ARUP

Teesworks

Steel House Park and Ride

Transport Assessment

Reference: 001

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1. Introduction

1.1 Introduction

Arup has been commissioned by Teesworks to develop a Transport Assessment (TA) in support of a planning application for the development of a Park and Ride (P&R) facility on the Steel House site, within Teesworks in the Borough of Redcar and Cleveland. The Steel House site is located in the north-east extent of Teesworks, and is currently occupied by the vacant Steel House office complex and its surrounding infrastructure.

The P&R facility is required to be in place by 2024 to support construction of the Net Zero Teesside (NZT) Project within the Teesworks site. The NZT Project comprises a number of elements, including a new gas fired power station, with carbon capture technology.

The proposed P&R facility will provide 1,500 car park spaces and be accessed via a new junction on the A1085 Trunk Road, to the east of the existing Teesworks entrance (the 'Redcar Gate'). A Development Consent Order (DCO) for the NZT Project was submitted in July 2021 which considered the P&R facility in the context of the NZT Project only. This TA will consider the full capacity of the P&R facility.

The site location is shown in Figure 1 and an indicative site plan is attached in Appendix A.

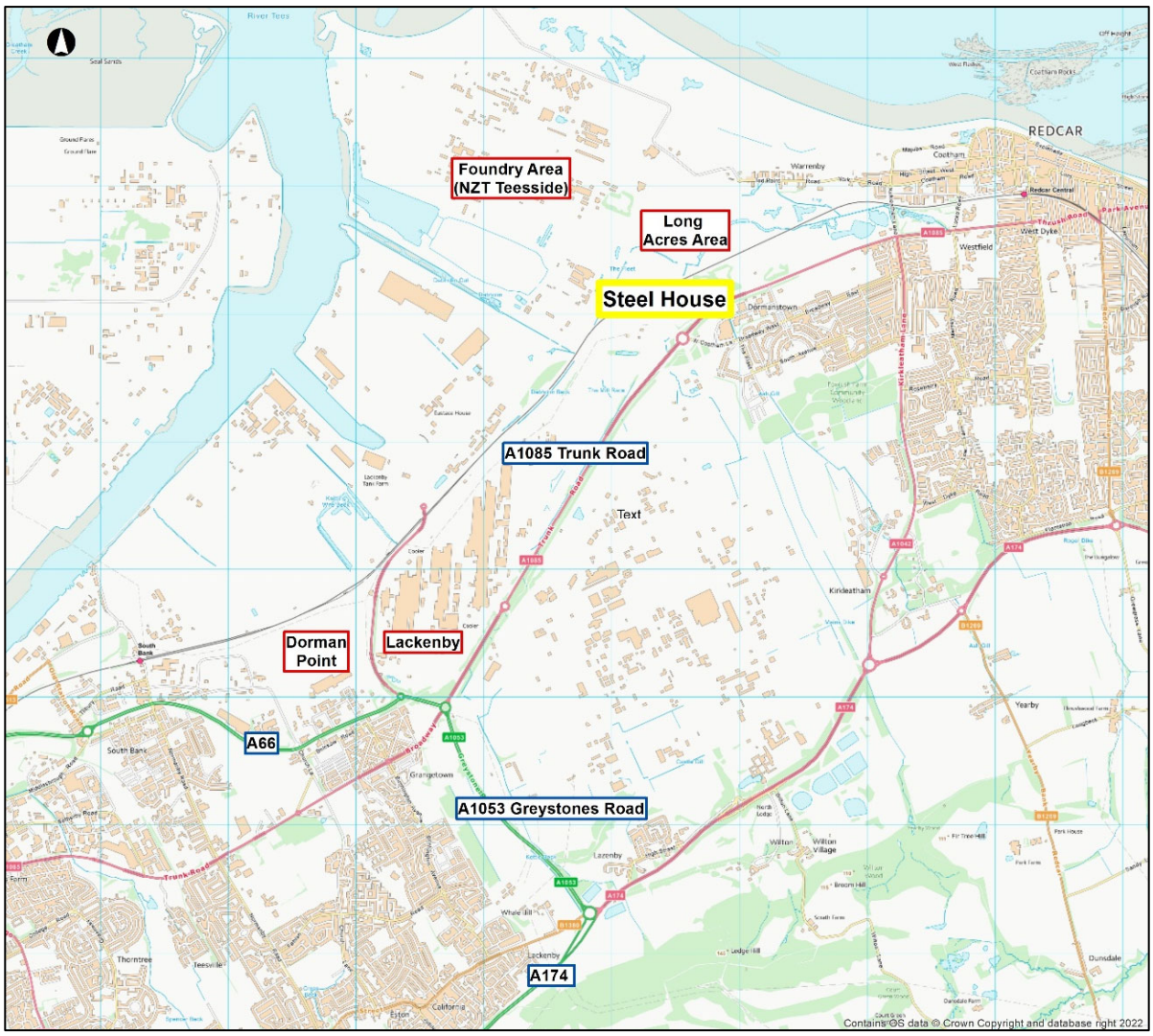


Figure 1: Location Plan

1.2 Relevant Planning History

Teesworks has been undergoing regeneration since the closure of the steelworks on the site in 2015 and a masterplan was adopted in November 2019. There have been a number of planning applications in recent years that have assessed the impact of the site proposals on the transport network, and rather than repeat the analysis, this document will refer to these assessments and previous conclusions that have been drawn. A brief overview of the planning applications is provided below.

1.2.1 South Bank Site (reference number R/2020/0357/OOM)

In 2020, Arup produced a TA for 418,000sqm of B2/B8 use on the South Bank site. Access to the site is primarily via a recently constructed roundabout on the western boundary of Teesworks, at the junction of Dockside Road and Smith's Dock Road. Work is currently on-going to build an offshore wind turbine factory on the site.

1.2.2 Dorman Point, Lackenby, Steel House, The Foundry and Long Acres

In 2021 five outline planning applications were submitted for development in Teesworks. These areas are identified in Figure 1 above, and are:

- Dorman Point – R/2020/0819/ESM
- Lackenby – R/2020/0820/ESM
- Foundry – R/2020/0821/ESM
- Long Acres – R/2020/0822/ESM
- Steel House - R/2020/0823/ESM

Arup produced a TA for each development which reviewed the highway network for the following scenarios:

- 2033 Base (operational assessment);
- 2033 Base + each development; and
- 2033 Base + all five proposed developments + South Bank development (cumulative assessment).

Having presented the results of the assessment, it was identified that highway mitigation would be required at the following locations to accommodate the proposed development:

- Greystones roundabout (A174 / A1053 Greystone Road);
- A1085 Trunk Road roundabout (A1053 Greystone Toad / A1085 Trunk Road); and
- Tees Dock Road roundabout (A66 / Tees Dock Road).

Indicative schemes for the junction improvements have been developed, and the Road Safety Audit process is ongoing. The improvement schemes, when delivered, are expected to be sufficient to accommodate at least 30% of the traffic forecast to be generated by the developments during the network peak hours (07:00 – 10:00 and 16:00 and 19:00). If traffic exceeds the 30% forecast, an additional assessment is required to demonstrate how the additional demand could be mitigated.

1.2.3 Net Zero Teesside (NZT)

NZT is a Carbon Capture, Utilisation and Storage (CCUS) project which aims to develop a network to enable the decarbonisation of a cluster of carbon-intensive businesses on Teesside by as early as 2030 and deliver the UK's first zero-carbon industrial cluster.

NZT will comprise a number of elements, including a new gas-fired power station, with state-of-the art carbon capture technology. Carbon dioxide (CO_2) from the power station, as well as from a cluster of local industries on Teesside, will be captured through a common CO_2 pipeline network and transported for secure storage at a suitable offshore geological site under the North Sea.

The NZT gas-fired power station is proposed to be constructed on land in the vicinity of the former Redcar Steelworks. Access to the NZT land will be via the Steel House roundabout (Redcar Gate).

AECOM prepared the TA for the NZT DCO[1] submission in 2021. During the peak of construction (expected to be 2024), the report forecasts that there could be 1,750 workers on the NZT project. Assuming an 80% car mode share, and a car occupancy rate of 2 people per vehicle, the TA forecasts 700 car trips per day (1,400 two-way flow). In addition, there is forecast to be 346 HGV two-way trips (173 in / out) per day during the peak of construction. The peak hours of movement are 06:00 – 07:00 and 18:00 – 19:00.

Peak hour junction assessments for the peak construction year of 2024 were undertaken at the following locations:

- A1085 Trunk Road / West Coatham Lane (Steel House Roundabout); and
- A1085 Trunk Toad / Greystones Road.

Greystones roundabout was scoped out of the assessment as the number of trips forecast to travel through the junction was less than 30 two-way movements

The modelling shows that both junctions would operate within capacity in 2024, with the development and known committed developments, without the need to undertake any off-site highway works.

A sensitivity test was subsequently undertaken by AECOM in June 2022 in response to a written question to the DCO. A technical note was prepared to assess a sensitivity test based upon revised assumptions from those used in the TA to validate the robustness of the original assessment. The sensitivity test assesses the scenarios of between 1,000 and 1,200 vehicles accessing the site (compared with the original assessment of 700 vehicles) and assumes the peak construction year is 2025 (compared with 2024 in the original assessment).

The sensitivity test concluded that whilst the capacity at each junction decreased due to the additional year of assessment, the level of impact from the construction traffic in both scenarios (1,000 and 1,200 trips) does not result in any additional capacity issues at the junction above those that would have occurred in the base, without development scenario.

