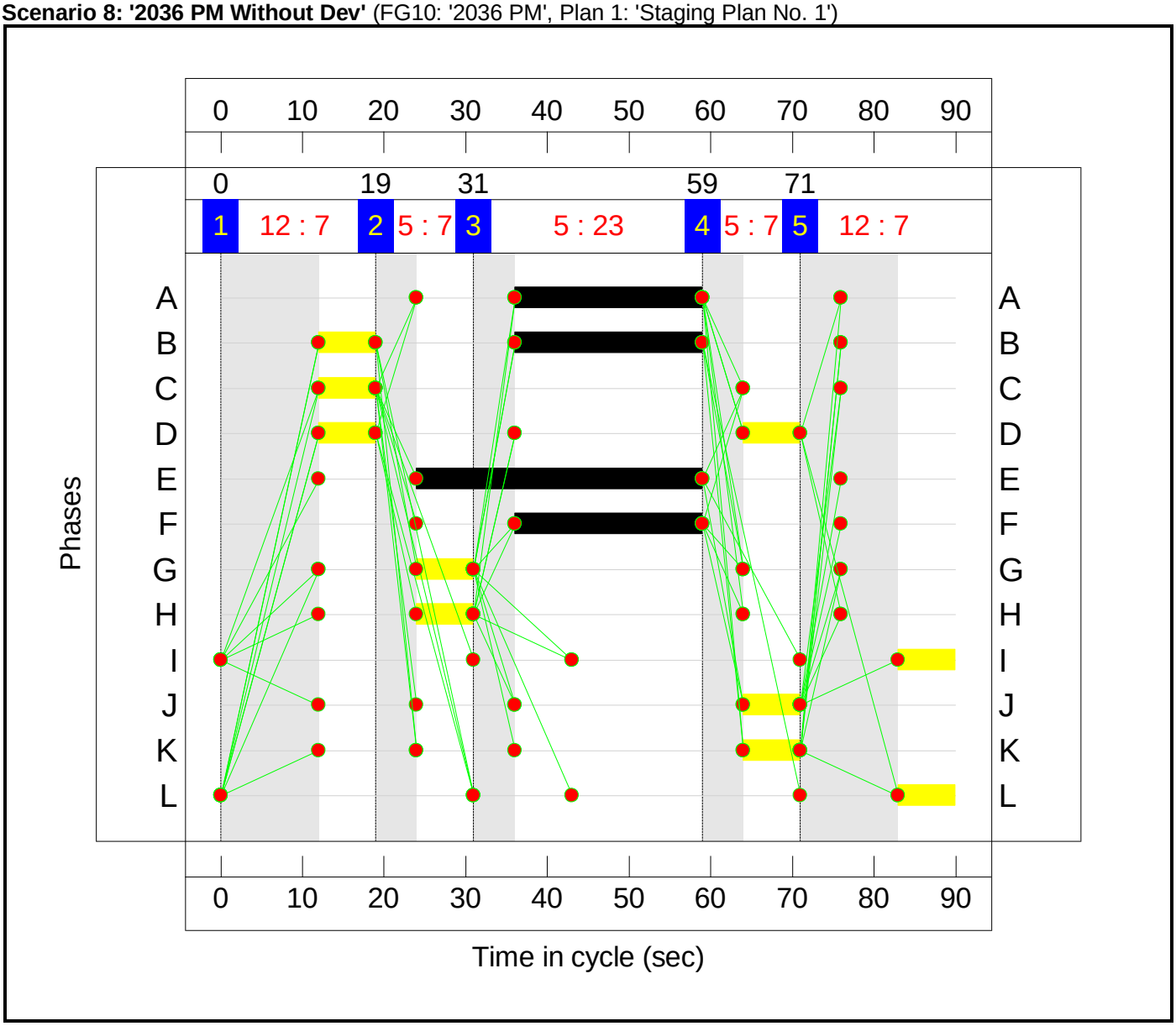
Basic Results Summary

Scenario 7: '2036 AM Without Dev' (FG9: '2036 AM', Plan 1: 'Staging Plan No. 1')