[1] Net Zero Teeside – Environmental Statement, Volume III – Appendices, Appendix 16A: Transport Assessment, AECOM, August 2021

2. Planning Policy Context

2.1 Introduction

This section considers some of the national, regional and local transport policy context within which the development will be assessed.

2.2 National Policy

The National Planning Policy Framework (NPPF), updated in 2021, sets out the Government's planning policies for England and how these should be applied. It prepares a framework in which locally prepared plans for development could be produced.

A key message within the NPPF regarding transport is that development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe. As this document will demonstrate, the impact on the highway network will be outside the usual peaks, and therefore no significant residual impacts are expected.

Another national policy of consideration is the announcement in March 2021 of Teesside as a Freeport. The Teesside Freeport includes areas within the Teesworks site, and has implications on the accessibility of the site. The provision of a Park & Ride site, outside the Freeport zone, enables the site to manage arrivals and departures more efficiently, and prevent the potential for any queueing on the public highway network. Employees will use the car park before travelling into the Freeport zone by bus.

2.3 Regional Policy

The Tees Valley Combined Authority (TVCA) produced the Strategic Transport Plan (STP) for the region in 2020.

The Teesworks area is included in the STP as an area to be transformed into a hotbed of new industry and enterprise, which will help the regeneration of the area and will contribute to the delivery of sustainable, inclusive and cohesive communities.

The STP presents a package of transport improvements to transform the Tees Valley transport system and identifies the delivery of Teesworks as one of the key actions towards achieving this goal.

The Plan identifies the following two core principles for the Teesworks site:

- Use the regeneration opportunity to strengthen transport connections with Redcar town centre and other urban centres, to realise improved economic and community benefits; and
- Deliver efficient connectivity across the South Tees area through enhanced on-site transport infrastructure to realise optimal functionality.

The provision of a P&R site to support construction workers at the NZT Teesside Project meets the second core principle of optimising transport provisions on the site. The site will also include cycle parking, and provides a connection to Redcar British Steel railway station. Services at the station have been suspended since 2019 but it is expected that in the longer term, the station will be brought back into use and the provision of an access that better connects to the station, with the option to provide car parking for station uses, enhances accessibility to the site.

2.4 Local Policy

The Redcar and Cleveland Local Plan was adopted in May 2018 by Redcar and Cleveland Borough Council. The vision is that the Plan will ensure that by 2032 the needs and aspirations of local communities will be met through the delivery of sustainable development across the Borough. The Local Plan also stresses the existing transport connectivity of the Teesworks site, which has access to a deep-water port, excellent road and rail links and access to energy and utilities.

A Supplementary Planning Document (SPD) was also developed for the site in 2018 by the Council. One of the key objectives of the SPD is delivering efficient connectivity across the Teesworks area through making the best use of existing transport infrastructure, providing new and enhanced on-site transport infrastructure and creating an integrated and safe transport network, which takes account of the needs of a variety of users and includes sustainable travel measures.

With regards to transport infrastructure, Development Principle STDC5 states that the Council will, in partnership with the STDC (Teesworks) and transport operators, other stakeholders and developers, seek to improve and enhance the transport infrastructure serving the Teesworks area. The Council will not support development proposals that may adversely impact on the delivery of the Infrastructure Corridor, and will ensure that all new developments will be required to have access to adequate infrastructure to meet their transport requirements.

The SPD also identifies a list of transport infrastructure schemes that will be supported, subject to confirmation of the need for each project and the avoidance of unacceptable environmental or amenity impacts. The following are of relevance to the proposed development:

- The provision of a four-arm roundabout at South Bank, giving improved access from the A66, via Dockside Road.
- The provision of new collector and local roads, providing access across and between development zones;
- The establishment of new rail connectivity at South Bank Wharf;
- The redevelopment of South Bank Wharf to bring this important river frontage back into beneficial use; and
- The provision of new and enhanced footpath and cycleway network identified within the Transport Strategy.

The SPD states that the presence of the existing passenger railway running through the Teesworks area is a major attribute for development and a key opportunity for improving access to significant employment opportunities by public transport. The SPD supports enhancements to the South Bank station to meet the anticipated future travel demands of the development.

Also, the SPD specifies that the area wide Transport Strategy for the site will include new and enhanced footpath and cycleway networks enabling ease of movement across the industrial park by non-automated transport modes and development proposals that align with this strategy will be supported.

The SPD was followed by a South Tees Regeneration Master Plan in 2019. The STDC Master Plan stated that ease of access to the site by all travel modes will be an essential component of a successful regeneration, also stressing the need for the site to be equipped with adequate, modern infrastructure for efficiently handling freight imports and exports. As the site will result in an increase in number and change in patterns of trips in the area, the Master Plan stresses that it is vital to ensure effective and enhanced connectivity by road, rail and bus.

The Steel House site is located within the North East Industrial Zone of the Master Plan. The Master Plan refers to the highway access point for this area, which is proposed to be via the existing roundabout on the A1085 Trunk Road at Redcar Gate. The Park & Ride proposal does add an additional entrance into the site, but this is considered necessary following the announcement of the Teesside Freeport in 2021.

The Master Plan notes that consideration will be given to the impact on the local highway network of the planned major increases in traffic resulting from the development, so that junction capacities are not adversely impacted. This document provides the results of a junction assessment for the new access into the P&R facility.

3. Baseline Conditions

3.1 Site Description

The application site is located within the Teesworks area. The site extends to an area of approximately 14 hectares. The site is located to the east and north of the former Steel House car parks, and is free from built structures and currently mostly comprises a series of landscaping mounds, and a section of the A1085 (Trunk Road). It is approximately 2.5km to the west of Redcar town centre and 10km to the east of Middlesbrough town centre. The wider site is bounded by the A1085 Trunk Road to the south and the network rail corridor to the north.

3.2 Walking and Cycling

The site is connected into the external footpath network on the A1085 Trunk Road, and the Teesdale Way passes along the southern boundary of the site.

On-road local cycle routes are provided, with on-road signed routes in some locations and advisory routes through quiet streets in other locations. National Cycle Route (NCR) 1 runs through Redcar, approximately 3km (linear distance) from the east of the site. NCR1 provides strategic connections between Saltburn, Marske, Redcar and Middlesbrough. The active travel connections are shown in Figure 2.

Figure 2: Active travel facilities in the vicinity of the site

3.3 Public Transport

Bus Services

There are currently no bus services in the immediate vicinity of the site, with the nearest bus stops located on West Coatham Lane, approximately 800m walking distance to the south of the site as shown in Figure 2. The bus stops are served by bus services 62, 64/64A, X3 and X4 and the services are shown in Table 1.

Table 1: Bus services

Route No.	Bus Stop	Route	Daytime frequency (minutes) per direction	
			Monday – Saturday	Sunday
62	International East Gate (West Coatham Lane)	Marske – Redcar – Dormanstown – Grangetown – Middlesbrough	Every 30 minutes	Every hour
64 / 64A	International East Gate (West Coatham Lane)	Eston – Redcar – Dormanstown – Grangetown - Bankfields – South Bank - Middlesbrough	Every 30 minutes	Every hour
X3/ X3A	International East Gate (West Coatham Lane)	Lingdale – Redcar – Dormanstown – Middlesbrough	Every 30 minutes	Every hour
X4/ X4A	International East Gate (West Coatham Lane)	Whitby – Boulby – Brotton Eston – Redcar – Dormanstown – Middlesbrough	Every 30 minutes	Every hour
Only key intermediate stops noted **Sources: Arriva**				

Railway Services

The Darlington to Saltburn Railway line, which runs along the north of the site, is an operational passenger railway line. Redcar British Steel station is located on the northern edge of the development site boundary but services at the station have been suspended since 2019. As part of the emerging Transport Strategy for the wider site, it is expected that the station will re-open to services.

Redcar Central railway station is located approximately 4km to the east of the site. The station is serviced by Transpennine Express and Northern, which provides three train services per hour. One train service per hour runs to Manchester Airport, and two train services per hour runs between Bishop Auckland (via Darlington) and Saltburn.

South Bank railway station is located on the south-western edge of the Teesworks site and is serviced by Northern, which provides hourly services between Bishop Auckland (via Darlington) and Saltburn.

3.4 Highway Network

3.4.1 Local Highway Network

The P&R site is located off the A1085 Trunk Road. The Trunk Road is a four-lane dual carriageway which runs in an east-west direction to the south of the site.

Access into the wider Teesworks site is provided via a roundabout junction where the A1085 Trunk Road meets the Teesworks site access road and West Coatham Lane. This roundabout is referred to locally as the Steel House Roundabout.

3.4.2 Strategic Road

The SRN near the site consists of the following roads:

- A1053, a four-lane dual carriageway, runs in a north-south direction and connects to the A1085 Trunk Road at a signalised roundabout junction to the south-west of the Teesworks site. The A1053 also connects to the A66 to the east and the A174 and B1380 High Street at the Greystones roundabout to the south; and
- A174, a four-lane dual carriageway to the south of the site, is a key east-west corridor between Middlesbrough and Redcar, that connects to the A19 to the west and to the A1053 to the east. Access to the A174 is via a signalised junction where the A1053 meets the A174 and Eston High Street, known locally as Greystones Roundabout.

3.5 Road Safety

Collision data covering the study area has been sourced, for the period 2015 to 2019 inclusive, from the Crashmap website. An overview of the collisions in the study area is provided in Table 2.

Table 2: Study area collision data (2017-2021)

Severity	2017	2018	2019	2020	2021	Total
Fatal	0	0	0	0	0	0
Serious	2	1	1	0	0	4
Slight	5	3	2	2	1	13
Total	7	4	3	2	1	17

Table 2 shows that 2017 recorded the most collisions within the study area, with a total of 7 collisions. The most recent year of data recorded, 2021, recorded the least amount, with one collision recorded during this year. A steady decline of collisions can be seen over the time period of 2017-2021.

The following sections will provide a high-level analysis of the key junctions within the study area and detail the main collision points that must be considered.

3.5.1 Steel House Roundabout (Trunk Road / West Coatham Lane Roundabout)

At the Steel House roundabout, the data indicates that five collisions were recorded between 2017 and 2021, four of which resulted in slight injuries. One incident was classified as a serious collision, occurring in 2018. All incidents occurred on the roundabout rather than on approach. One collision happened in each of the years 2017, 2019 and 2021, whilst two incidents occurred in 2018. The serious incidents that occurred at this roundabout during the study time period involved vulnerable road users; a motorcyclist.

There does not appear to be any clear trends or causation factors responsible for the incidents that have occurred at this roundabout.

3.5.2 A1085 Trunk Road / A1042 Kirkleatham Lane

Two collisions were recorded at the A1085 Trunk Road / A1042 Kirkleatham Lane crossroads junction during the 2017-2021 study period, all of which were classified as slight. One collision occurred in 2017 and one further incident one took place in 2018. Both collisions involved two vehicles, with one or two casualties per incident.

There appears to be no clear causation factors for the collisions that have occurred at this junction during the study period.

3.5.3 A1085 Corporation Road / Locke Road / Mersey Road

At this junction one serious incident has occurred during the study period. This was in 2017 and involved a pedal cyclist. Another serious collision took place in 2017, involving a pedal cyclist, to the east of the junction.

3.5.4 A1085 Corporation Road / Sandringham Road

A total of two incidents have taken place between 2017 and 2021 at the A1085 Corporation Road / Sandringham Road priority junction, both of which were of slight severity. One collision happened in 2017 and another in 2019. Both collisions had one casualty recorded and involved young drivers.

There are no common causation factors for the incidents that have taken place at this junction.

3.5.5 A1085 Corporation Road / West Dyke Road / A1085 Thrush Road

A total of three collisions were noted between 2017 and 2021 at the A1085 Corporation Road / West Dyke Road / A1085 Thrush Road roundabout. Two incidents were of slight severity and one was classified as serious. Two collisions occurred in in 2017 and a further one collision happened in 2019, which was of serious severity.

One of the collisions at the roundabout involved pedal cyclists, which led to slight injuries.

There does not appear to be any clear trends or common causation factors in the collisions that have taken place at this roundabout.

3.5.6 Road Safety Summary

Based on the review of the collision data, and an assessment of the key junctions within the study area, three local junctions have been identified where geographic clusters of collisions have occurred during the assessment period:

- Steel House roundabout;
- A1085 Trunk Road / A1042 Kirkleatham Lane; and
- A1085 Corporation Road / West Dyke Road / A1085 Thrush Road.

Analysis of the Crashmap website has shown that there was a total of six collisions within the study area involving a pedal cyclist, two of which led to serious injuries.

No common causation factors have been identified for the collisions that have occurred throughout the highway network within the study area.

4. Development Proposals

4.1 Development Description

The proposed P&R facility is required to provide a car parking area for the Teesworks site, outside of the proposed Freeport zone, and with access from the existing public road network. An indicative site plan is attached in Appendix A.

The P&R facility will initially be used to accommodate demand associated with the construction of the NZT Project, and it is expected that the car park will be limited to construction staff only for the first three years. In the longer-term, the car park will be made available to those working on the Teesworks site. The use of the car park for future Teesworks developments will be assessed as part of the planning applications for those future developments.

A new connection to the highway network will be provided to the east of Steel House via the form of a new signalised junction on the A1085 Trunk Road. This will allow security checks to be carried out within the P&R site prior to construction workers boarding the P&R buses, which will then proceed directly through the Steel House access without the need for further security checks. Footway and cycleway connections from the existing network have been provided.

As detailed in Section 1.2.3, the NZT proposal forecasts that the construction workforce will peak at approximately 1,750 workers per day, resulting in forecasts of 700 car trips per day. The proposed car parking schedule for the site is detailed in Table 3, showing a total provision of ~1,500 spaces. This is to account for a worst-case scenario where all trips would be made by single occupancy vehicles. This would result in 1,500 arrivals in the morning and 1,500 departures in the evening, notably increased from the 700 vehicle trips stated in NZT TA.

Table 3: P&R - car parking provisions

Type	Provision
Car Parking spaces	1254
EV Charging spaces	150
Disabled Bays	30
Minibus / Vans	45
Motorcycle Spaces	30
Cycle Spaces	80

4.2 Access Proposals

The proposed access for the P&R site is from a new signalised junction on the A1085 Trunk Road, east of the main site access via Steel House roundabout. The junction has been designed by Atkins, and a plan is attached in Appendix A. The junction connects to the site access road which provides a link into the main car park, as well as connections to the rail station and other potential future uses.

5. Development Impact

5.1 Trip Generation and Distribution

Construction workers

Based upon the construction shifts applied in the NZT Teesside TA, the peak hours of movement to / from the site are forecast to be 06:00 – 07:00 and 18:00 – 19:00. During the morning peak, it is forecast that there could be 1,000 vehicles arriving for the morning construction shift before 07:00. The same, but reverse pattern is expected in the evening peak hour during shift changeover (19:00 – 20:00).

To add robustness to the assessment it has been assumed there may be some drop off trips which would result in a small number of trips in the counter peak direction. It is therefore assumed there would be one vehicle every other minute in the counter peak direction, resulting in 30 vehicles across each peak hour. These vehicles are assumed to be cars.

P&R Bus

To service the peak operating hours, the P&R bus timetable forecasts 24 bus trips out and 24 bus trips back in (48 PCU's per hour in each direction). This is consistent in both peak hours.

The trips associated with the car park have been assigned onto the highway network using the distribution agreed for the outline Teesworks planning applications (see Section 1.2). The forecast trips for the AM and PM peaks are shown in Figure 3 and Figure 4 respectively.