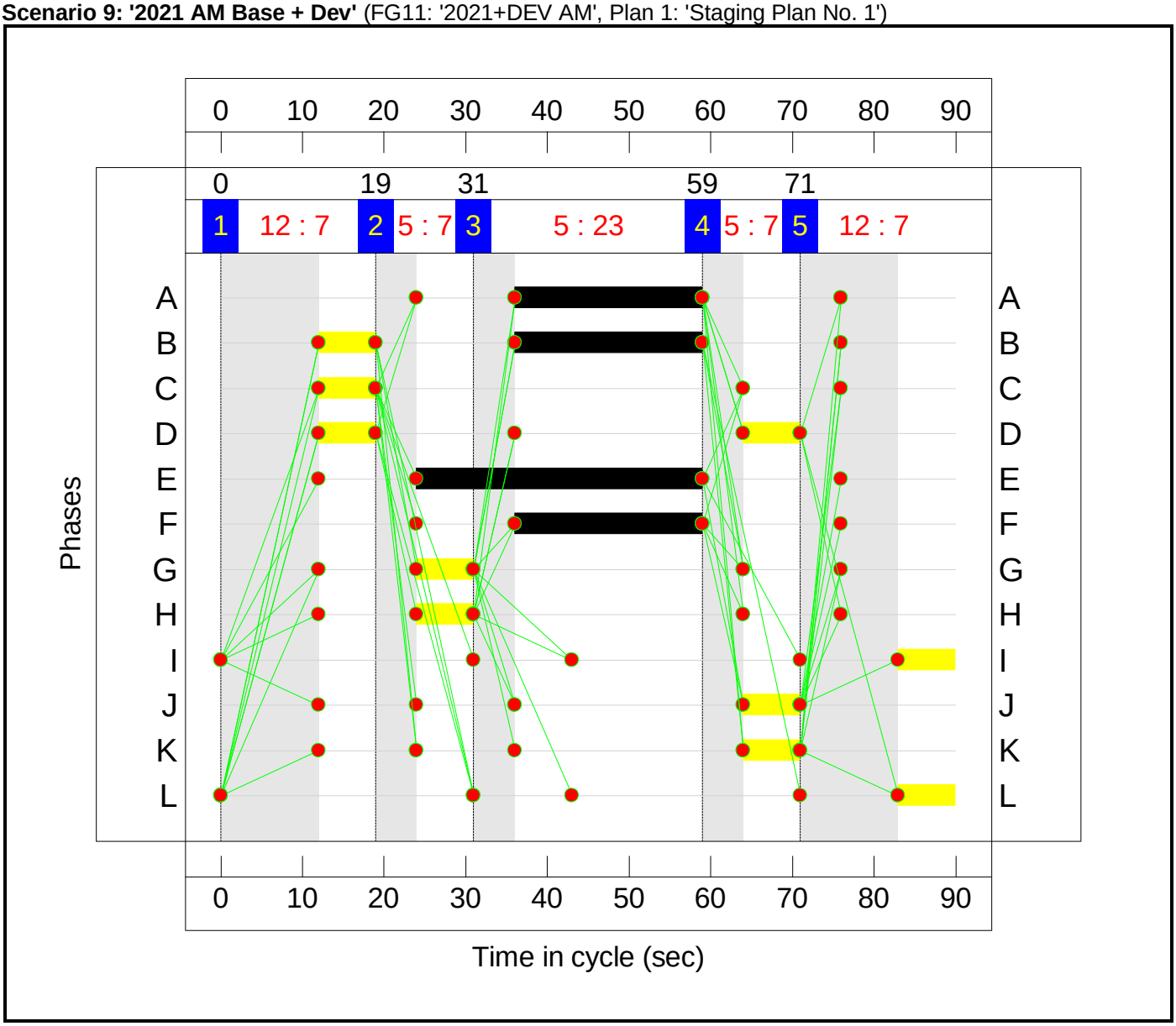
Basic Results Summary

Scenario 8: '2036 PM Without Dev' (FG10: '2036 PM', Plan 1: 'Staging Plan No. 1')



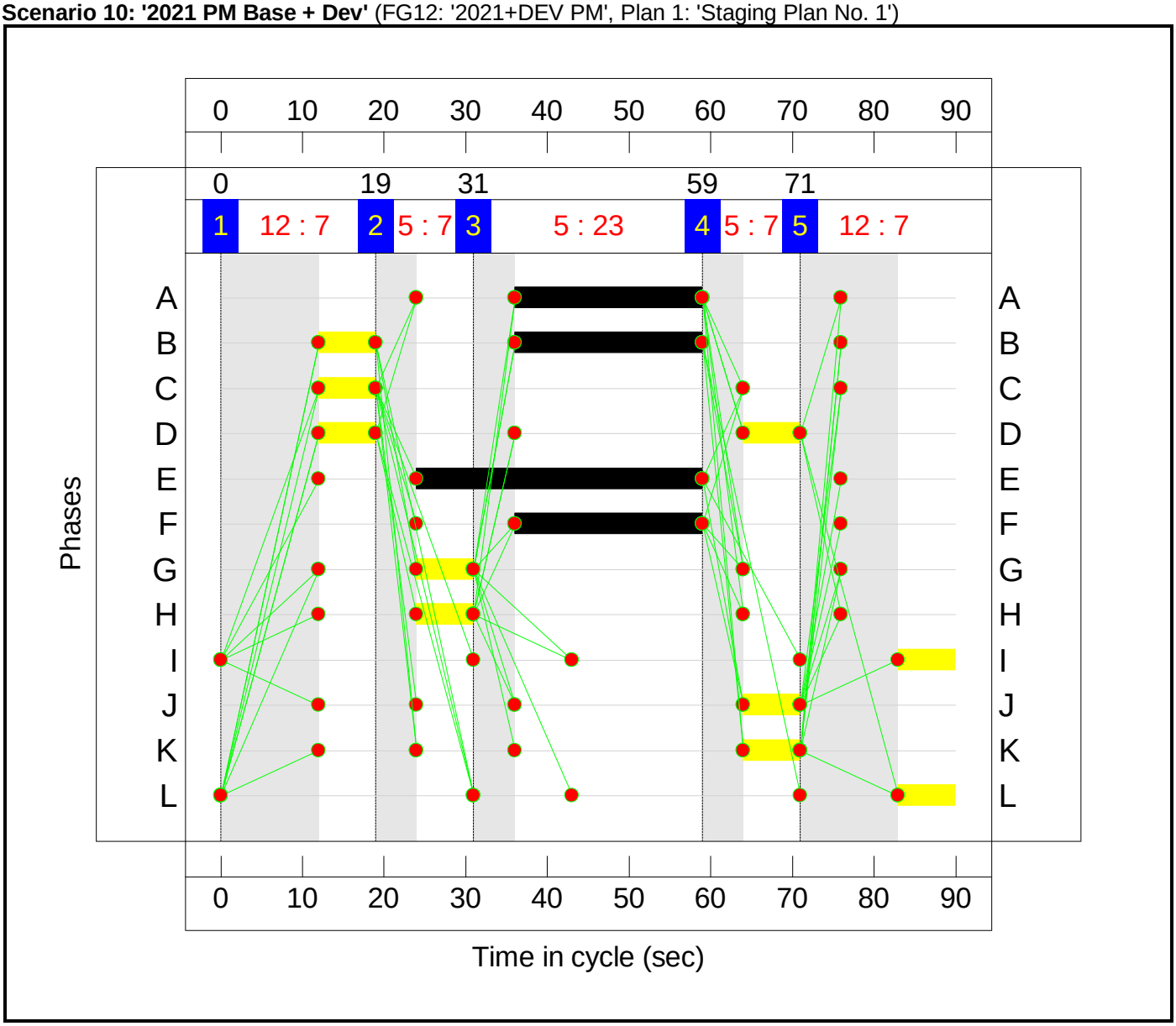
Basic Results Summary

Scenario 9: '2021 AM Base + Dev' (FG11: '2021+DEV AM', Plan 1: 'Staging Plan No. 1')