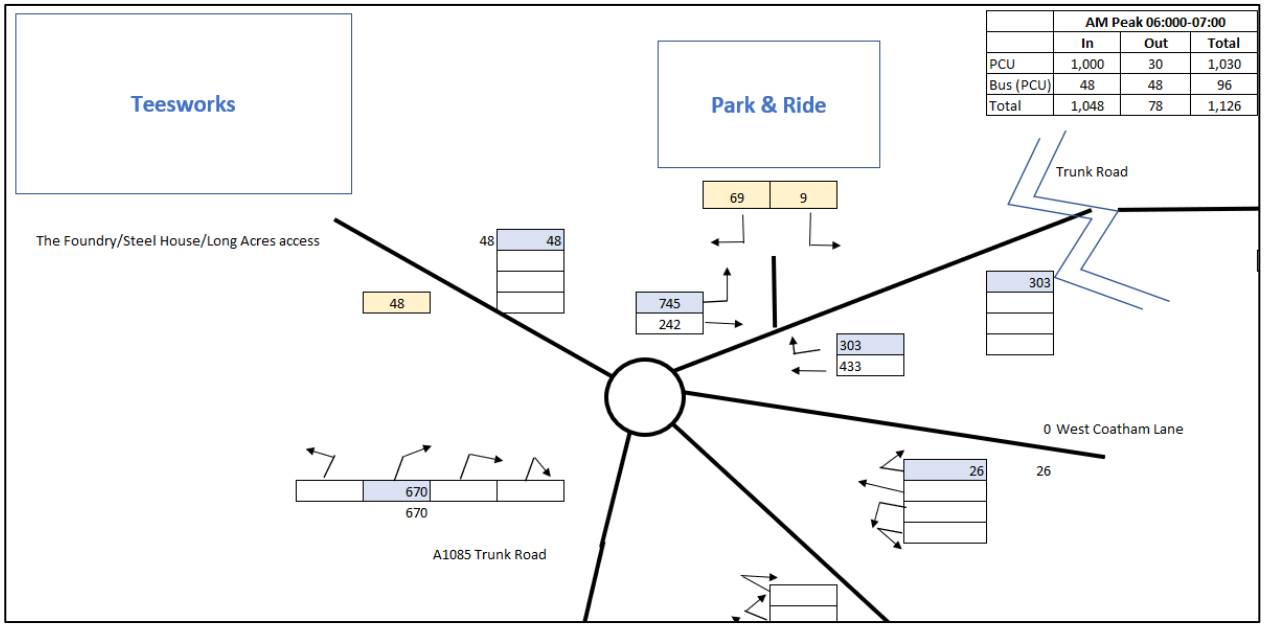


Figure 3: AM peak (06:00 – 07:00) P&R trips

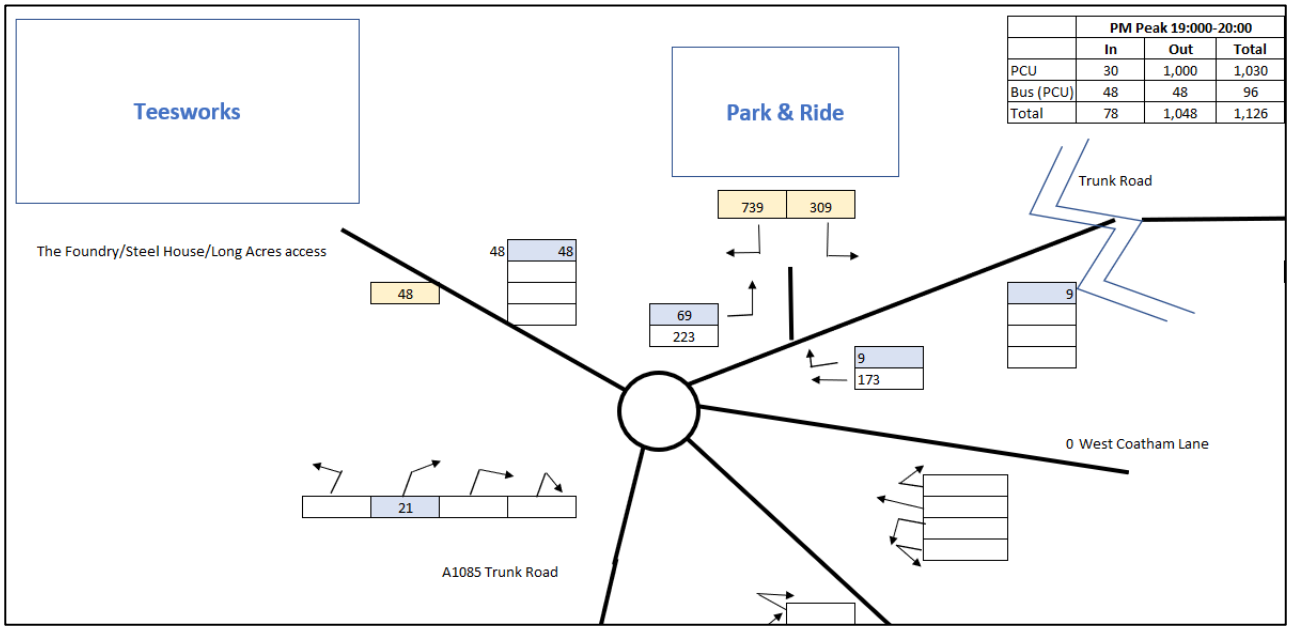


Figure 4: PM peak (19:00 – 20:00) P&R trips

5.2 Background Traffic

The background traffic assumptions have been developed and agreed following detailed discussions with National Highways for the Teesworks developments. It was agreed that the assessment would be undertaken for a forecast year of 2033. This is beyond the peak construction of NZT project in 2025, but provides a robust case for the assessment of the road network. The 2033 base forecast, which was developed from National Highway's North Regional Transport Model (NRTM), includes local trip end growth so individual committed developments have not been added to avoid duplicating growth scenarios.

As stated, the peak hours for the P&R site do not align to the network peak hours of 08:00 – 09:00 and 17:00 – 18:00. Instead, the peak hours associated with the site are understood to be 06:00 – 07:00 and 18:00 – 19:00. To create a 2033 forecast for the background traffic which aligns to the site peak hours, Webtris profiles (publicly available National Highways traffic count data) for average weekday counts on A1085 Greystones Road in 2019 have been used. The site peak hour has been compared to the network peak hour to calculate an average reduction factor to apply to the network peak hour background flows, Table 4 and Table 5.

Table 4: Reduction factor calculation from network peak hour to site peak hour - A1085 Northbound

Month	06:00 - 07:00	08:00 - 09:00	%	17:00 - 18:00	19:00 - 20:00	%
Jan-19	617	1196	52%	361	148	41%
Feb-19	687	1246	55%	405	168	41%
Mar-19	718	1306	55%	408	185	45%
Apr-19	641	1081	59%	400	188	47%
May-19	635	1076	59%	394	175	44%
Jun-19	581	1003	58%	397	181	46%
Jul-19	646	1089	59%	409	272	67%
Aug-19	527	879	60%	393	198	50%
Sep-19	581	1247	47%	417	193	46%
Oct-19	637	1315	48%	451	192	43%
Nov-19	672	1342	50%	399	180	45%
Dec-19	518	991	52%	350	173	49%
		Average factor	55%		Average factor	47%
		Neutral Months only	54%		Neutral Months only	45%

Table 5: Reduction factor calculation from network peak hour to site peak hour - A1085 Southbound

Month	06:00 - 07:00	08:00 - 09:00	%	17:00 - 18:00	19:00 - 20:00	%
Jan-19	180	282	64%	830	262	32%
Feb-19	202	326	62%	911	284	31%
Mar-19	221	321	69%	915	301	33%
Apr-19	202	295	68%	897	290	32%
May-19	208	290	72%	857	293	34%
Jun-19	193	289	67%	893	289	32%
Jul-19	206	291	71%	897	305	34%
Aug-19	196	281	70%	828	283	34%
Sep-19	207	330	63%	907	297	33%
Oct-19	211	327	65%	876	288	33%
Nov-19	211	328	64%	810	288	36%
Dec-19	178.8	267	67%	696	261	38%
		Average factor	67%		Average factor	33%
		Neutral Months only	67%		Neutral Months only	33%

As part of the ongoing Transport Assessments associated with developments at Teesworks, there is an existing adopted 2033 forecast for background traffic at traditional network peak times. The average neutral month reduction factors from tables Table 4 and Table 5 are applied to the network

peak hour traffic to calculate the peak hour background traffic at the site access, as outlined in Table 6.

Table 6: A1085 Background Trip calculation

	A1085 Eastbound	A1085 Westbound
2033 AM Background – Network Peak	447	648
2033 AM Background – Site Peak	242	433
2033 PM Background – Network Peak	493	517
2033 PM Background – Site Peak	223	173

5.3 Combined traffic flow diagrams

The forecast site traffic is combined with the 2033 background traffic to generate traffic flow diagrams for junction assessment, Figure 5 and Figure 6.

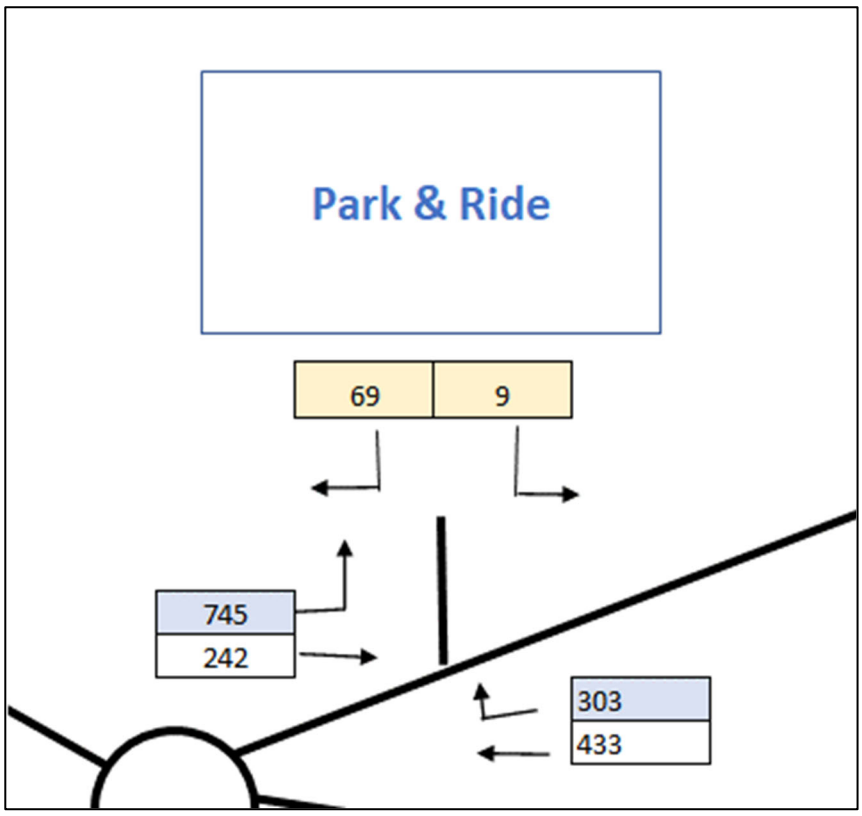


Figure 5: AM Peak (06:00 – 07:00) 2033 background + P&R traffic

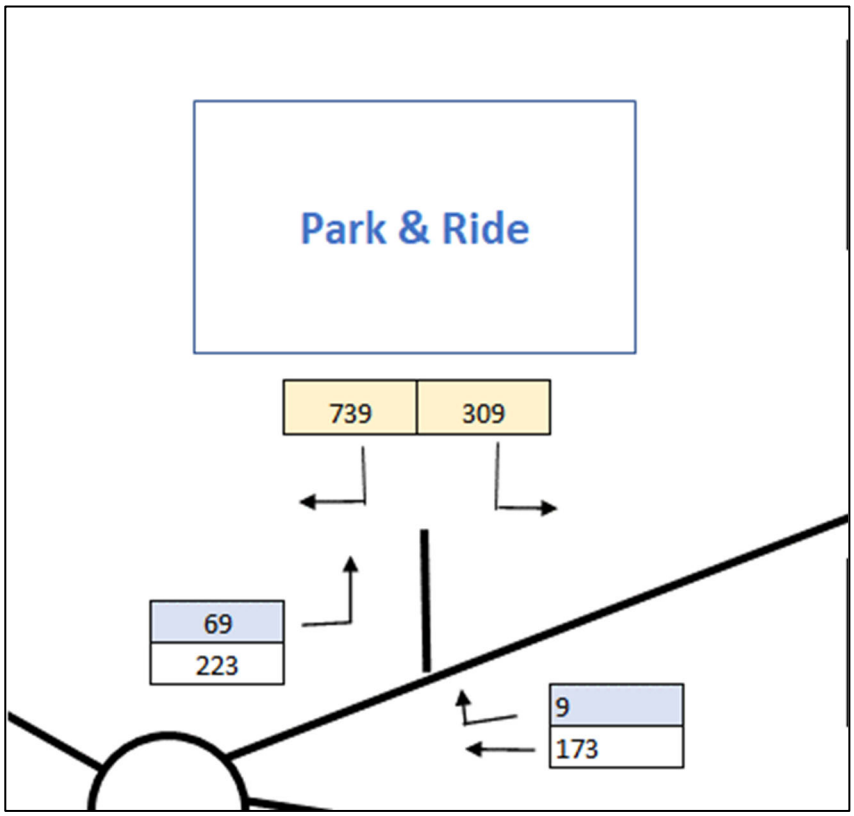


Figure 6: PM Peak (19:00 – 20:00) 2033 background + P&R traffic

5.4 Junction Assessment

An assessment of the proposed site access junction has been undertaken. This section outlines the junction assessment, including results and any recommendations.

The assessment of this signalised junction is being undertaken in LinSig, a nationally recognised software tool for assessing the performance of signalised junctions. The junction will be assessed for average delay, average queue length and Degree of Saturation. When considering Degree of Saturation, below 90% is acceptable and desirable; between 90 and 100% indicates a sub-optimal operation, and a Degree of Saturation above 100% indicates that either there is too much traffic or not enough road space or time for the traffic to pass through the signalised junction, and queue lengths can be expected to rise exponentially

Assessment scenarios

The assessment considers the scenarios as follows:

- 2033 Background traffic + P&R Site traffic AM Peak (06:00 – 07:00)
- 2033 Background traffic + P&R Site traffic PM Peak (19:00 – 20:00)

Additional committed developments have been excluded from this assessment as the base year of 2033 allows for growth, but also noting that the majority of developments are located to the west of the site and are therefore unlikely to impact junction performance due to location to the west of this site.

Junction assessment

This junction was initially assessed in LinSig as part of the STDC – Steel House Park and Ride Junction Assessment[2] undertaken by Atkins to inform their design of the junction. A summary note is attached in Appendix B. The model generated by Atkins has been used as a basis for the assessment included in this TA,

[2] STDC – Steel House Park and Ride Junction Assessment, Atkins, April 2022

with demand updated to reflect the traffic flows detailed in Section 5.3. The signal stage sequence has been maintained from the existing model.

Junction layout

The assumed junction layout and operation is consistent with that assessed previously. A signalised layout has been tested, with two lanes in either direction on the A1085, including a short third lane for right turners from the east/Redcar direction. Two lanes are provided for the site access departures, becoming two lanes for right turners to A1085 west and separate left turn lane to A1085 east. An allowance has been made for pedestrians to cross on the north side of the A1085, across the site access arm, and across the east side of the junction across the A1085. A 100 second cycle time has been used. A plan of the junction layout can be seen in Appendix A.

Results

The results shown in Table 7 (further details in Appendix C) show that the proposed junction will operate satisfactorily. The Degree of Saturation values are below 70%, delay is minimal, and queue lengths are not excessive. If required, some adjustments to timings could be made to minimise the delay to departing bus traffic in the morning (shown as 60s per vehicle in 'pcu's).

Table 7: A1085 / P&R junction assessment results

		AM Peak (06:00-07:00)			PM Peak (19:00-20:00)		
		Queue (PCU)	Av Delay / Veh (s)	Degree of Saturation	Queue (m)	Delay / Veh (s)	Degree of Saturation
Site Access	Ln 1 (l&r)	1.4	50.0	28.9%	3.9	9.3	55.5%
	Ln 2 (r)	0.7	57.1	16.4%	7.0	12.7	40.8%
A1085 East	Ln 1 (a)	3.9	5.5	30.0%	1.9	36.0	18.1%
	Ln 2 & Ln 3 (a&r)	7.8	38.7	57.0%	2.3	37.0	21.5%
A1085 West	Ln 1 (a&l)	14.3	16.9	64.8	3.8	33.1	45.1%
	Ln 2 (a)	4	17.5	25.8	2.3	45.2	28.3%

Note: Ln 1 (Lane 1) is the first nearside lane, with lane numbering continuing away from the nearside.
Movements shown as a=ahead, l=left, r=right

5.5 Wider Network Impacts – Local Junctions

A Transport Assessment, produced by AECOM, was submitted in support of the NZT Project DCO submission. It forecast a peak construction workforce of 1,750 people, generating 700 car trips (1,500 two-way daily flow).

A document detailing a sensitivity test of construction traffic modelling was also submitted to the DCO in June 2022. The technical note assessed test scenarios of either between 1,000 or 1,200 vehicles associated with construction worker accessing the proposed development site at peak of construction activity.

Both the TA and sensitivity test determine that the NZT construction traffic, that the P&R facility will serve, can be accommodated on the network without a detriment to the capacity of local junctions included in the assessment.

5.6 Wider Network Impacts – Links

The peak traffic associated with the P&R Site will occur at 06:00 – 07:00 and 19:00 – 20:00 which is outside of the traditional network peak. Table 4 and Table 5 show that traffic during site peak

represents a maximum of 67% of the traffic volumes at network peak hours. It is therefore expected that the development trips can be accommodated, without exceeding the traffic flows that are already on the network, during the peak hours.

6. Summary and Conclusions

This TA has been produced in support of the planning application for the development of a P&R facility on the Steel House site, within Teesworks. The proposed P&R facility will provide 1,500 spaces and be accessed via a new direct access on the A1085 Trunk Road, to the east of the existing Teesworks entrance.

The P&R facility is initially required to support construction of the NZT Teesside Project within the Teesworks site, and in longer term, is expected to provide a parking facility for other future developments on the Teesworks site. Areas within the Teeswork site are part of the Teesside Freeport, where access restrictions apply, and therefore providing a parking facility outside the site, with limited access into the Teesworks site, ensures that access into the Freeport can be managed efficiently, without a detrimental impact on the public highway network.

The proposed access junction has been assessed using LinSig and builds on a previous assessment undertaken by Atkins, who developed the design of the site and access junction. The access junction to the facility has been assessed assuming full capacity operations of 1,500 vehicles arriving in the morning and departing in the evening, of which 1,000 are expected to arrive / depart within the relative peak hours. A small amount of counter-peak direction traffic was also included, as well as the buses associated with the P&R operations. This represents peak construction levels, which are forecast to occur in 2024. The peak hours for vehicles arriving at the site in the morning will occur at 06:00-07:00 and departing the site in the evening will occur at 19:00-20:00.

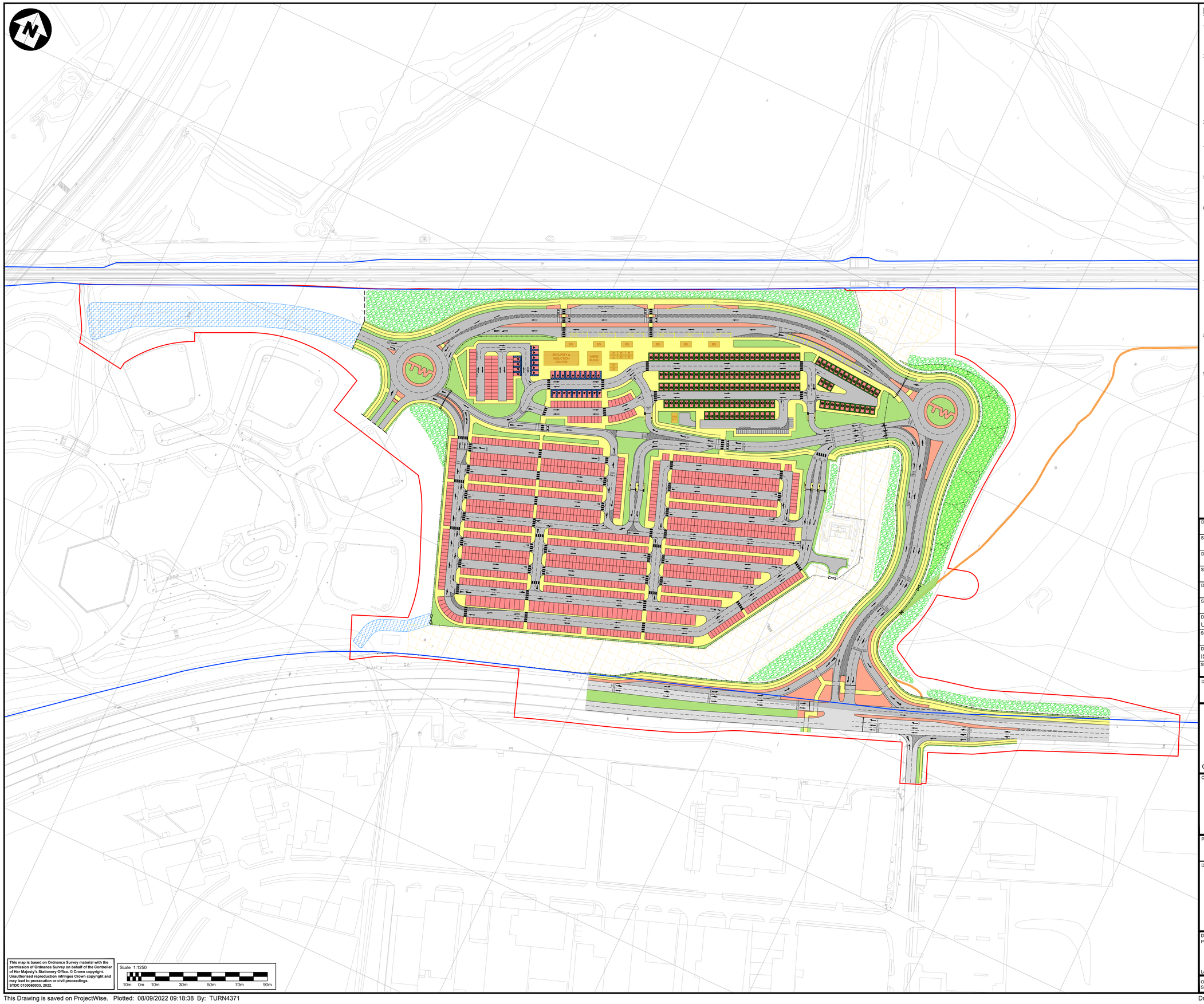
Background traffic flows have been generated for a future year of 2033 representing a robust assessment. The network peak hours occur at 08:00 – 09:00 and 17:00 – 18:00 and therefore has been factored to align to the P&R site peak traffic.