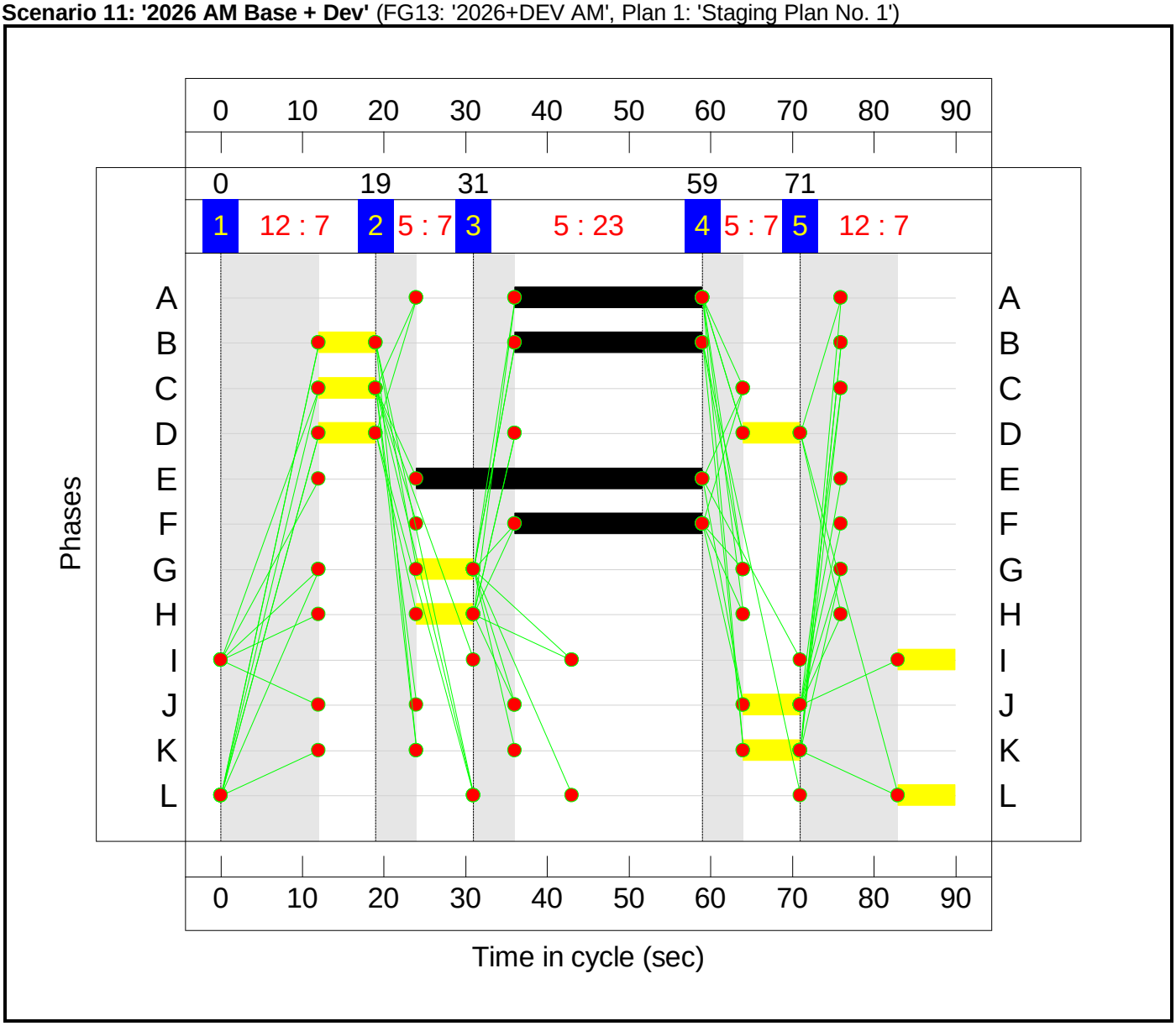
Basic Results Summary

Scenario 10: '2021 PM Base + Dev' (FG12: '2021+DEV PM', Plan 1: 'Staging Plan No. 1')



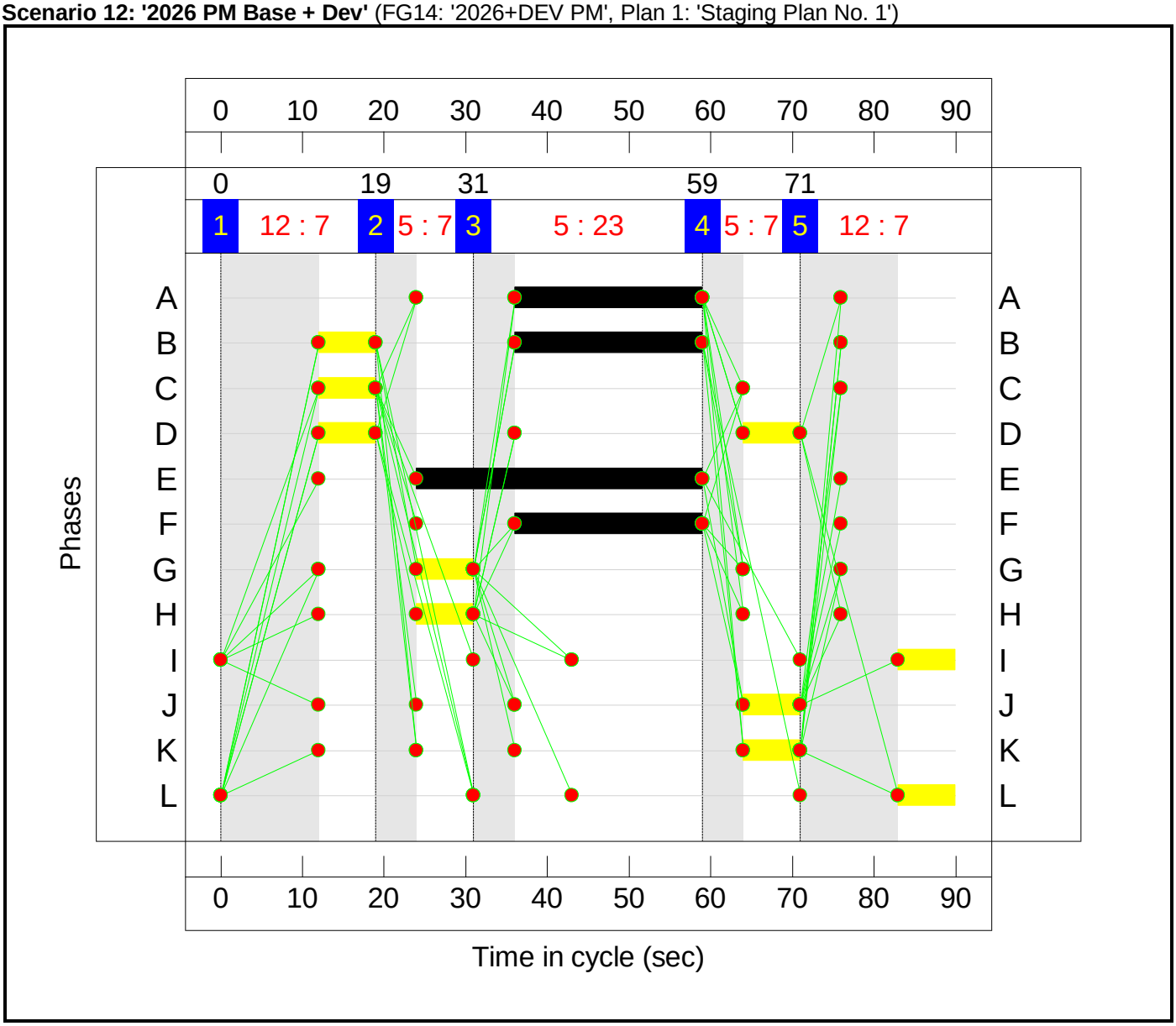
Basic Results Summary

Scenario 11: '2026 AM Base + Dev' (FG13: '2026+DEV AM', Plan 1: 'Staging Plan No. 1')



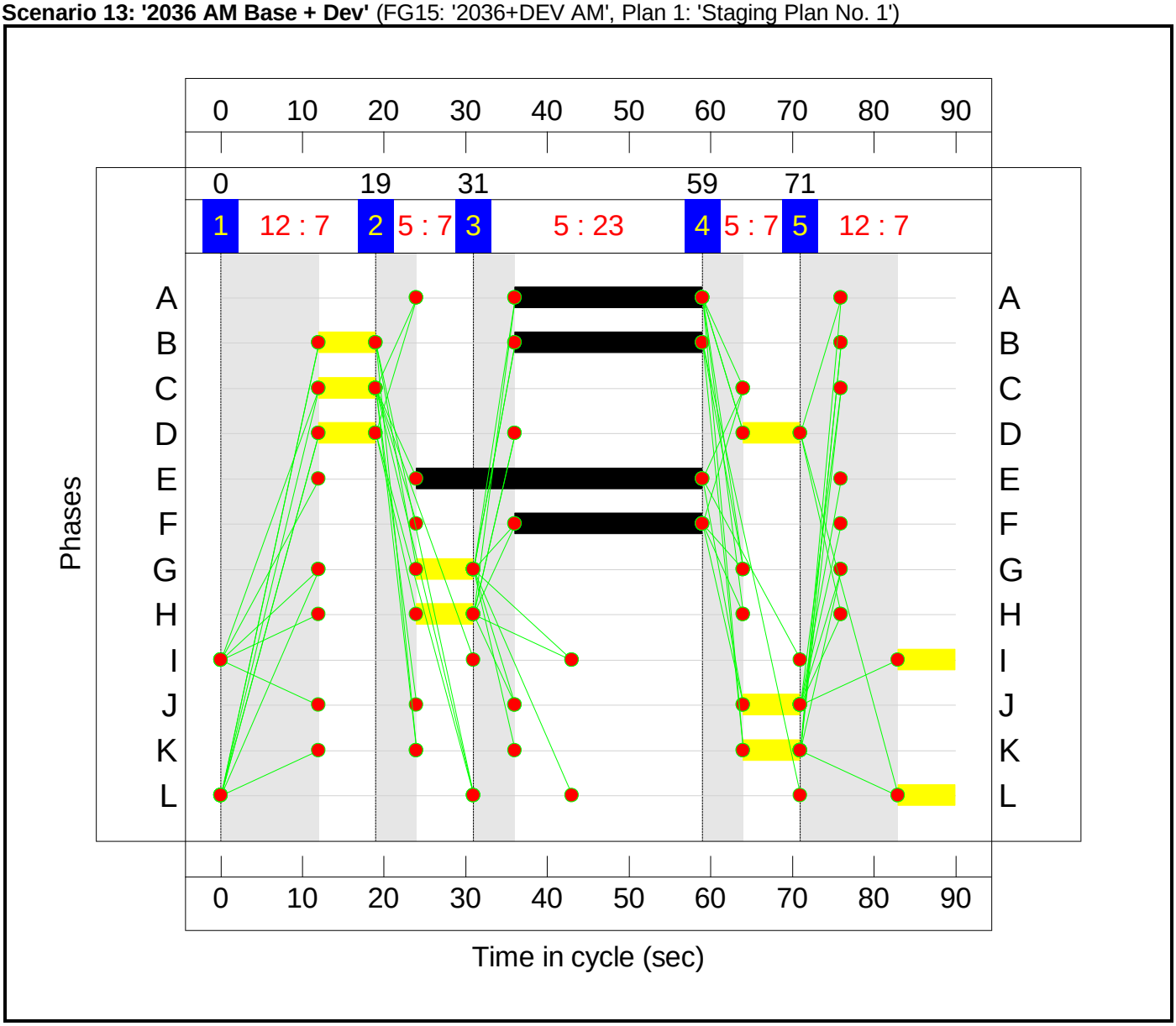
Basic Results Summary

Scenario 12: '2026 PM Base + Dev' (FG14: '2026+DEV PM', Plan 1: 'Staging Plan No. 1')