The LinSig assessment of the signalised access junction demonstrates satisfactory performance, although some adjustments could be made to minimise the delay to traffic leaving the site in the morning peak.

To conclude, the proposed development is in compliance with local, regional and national policy as it supports development on the Teesworks site, and there are no transport related reasons why the development should not be granted planning consent.

Appendix A

Indicative Site Plan



NOTES:

1. HIGH LEVEL PLANNING LAYOUT. A FULL GEOMETRIC DESIGN IS TO BE UNDERTAKEN ONCE FINAL PARAMETERS AND CONSTRAINTS ARE CONFIRMED.

2. PROPOSED PARK & RIDE LAYOUT CAR PARK PROVIDES:
   - 1,254 No. 2.4m x 4.8m CAR PARK SPACES
   - 30 No. 1.5 x 3.0m MOTORCYCLE SPACES
   - 45 No. 3.5m x 7.5m MINI BUS / VAN SPACES
   - 30 No. 3.6m x 6.0m DISABLED SPACES
   - 150 No. 3.6m x 6.0m E.V. CHARGING SPACES [1509 P&R SPACES]
   - 80 No. CYCLE SPACES IN 8 No. SHELTERS
   - 14 No. STAFF CAR PARK SPACES

3. FOR TYPICAL HIGHWAY CROSS SECTIONS REFER TO DRAWINGS: STDC_HWY-ATK-LDC-SHPR-DR-CH-000031 & 032.

4. SECURITY ARRANGEMENTS FOR THE SITE, INCLUDING ENTRY BARRIERS, GATES AND INTERNAL & EXTERNAL BOUNDARY FENCING ARE TO BE DETERMINED DURING DETAILED DESIGN.

5. KERBING - TYPES AND TACTILE PAVING ARRANGEMENTS TO BE DETERMINED IN ACCORDANCE WITH TEES VALLEY DESIGN GUIDE (TVDG) AND RELEVANT STANDARDS.

6. TRAFFIC SIGNS AND ROAD MARKINGS - ROAD MARKINGS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. AN APPROPRIATE TRAFFIC SIGNING AND ROAD MARKING LAYOUT WILL BE DEVELOPED DURING THE DETAILED DESIGN TO COMPLY WITH CURRENT STANDARDS (TSRGD 2016 & TVDG) AND BEST PRACTICE. THE SIGNING PROVIDED WILL INCLUDE APPROPRIATE DIRECTIONAL, INFORMATION, WARNING AND REGULATION SIGNS AS WELL AS ANY REQUIRED NMU SIGNS.

7. STREET LIGHTING - ALL SECTIONS OF NEW OR WIDENED HIGHWAY AND OFF CARRIAGEWAY NMU ROUTES WILL BE LIT IN ACCORDANCE WITH THE RELEVANT STANDARDS FOR THE ROUTE UNDER CONSIDERATION. THE DETAILED DESIGN WILL CONSIDER THE EXTENTS OF STREET LIGHTING REQUIRED TO PROVIDE SAFE HIGHWAY AND NMU ROUTES.

8. DRAINAGE - THE TWO DISCHARGE POINTS IDENTIFIED ARE SUBJECT TO REFINEMENT AT DESIGN STAGE. THE EXISTING DRAINAGE NETWORK SHALL BE ASSESSED TO DETERMINE EXISTING CAPACITY FOR JUNCTION WIDENING WORKS.

9. SEE JBA DRAWINGS FOR DETAILS IN RELATION TO FLOOD RISK ASSESSMENTS AND EXISTING WATERCOURSE DETAILS.

10. PAVEMENT DESIGN - THE ROAD CONSTRUCTION AND FOOTWAY / CYCLEWAY CONSTRUCTION WILL BE CONSTRUCTED FROM FLEXIBLE (BITUMINOUS) SURFACING MATERIALS (WHICH MAY INCLUDE PERMEABLE PAVEMENT OPTIONS FOR CAR PARK BAYS). PAVEMENTS WILL BE DESIGNED TO THE CURRENT TVDG STANDARDS OR UK DMRB PAVEMENT STANDARDS. EXISTING PAVEMENT CONDITION TO BE ASSESSED FOR AREAS OF RESURFACING OR FULL RE-CONSTRUCTION.

11. EARTHWORKS - THE GENERAL ARRANGEMENT DRAWINGS DO NOT SHOW HIGHWAY ALIGNMENT EARTHWORKS. THESE ARE TO BE DETERMINED DURING DETAILED DESIGN AND SUBJECT TO SITE REMEDIATION GROUND LEVELS..

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

UPDATED FOR OPTION 7 (ISSUED TO TEAM & EXTERNAL)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S2	P01	MT	DS	MT	---	09/08/22

Description

ISSUED FOR PLANNING

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A2	C01	MT	MT	MT	DMA	02/09/22

Drawing Suitability	Status
APPROVED - ORDERS / LICENSES	A2

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Client

TEESWORKS
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Project Title

SOUTH TEES
DEVELOPMENT CORPORATION

Drawing Title

STEEL HOUSE PARK & RIDE
PLANNING APPLICATION
ENGINEERING LAYOUT (COLOUR)

Drawing Number

Project	Originator	Volume		
STDC_HWY	ATK	LDC		
Location		Type	Role	Number
SHPR		DR	CH	000030

Original Size:	Scale:	Project Ref. No:	Sheet:	Rev:
A1	1:1250	5198022	1 of 1	C01

Scale 1:1250

10m 0m 10m 30m 50m 70m 90m

This Drawing is saved on ProjectWise. Plotted: 08/09/2022 09:18:38 By: TURN4371

Drawing File: STDC_HWY-ATK-LDC-SHPR-DR-CH-000030.dwg

Appendix B

Junction Assessment for Junction Design

Technical Note

Project:	STDC – Steel House Park and Ride		
Subject:	Park and Ride Junction Assessment		
Author:	Atkins		
Date:	08/04/2022	Project No.:	5212299
Atkins No.:		Icepac No.:	
Distribution:		Representing:	

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
P01	For information	GF	DS	GF	DS	08/04/2022

Client signoff

Client	South Tees Development Corporation
Project	STDC – Steel House Park and Ride
Project No.	5212299
Client signature / date	

1. Introduction

Atkins' transport planners were asked to provide an understanding of the type of junction required on the A1085 Trunk Road to serve the proposed Steel House Park and Ride site. The junction is proposed to be located some 470m northeast of the main site access roundabout at West Coatham Lane, at a point on the dual carriageway section some 80m away from where it becomes single carriageway.

A series of sketches were provided which offered different layouts on the Park and Ride site arrangement, and included a broad indication of a roundabout junction with A1085 Trunk Road.

Traffic data was taken from the following sources:

- Steel House Environmental Statement Volume 2: Chapter C – Transport
- Steel House Environmental Statement Volume 3: Technical Appendices, Appendices to Chapter C - Transport
- Net Zero Teesside – Environmental Statement Volume III – Appendices, Appendix 16A Transport Assessment

Some preliminary work was undertaken based on an indicative roundabout junction, with an overestimate of traffic flows (based on 2033 peak hour flows), which, had this proved adequate, would have indicated that such a junction was feasible. Unfortunately, this testing proved that such a junction would be either too small and a larger roundabout would be required, else the situation would be best resolved with a traffic signalised arrangement. This was also based on 'network' peak hour traffic flows at 0800-0900hrs and 1700-100hrs which would not necessarily be the construction traffic peak hours.

The opportunity was taken to consider 'construction staff traffic' peak hours of 0600-0700hrs and 1900-2000hrs. This would be at 2024, as indicated in Net Zero Teesside Environmental Statement Volume I, paragraph 16.6.4.

To account for a worse-case scenario, 1500 staff arrivals in the morning and 1500 staff departures in the evening, all in single occupancy vehicles has been assumed, based on the anticipated parking capacity of the proposed Park and Ride facility. It is acknowledged that this is over the 1296 vehicle arrivals as stated in the Net Zero Teesside Environmental Statement Volume III, Table 16A-24.

2. Traffic Flows

Bus traffic volumes

Bus traffic has been estimated from a mix of demand and an assumption about the type of bus, loading and time of staff arrivals and departures.

A large single decker bus or a coach has been assumed to carry 56 seats. An 80% loading equalling 45 seats (which is also equivalent to a standard single deck bus with 100% loading) has been assumed.

The beginning of the construction shift is taken to be at 0700hrs, ending at 1900hrs as indicated in the Net Zero Teesside Environmental Statement Volume I, paragraph 16.6.5. This means most staff will arrive at the Park and Ride site between 0600-0700hrs with some arriving earlier from 0530hrs. It also means that the staff departing peak hour will be 1900-2000hrs, similarly with some departing later at 2000-2030hrs.