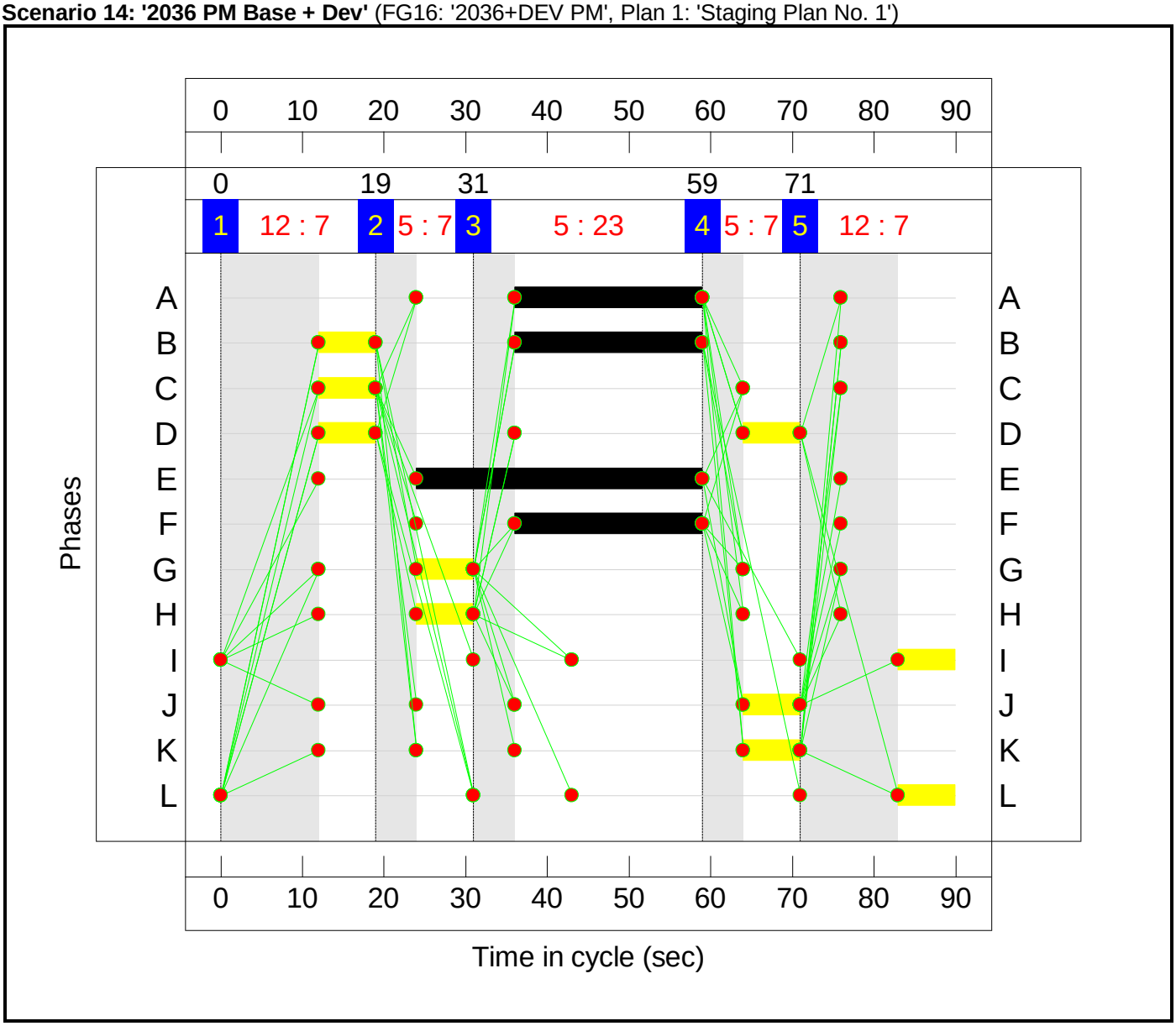
Basic Results Summary

Scenario 13: '2036 AM Base + Dev' (FG15: '2036+DEV AM', Plan 1: 'Staging Plan No. 1')



Basic Results Summary

Scenario 14: '2036 PM Base + Dev' (FG16: '2036+DEV PM', Plan 1: 'Staging Plan No. 1')



Appendix E Junction 9 Analysis

Junctions 9

PICADY 9 - Priority Intersection Module

Version: 9.0.1.4646 []

For sales and distribution information, program advice and maintenance, contact TRL:
Tel: +44 (0)1344 770758 email: software@trl.co.uk Web: http://www.trlsoftware.co.uk

Filename: Site Access and Northern Junction06.04.j9
Path: \\eu.aecomnet.com\emia\UKI\IEDBL2\Jobs\PR-224738_Palmerstown,_Monti\400_Technical\470_Traffic\2019 Submission\Junction Modelling
Report generation date: 10/04/2020 12:39:20

Summary of junction performance

	AM		PM	
	Queue (PCU)	RFC	Queue (PCU)	RFC
	2017			
Junction 1 - Stream B-AC	0.0	0.00	0.0	0.02
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	2.1	0.68	1.0	0.49
Junction 2 - Stream C-AB	0.2	0.17	0.5	0.29
Junction 3 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2021			
Junction 1 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	2.7	0.73	1.1	0.52
Junction 2 - Stream C-AB	0.3	0.18	0.5	0.32
Junction 3 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2026			

Junction 1 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	3.7	0.79	1.4	0.57
Junction 2 - Stream C-AB	0.3	0.20	0.6	0.35
Junction 3 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2036			
Junction 1 - Stream B-AC	0.0	0.00	0.0	0.03
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	6.0	0.87	1.7	0.62
Junction 2 - Stream C-AB	0.3	0.22	0.7	0.38
Junction 3 - Stream B-AC	0.0	0.00	0.0	0.04
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2021 Base + Dev			
Junction 1 - Stream B-AC	0.1	0.07	0.1	0.07
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	4.5	0.83	1.6	0.61
Junction 2 - Stream C-AB	0.3	0.20	0.6	0.34
Junction 3 - Stream B-AC	0.1	0.07	0.1	0.07
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2026 Base + Dev			
Junction 1 - Stream B-AC	0.1	0.07	0.1	0.07
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	7.0	0.89	2.0	0.66
Junction 2 - Stream C-AB	0.4	0.22	0.7	0.37
Junction 3 - Stream B-AC	0.1	0.07	0.1	0.07
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00
	2036 Base + Dev			
Junction 1 - Stream B-AC	0.1	0.07	0.1	0.07
Junction 1 - Stream C-AB	0.0	0.00	0.0	0.00
Junction 2 - Stream B-AC	13.3	0.97	2.6	0.72
Junction 2 - Stream C-AB	0.4	0.24	0.8	0.40
Junction 3 - Stream B-AC	0.1	0.07	0.1	0.08
Junction 3 - Stream C-AB	0.0	0.00	0.0	0.00

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	(untitled)
Location	
Site number	
Date	15/01/2018
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	EU\manniona
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D1	2017	AM	ONE HOUR	08:00	09:30	15	✓		
D2	2017	PM	ONE HOUR	17:00	18:30	15	✓		
D3	2021	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.06639
D4	2021	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.06639
D5	2026	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.1556
D6	2026	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.1556
D7	2036	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.2581
D8	2036	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.2581
D9	Dev Flows	AM	ONE HOUR	08:00	09:30	15			
D10	Dev Flows	PM	ONE HOUR	17:00	18:30	15			
D11	2021 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D3+D9
D12	2021 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D4+D10
D13	2026 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D5+D9
D14	2026 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D6+D10
D15	2036 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D7+D9
D16	2036 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D8+D10

Analysis Set Details

ID	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A1	✓	100.000	100.000

2017, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.00	A
2	untitled	T-Junction	Two-way	14.01	B
3	untitled	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Junction	Arm	Name	Description	Arm type
1	A	untitled		Major
	B	untitled		Minor
	C	untitled		Major
2	A	untitled		Major
	B	untitled		Minor
	C	untitled		Major
3	A	untitled		Major
	B	untitled		Minor
	C	untitled		Major

Major Arm Geometry

Junction	Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
1	C	9.20			42.0	✓	0.00
2	C	7.00			80.0	✓	0.00
3	C	7.00			49.0	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Junction	Arm	Minor arm type	Lane width (m)	Visibility to left (m)	Visibility to right (m)
1	B	One lane	3.50	130	23
2	B	One lane	3.33	80	80
3	B	One lane	2.75	49	49

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
2	B-A	562	0.098	0.247	0.156	0.353
2	B-C	697	0.102	0.258	-	-
2	C-B	620	0.230	0.230	-	-

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	557	0.087	0.221	0.139	0.316

1	B-C	670	0.088	0.224	-	-
1	C-B	598	0.200	0.200	-	-

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
3	B-A	505	0.088	0.222	0.140	0.318
3	B-C	638	0.094	0.237	-	-
3	C-B	602	0.223	0.223	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2017	AM	ONE HOUR	08:00	09:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	**A**		ONE HOUR	✓	361	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	123	100.000
2	**A**		ONE HOUR	✓	23	100.000
	B		ONE HOUR	✓	356	100.000
	C		ONE HOUR	✓	186	100.000
3	**A**		ONE HOUR	✓	361	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	123	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	**B**	**C**
From	**A**	0	8	15
	B	191	0	165
	C	97	89	0

Demand (PCU/hr)

Junction 1

		To		
		A	**B**	**C**
From	**A**	0	4	357
	B	0	0	0
	C	123	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	4	357
	B	0	0	0
	C	123	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					113	169
	A-B					4	6
	A-C					328	491
2	B-AC	0.68	20.30	2.1	C	327	490
	C-AB	0.17	6.65	0.2	A	95	142
	C-A					76	114
	A-B					7	11
	A-C					14	21
3	B-AC	0.00	0.00	0.0	A	0	0

	C-AB	0.00	0.00	0.0	A	0	0
	C-A					113	169
	A-B					4	6
	A-C					328	491

2017, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.16	A
2	untitled	T-Junction	Two-way	7.88	A
3	untitled	T-Junction	Two-way	0.18	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2017	PM	ONE HOUR	17:00	18:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	**A**		ONE HOUR	✓	279	100.000
	B		ONE HOUR	✓	10	100.000
	C		ONE HOUR	✓	237	100.000
2	**A**		ONE HOUR	✓	110	100.000
	B		ONE HOUR	✓	270	100.000
	C		ONE HOUR	✓	210	100.000
3	**A**		ONE HOUR	✓	279	100.000
	B		ONE HOUR	✓	10	100.000
	C		ONE HOUR	✓	237	100.000

Origin-Destination Data

Junction 2

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	93	17
	B	71	0	199
	C	57	153	0

Junction 1

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	9	270
	B	9	0	1
	C	237	0	0

Junction 3

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	9	270
	B	9	0	1
	C	237	0	0

Vehicle Mix

Junction 2

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Junction 1

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Junction 3

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	5	5	5
	B	5	5	5
	C	5	5	5

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.02	8.31	0.0	A	9	14
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					217	326
	A-B					8	12
	A-C					248	372
2	B-AC	0.49	11.99	1.0	B	248	372
	C-AB	0.29	8.45	0.5	A	154	230
	C-A					39	59
	A-B					85	128
	A-C					16	23
3	B-AC	0.03	9.39	0.0	A	9	14
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					217	326
	A-B					8	12
	A-C					248	372

2021, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.00	A
2	untitled	T-Junction	Two-way	16.31	C
3	untitled	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship

D3	2021	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.06639

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	385	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	131	100.000
2	A		ONE HOUR	✓	25	100.000
	B		ONE HOUR	✓	380	100.000
	C		ONE HOUR	✓	198	100.000
3	A		ONE HOUR	✓	385	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	131	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	9	16
	B	204	0	176
	C	103	95	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	4	381
	B	0	0	0
	C	131	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	4	381
	B	0	0	0
	C	131	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					120	181
	A-B					4	6
	A-C					349	524
2	B-AC	0.73	23.93	2.7	C	348	523
	C-AB	0.18	6.71	0.3	A	102	153
	C-A					80	120
	A-B					8	12
	A-C					15	22
3	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					120	181
	A-B					4	6
	A-C					349	524

2021, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.16	A
2	untitled	T-Junction	Two-way	8.40	A
3	untitled	T-Junction	Two-way	0.18	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D4	2021	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.06639

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	298	100.000
	B		ONE HOUR	✓	11	100.000
	C		ONE HOUR	✓	253	100.000
2	A		ONE HOUR	✓	117	100.000
	B		ONE HOUR	✓	288	100.000
	C		ONE HOUR	✓	224	100.000
3	A		ONE HOUR	✓	298	100.000
	B		ONE HOUR	✓	11	100.000
	C		ONE HOUR	✓	253	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	99	18
	B	76	0	212
	C	61	163	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	10	288
	B	10	0	1
	C	253	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	10	288
	B	10	0	1
	C	253	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.03	8.44	0.0	A	10	15
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					232	348
	A-B					9	13

	A-C					264	396
2	B-AC	0.52	12.92	1.1	B	264	396
	C-AB	0.32	8.70	0.5	A	165	247
	C-A					41	61
	A-B					91	137
	A-C					17	25
3	B-AC	0.03	9.57	0.0	A	10	15
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					232	348
	A-B					9	13
	A-C					264	396

2026, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.00	A
2	untitled	T-Junction	Two-way	20.97	C
3	untitled	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D5	2026	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.1556

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	417	100.000
	B		ONE HOUR	✓	0	100.000

	C		ONE HOUR	✓	142	100.000
2	A		ONE HOUR	✓	27	100.000
	B		ONE HOUR	✓	411	100.000
	C		ONE HOUR	✓	215	100.000
3	A		ONE HOUR	✓	417	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	142	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	9	17
	B	221	0	191
	C	112	103	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	5	413
	B	0	0	0
	C	142	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	5	413
	B	0	0	0
	C	142	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					130	196
	A-B					4	6
	A-C					379	568
2	B-AC	0.79	31.28	3.7	D	378	566
	C-AB	0.20	6.79	0.3	A	112	168
	C-A					86	128
	A-B					8	13
	A-C					16	24
3	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					130	196
	A-B					4	6
	A-C					379	568