Making assumptions about bus journey times, a single bus with make 2.4 trips per hour, therefore being able to move 108 staff (2.4 trips x 45 occupied seats).

With 1500 staff spread over the 1.5 hours period at the start and end of the day, that could lead to 23 bus movements in the construction staff peaks hours of 0600-0700hrs and 1900-2000hrs, as broadly set out below, with buses setting off from 4 bus stops every 10 minutes. For the sake of uneven loading and peak-of-peak movement, that could indicate 24 bus movements in those peak hours.

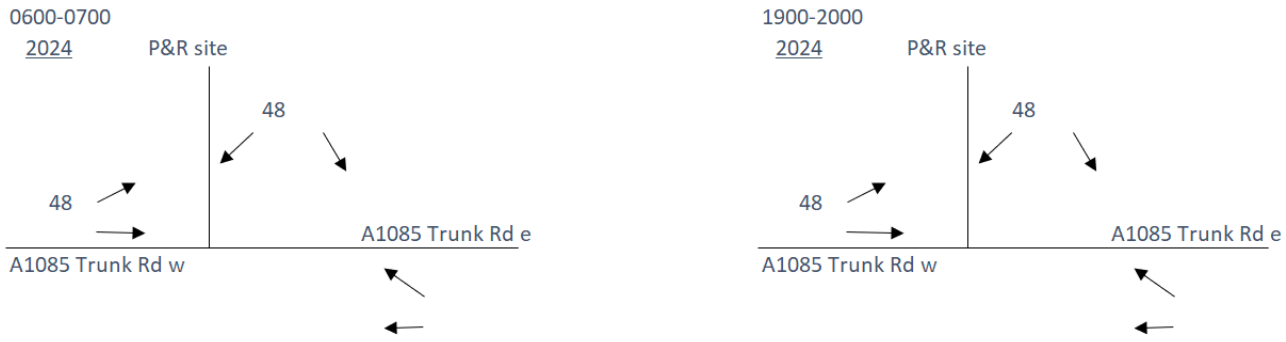
Table 2-1 - Staff bus schedule

Departure Time	Buses	Departure Time	Buses
05:30	1, 2, 3 & 4	19:10	1, 2, 3 & 4
05:40	5, 6 ,7 & 8	19:20	5, 6 ,7 & 8
05:50	9, 10, 11 & 12	19:30	9, 10, 11 & 12
06:00	1, 2, 3 & 4	19:40	1, 2, 3 & 4
06:10	5, 6 ,7 & 8	19:50	5, 6 ,7 & 8
06:20	9, 10, 11 & 12	20:00	9, 10, 11 & 12
06:30	1, 2, 3 & 4	20:10	1, 2, 3 & 4
06:40	5, 6 ,7 & 8	20:20	5, 6 ,7 & 8
06:50	9, 10, 11 & 12	20:30	9, 10, 11 & 12

It has been assumed that buses would arrive at and depart from the Park and Ride site via a proposed new Park and Ride access junction with the A1085 Trunk Road some 470m northeast of the main site access roundabout at West Coatham Lane. Buses would only use the A1085 west arm in both directions.

Bus movements are shown in ‘pcu’s (passenger car equivalents) often taken for buses as double the actual number of vehicles, hence shown as 48 pcu movements in the bus movement diagram in Figure 2-1 below.

Figure 2-1 - Bus movements (in 'pcu's)

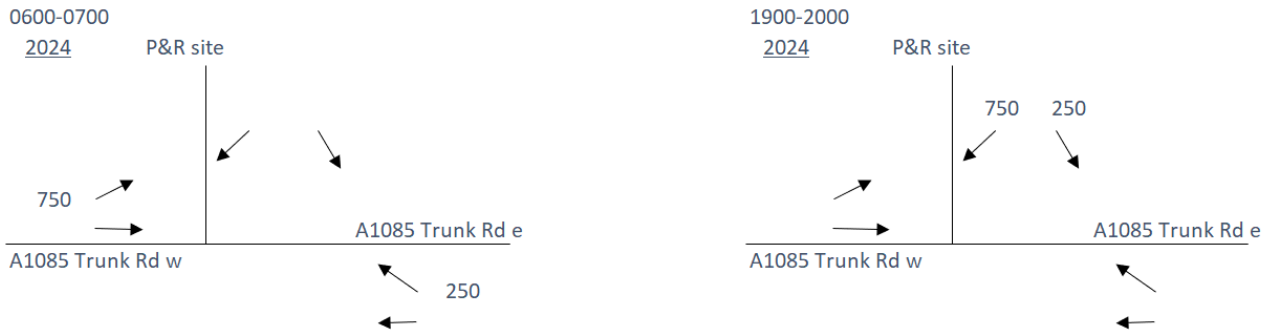


Staff traffic flows

1500 staff arrivals and 1500 staff departures are assumed to arrive at the Park and Ride site over 0530-0700hrs and depart over 1900-2030hrs. It is assumed that 1000 of these would arrive and depart in the 0600-0700hrs and 1900-2000hrs construction traffic peak hours. It is assumed that 75% of the arrivals and departures would be to and from the west.

Staff traffic is shown in Figure 2-2.

Figure 2-2 - Staff traffic



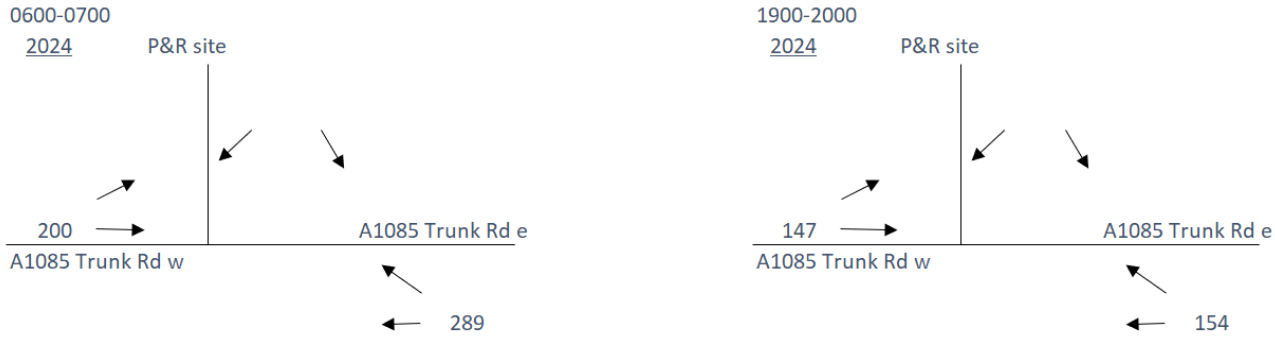
General traffic

Traffic flows at this location have been synthesised for the construction staff peak hours from the available traffic data which does not directly reference these hours. The description of this process is best listed in the following steps:

- Base 2033 'through' traffic flows 0800-0900 and 1700-1800 hrs traffic data from Appendix F of Steel House Environmental Statement Volume 3: Technical Appendices, Appendices to Chapter C – Transport.
- Rebased to 2020 using comparable 2033 and 2020 base traffic flows at near-by A1085 between West Coatham Lane and Wilton Site access roundabout.
- Grow traffic to 2024 base year using 2019 to 2024 traffic growth provided in Net Zero Teesside – Environmental Statement Volume III – Appendix 16A Part 1 Table 16A-33, as adjusted using TEMPro for 2020 to 2024.
- Adjusted from 'network' peak hours to 'construction staff' peak hours (0800-0900 to 0600-0700hs and 1700-1800 to 1900-2000hrs) using data in Net Zero Teesside – Environmental Statement Volume III – Appendix 16A Part 1 Table 16A-46.

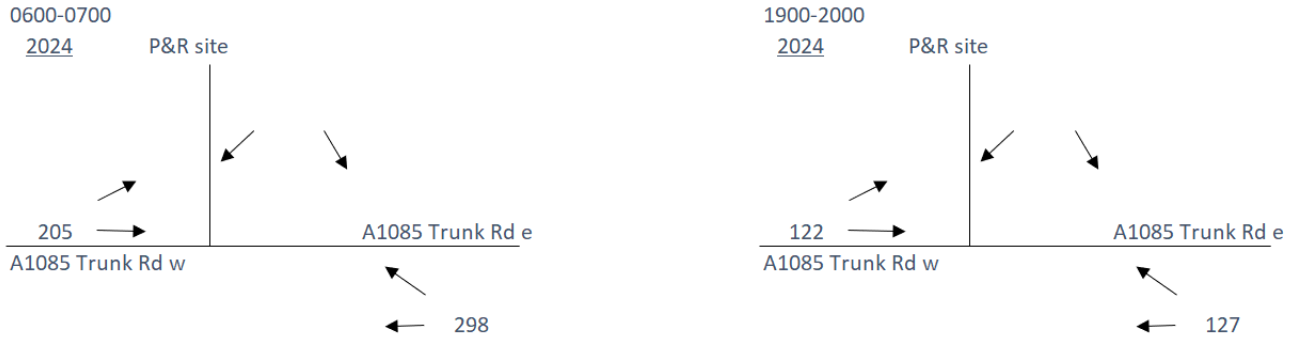
These steps have produced 2024 base traffic flows as shown in Figure 2-3.

Figure 2-3 - Background 'construction staff traffic' peak hour traffic flows



Committed development traffic was added based on flows provided in Net Zero Teesside – Environmental Statement Volume III – Appendix 16A Part 1 Table 16A-46. These flows are shown below in Figure 2-4.