2026, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.16	A
2	untitled	T-Junction	Two-way	9.21	A
3	untitled	T-Junction	Two-way	0.19	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D6	2026	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.1556

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	322	100.000
	B		ONE HOUR	✓	12	100.000
	C		ONE HOUR	✓	274	100.000
2	A		ONE HOUR	✓	127	100.000
	B		ONE HOUR	✓	312	100.000
	C		ONE HOUR	✓	243	100.000
3	A		ONE HOUR	✓	322	100.000
	B		ONE HOUR	✓	12	100.000
	C		ONE HOUR	✓	274	100.000

Origin-Destination Data

Junction 2

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	107	20
	B	82	0	230
	C	66	177	0

Junction 1

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	10	312
	B	10	0	1
	C	274	0	0

Junction 3

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	10	312
	B	10	0	1
	C	274	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.03	8.64	0.0	A	11	16
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					251	377
	A-B					10	14
	A-C					286	429
2	B-AC	0.57	14.43	1.4	B	286	429
	C-AB	0.35	9.07	0.6	A	180	270
	C-A					43	64
	A-B					99	148
	A-C					18	27
3	B-AC	0.03	9.83	0.0	A	11	16
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					251	377
	A-B					10	14
	A-C					286	429

2036, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.00	A
2	untitled	T-Junction	Two-way	30.73	D
3	untitled	T-Junction	Two-way	0.00	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D7	2036	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D1*1.2581

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	454	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	155	100.000
2	A		ONE HOUR	✓	29	100.000
	B		ONE HOUR	✓	448	100.000
	C		ONE HOUR	✓	234	100.000
3	A		ONE HOUR	✓	454	100.000
	B		ONE HOUR	✓	0	100.000
	C		ONE HOUR	✓	155	100.000

Origin-Destination Data

Junction 2

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	10	19
	B	240	0	208
	C	122	112	0

Junction 1

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	5	449
	B	0	0	0
	C	155	0	0

Junction 3

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	5	449
	B	0	0	0
	C	155	0	0

Vehicle Mix

Junction 2

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Junction 1

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Junction 3

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	0	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					142	213
	A-B					5	7
	A-C					412	618
2	B-AC	0.87	46.70	6.0	E	411	616
	C-AB	0.22	6.89	0.3	A	123	185
	C-A					91	137
	A-B					9	14
	A-C					17	26
3	B-AC	0.00	0.00	0.0	A	0	0
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					142	213
	A-B					5	7
	A-C					412	618

2036, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.17	A
2	untitled	T-Junction	Two-way	10.40	B
3	untitled	T-Junction	Two-way	0.19	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D8	2036	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D2*1.2581

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	351	100.000
	B		ONE HOUR	✓	13	100.000
	C		ONE HOUR	✓	298	100.000
2	A		ONE HOUR	✓	138	100.000
	B		ONE HOUR	✓	340	100.000
	C		ONE HOUR	✓	264	100.000
3	A		ONE HOUR	✓	351	100.000
	B		ONE HOUR	✓	13	100.000
	C		ONE HOUR	✓	298	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	117	21
	B	89	0	250
	C	72	192	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	11	340
	B	11	0	1
	C	298	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	11	340
	B	11	0	1
	C	298	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.03	8.87	0.0	A	12	17
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					274	410
	A-B					10	16
	A-C					312	468
2	B-AC	0.62	16.66	1.7	C	312	468
	C-AB	0.38	9.54	0.7	A	198	297
	C-A					45	67
	A-B					107	161
	A-C					20	29
3	B-AC	0.04	10.13	0.0	B	12	17
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					274	410
	A-B					10	16
	A-C					312	468

2021 Base + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.44	A
2	untitled	T-Junction	Two-way	24.60	C
3	untitled	T-Junction	Two-way	0.45	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D11	2021 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D3+D9

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	405	100.000
	B		ONE HOUR	✓	36	100.000
	C		ONE HOUR	✓	142	100.000
2	A		ONE HOUR	✓	25	100.000
	B		ONE HOUR	✓	424	100.000
	C		ONE HOUR	✓	221	100.000
3	A		ONE HOUR	✓	393	100.000
	B		ONE HOUR	✓	24	100.000
	C		ONE HOUR	✓	131	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	9	16
	B	240	0	184
	C	115	106	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	16	389
	B	0	0	36
	C	142	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	12	381
	B	24	0	0
	C	131	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	0	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.08	0.1	A	33	50
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					130	196
	A-B					15	22
	A-C					357	535
2	B-AC	0.83	36.85	4.5	E	389	583
	C-AB	0.20	6.81	0.3	A	116	173
	C-A					88	131
	A-B					8	12
	A-C					15	22
3	B-AC	0.07	10.39	0.1	B	22	33
	C-AB	0.00	0.00	0.0	A	0	0

	C-A					120	181
	A-B					11	17
	A-C					349	524

2021 Base + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.37	A
2	untitled	T-Junction	Two-way	10.32	B
3	untitled	T-Junction	Two-way	0.42	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D12	2021 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D4+D10

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	361	100.000
	B		ONE HOUR	✓	32	100.000
	C		ONE HOUR	✓	263	100.000
2	A		ONE HOUR	✓	117	100.000
	B		ONE HOUR	✓	334	100.000
	C		ONE HOUR	✓	238	100.000
3	A		ONE HOUR	✓	323	100.000
	B		ONE HOUR	✓	25	100.000
	C		ONE HOUR	✓	253	100.000

Origin-Destination Data

Junction 2

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	99	18
	B	97	0	237
	C	65	173	0

Junction 1

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	48	313
	B	10	0	22
	C	263	0	0

Junction 3

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	35	288
	B	24	0	1
	C	253	0	0

Vehicle Mix

Junction 2

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Junction 1

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Junction 3

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.60	0.1	A	29	44
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					241	362
	A-B					44	66
	A-C					287	431
2	B-AC	0.61	16.18	1.6	C	306	460
	C-AB	0.34	8.92	0.6	A	176	264
	C-A					42	64
	A-B					91	137
	A-C					17	25
3	B-AC	0.07	10.22	0.1	B	23	34
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					232	348
	A-B					32	48
	A-C					264	396

2026 Base + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.41	A
2	untitled	T-Junction	Two-way	35.57	E
3	untitled	T-Junction	Two-way	0.43	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship

D13	2026 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D5+D9

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	437	100.000
	B		ONE HOUR	✓	36	100.000
	C		ONE HOUR	✓	153	100.000
2	A		ONE HOUR	✓	27	100.000
	B		ONE HOUR	✓	455	100.000
	C		ONE HOUR	✓	238	100.000
3	A		ONE HOUR	✓	425	100.000
	B		ONE HOUR	✓	24	100.000
	C		ONE HOUR	✓	142	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	9	17
	B	257	0	199
	C	124	114	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	17	421
	B	0	0	36
	C	153	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	13	413
	B	24	0	0
	C	142	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	0	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.19	0.1	A	33	50
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					141	211
	A-B					15	23
	A-C					386	579
2	B-AC	0.89	54.15	7.0	F	418	627
	C-AB	0.22	6.90	0.4	A	126	189
	C-A					92	139
	A-B					8	13
	A-C					16	24
3	B-AC	0.07	10.67	0.1	B	22	33
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					130	196
	A-B					12	17
	A-C					379	568

2026 Base + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.36	A
2	untitled	T-Junction	Two-way	11.59	B
3	untitled	T-Junction	Two-way	0.41	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D14	2026 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D6+D10

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	385	100.000
	B		ONE HOUR	✓	33	100.000
	C		ONE HOUR	✓	284	100.000
2	A		ONE HOUR	✓	127	100.000
	B		ONE HOUR	✓	358	100.000
	C		ONE HOUR	✓	257	100.000
3	A		ONE HOUR	✓	347	100.000
	B		ONE HOUR	✓	26	100.000
	C		ONE HOUR	✓	274	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	107	20
	B	103	0	255
	C	70	187	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	48	337
	B	10	0	22
	C	284	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	35	312
	B	24	0	1
	C	274	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.77	0.1	A	30	45
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					260	391
	A-B					44	67

	A-C					309	464
2	B-AC	0.66	18.59	2.0	C	329	493
	C-AB	0.37	9.32	0.7	A	191	287
	C-A					44	66
	A-B					99	148
	A-C					18	27
3	B-AC	0.07	10.50	0.1	B	23	35
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					251	377
	A-B					32	49
	A-C					286	429

2036 Base + Dev, AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.39	A
2	untitled	T-Junction	Two-way	60.06	F
3	untitled	T-Junction	Two-way	0.41	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D15	2036 Base + Dev	AM	ONE HOUR	08:00	09:30	15	✓	Simple	D7+D9

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	474	100.000
	B		ONE HOUR	✓	36	100.000

	C		ONE HOUR	✓	166	100.000
2	A		ONE HOUR	✓	29	100.000
	B		ONE HOUR	✓	492	100.000
	C		ONE HOUR	✓	257	100.000
3	A		ONE HOUR	✓	462	100.000
	B		ONE HOUR	✓	24	100.000
	C		ONE HOUR	✓	155	100.000

Origin-Destination Data

Demand (PCU/hr)

Junction 2

		To		
		A	B	C
From	A	0	10	19
	B	276	0	216
	C	134	123	0

Demand (PCU/hr)

Junction 1

		To		
		A	B	C
From	A	0	17	457
	B	0	0	36
	C	166	0	0

Demand (PCU/hr)

Junction 3

		To		
		A	B	C
From	A	0	13	449
	B	24	0	0
	C	155	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	0	0	5
	C	5	0	0

Junction 3

Heavy Vehicle Percentages

		To		
		A	B	C
From	A	0	5	5
	B	5	0	0
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.32	0.1	A	33	50
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					152	228
	A-B					16	23
	A-C					419	629
2	B-AC	0.97	92.83	13.3	F	451	677
	C-AB	0.24	7.01	0.4	A	138	207
	C-A					98	147
	A-B					9	14
	A-C					17	26
3	B-AC	0.07	11.01	0.1	B	22	33
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					142	213
	A-B					12	18
	A-C					412	618

2036 Base + Dev, PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Demand Set Relationship	D11 - 2021 Base + Dev, AM	Demand Set relationships are chained. This may slow down the file.

Junction Network

Junctions

Junction	Name	Junction Type	Major road direction	Junction Delay (s)	Junction LOS
1	untitled	T-Junction	Two-way	0.35	A
2	untitled	T-Junction	Two-way	13.56	B
3	untitled	T-Junction	Two-way	0.41	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically	Relationship type	Relationship
D16	2036 Base + Dev	PM	ONE HOUR	17:00	18:30	15	✓	Simple	D8+D10

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Junction	Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1	A		ONE HOUR	✓	414	100.000
	B		ONE HOUR	✓	34	100.000
	C		ONE HOUR	✓	308	100.000
2	A		ONE HOUR	✓	138	100.000
	B		ONE HOUR	✓	386	100.000
	C		ONE HOUR	✓	278	100.000
3	A		ONE HOUR	✓	376	100.000
	B		ONE HOUR	✓	27	100.000
	C		ONE HOUR	✓	298	100.000

Origin-Destination Data

Junction 2

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	117	21
	B	110	0	275
	C	76	202	0

Junction 1

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	49	365
	B	11	0	22
	C	308	0	0

Junction 3

Demand (PCU/hr)

		To		
		A	B	C
From	A	0	36	340
	B	25	0	1
	C	298	0	0

Vehicle Mix

Heavy Vehicle Percentages

Junction 2

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	5	0

Heavy Vehicle Percentages

Junction 1

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Heavy Vehicle Percentages

Junction 3

		To		
		A	B	C
From	A	0	5	5
	B	5	0	5
	C	5	0	0

Results

Results Summary for whole modelled period

Junction	Stream	Max RFC	Max delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
1	B-AC	0.07	7.99	0.1	A	31	46
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					283	424
	A-B					45	68
	A-C					335	502
2	B-AC	0.72	22.40	2.6	C	354	531
	C-AB	0.40	9.83	0.8	A	209	314
	C-A					46	69
	A-B					107	161
	A-C					20	29
3	B-AC	0.08	10.84	0.1	B	24	37
	C-AB	0.00	0.00	0.0	A	0	0
	C-A					274	410
	A-B					33	50
	A-C					312	468