Figure 2-4 - Committed development traffic flows



The total traffic is then an addition of these disparate elements, as shown in Figure 2-5. These flows, including the percentage of heavy vehicles were taken forward into the junction assessments.

Figure 2-5 - Total traffic flows (in 'pcu's)

3. Junction assessments

Two junction forms have been tested in terms of their operation; a roundabout layout and a traffic signalised layout. The junction operation is a test of how the junctions perform using proprietary software, providing information on queue lengths, delay, and how the volume of traffic flow reacts to the capacity provided.

At this stage the assessments are only preliminary as the design will better refine the junction operational tests in due course.

The roundabout layout has taken as its starting point some sketched ideas about its size. Key to this has been the 'inscribed circle diameter', which is the outer kerb to outer kerb dimension. The total traffic flows as shown above, the percentage of heavy goods vehicles and buses, and various geometric data have been provided to the 'Junctions 9' suite of junction assessment tools, which includes the roundabout assessment program largely referred to as 'ARCADY'. This is a nationally recognised software tool for assessing the performance of roundabout junctions.

Outputs for each arm giving way include a measure of Queues, and a measure of the flow-to-capacity, known as the RFC (Ratio of Flow to Capacity). Each give-way arm is deemed to be operating satisfactorily if the RFC is below 0.85, i.e. traffic flows are inside 85% of the capacity provided. RFCs between 0.85 and 1.0 still indicated a 'within capacity' operation, but poor driver behaviour may lead to a less than desirable level of operation. Above 1.0, and the RFC is indicating that traffic flows are exceeding capacity and queue lengths may begin to rise exponentially.

Traffic signals at this junction have also been assessed. Atkins has defined a minimum traffic signal junction arrangement. Similar information has been provided to the LinSig software package, as well as assumed traffic signal timing information, notably minimum green times, cycle times, pedestrian timings, intergreen times (between green phases) and the sequence of green traffic and pedestrian movements. LinSig is also a nationally recognised software tool for assessing the performance of signalised junctions.

Similar measures of operation are produced, but the main difference being that the flow-to-capacity ratio is replaced by a Degree of Saturation for each signalised approach. The criteria is similar; below 90% is acceptable and desirable; between 90 and 100% indicates a sub-optimal operation, and a Degree of Saturation above 100% indicates that either there is too much traffic or not enough road space or time for the traffic to pass through the signalised junction, and again queue lengths can be expected to rise exponentially.

Test 1 – Roundabout layout

A roundabout layout has been tested with an 'inscribed circle diameter' (outer kerb to outer kerb) dimension of 48m, and two lanes on each of the three approaches, as per some indicative sketches associated with alternative Park and Ride site layouts.

In summary, the junction in that arrangement will operate satisfactorily. The RFC values are below 0.85, delay is minimal, and queue lengths are not excessive. The summary data is shown in Table 3-1.

Table 3-1 - Roundabout operation summary data

	0600-0700hrs			1900-2000hrs		
	Queue (m)	Delay/veh (s)	RFC	Queue (m)	Delay/veh (s)	RFC
Site access	0.6	3.6	0.03	6.9	3.8	0.54
A1085 east (from Redcar direction)	4.1	2.7	0.40	1.2	2.8	0.18
A1085 west	9.8	4.5	0.61	1.2	2.0	0.15

Test 2 – Signalised layout

A signalised layout has been tested, with two lanes in either direction on the A1085, including a short third lane for right turners from the east/Redcar direction. Two lanes are provided for the site access departures, becoming two lanes for right turners to A1085 west and separate left turn lane to A1085 east. An allowance has been made for pedestrians to cross on the north side of the A1085, across the site access arm, and across the east side of the junction across the A1085. A 100s cycle time has been used.

In summary, the junction in that arrangement will operate satisfactorily. The Degree of Saturation values are below 90%, delay is minimal, and queue lengths are not excessive. Some adjustments to timings could be made to minimise the delay to departing bus traffic in the morning (shown as 60s per vehicle in 'pcu's). The summary data is shown in Table 3-2.

Table 3-2 - Signalised operation summary data

		0600-0700hrs			1900-2000hrs		
		Queue (m)	Delay/veh (s)	Degree of Saturation (%)	Queue (m)	Delay/veh (s)	Degree of Saturation (%)
Site access	Ln 1 (l & r)	4.0	56.8	15.1	32.2	9.4	48.7
	Ln 2 (r)	4.0	57.1	16.4	35.1	12.2	36.3
A1085 east (from Redcar direction)	Ln 1 (a)	33.9	6.3	40.7	20.1	38.1	32.3
	Lns 2 & 3 (a & r)	35.1	36.2	47.0	20.1	38.1	32.3
A1085 west	Ln 1 (a & l)	92.6	18.2	69.3	23.0	37.5	47.4
	Ln 2 (a)	43.7	19.9	43.5	19.6	47.8	41.1

Note: Ln 1 (Lane 1) is the first nearside lane, with lane numbering continuing away from the nearside.

Movements also shown as a = ahead, l = left, r = right.

4. Summary

Traffic flows have been calculated at 2024 levels for the morning and evening construction staff peak hours, at 0600-0700hrs and 1900-2000hrs.

Junction assessments have shown that both a roundabout and signalised junction could operate at those times to accommodate construction staff traffic, assuming shifts starting at 0700hrs and ending at 1900hrs.

A roundabout of around 48m inscribed circle diameter and with 2 lanes on all approaches works best.

A signalised junction would also operate satisfactorily, although some adjustments might need to be made to minimise the morning's delay to staff buses leaving the Park and Ride site.

Both junction tests are subject to a more detailed assessment once refinement of the junction has been undertaken.

Appendix C

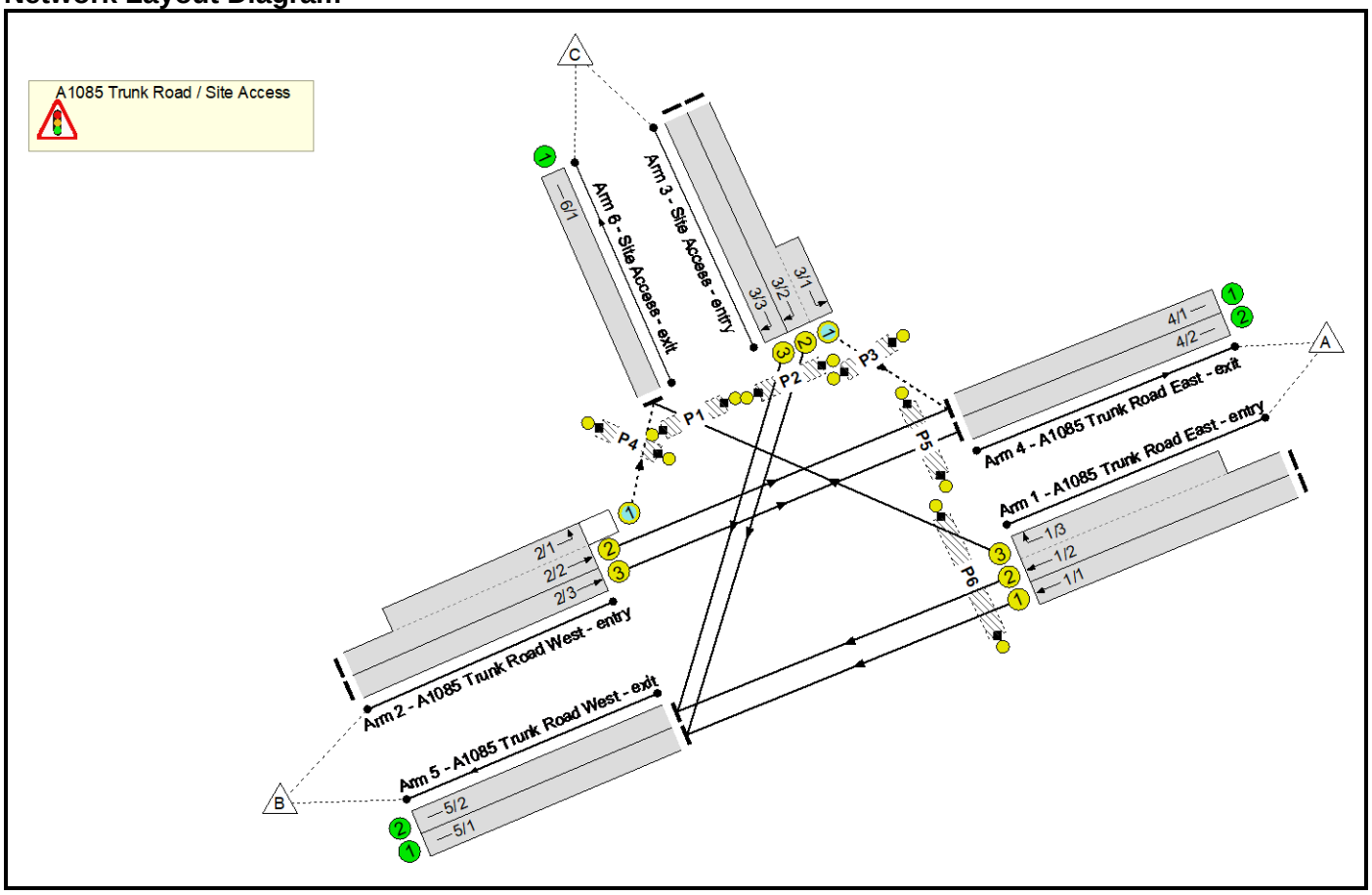
Junction Model Results

Full Input Data And Results

User and Project Details

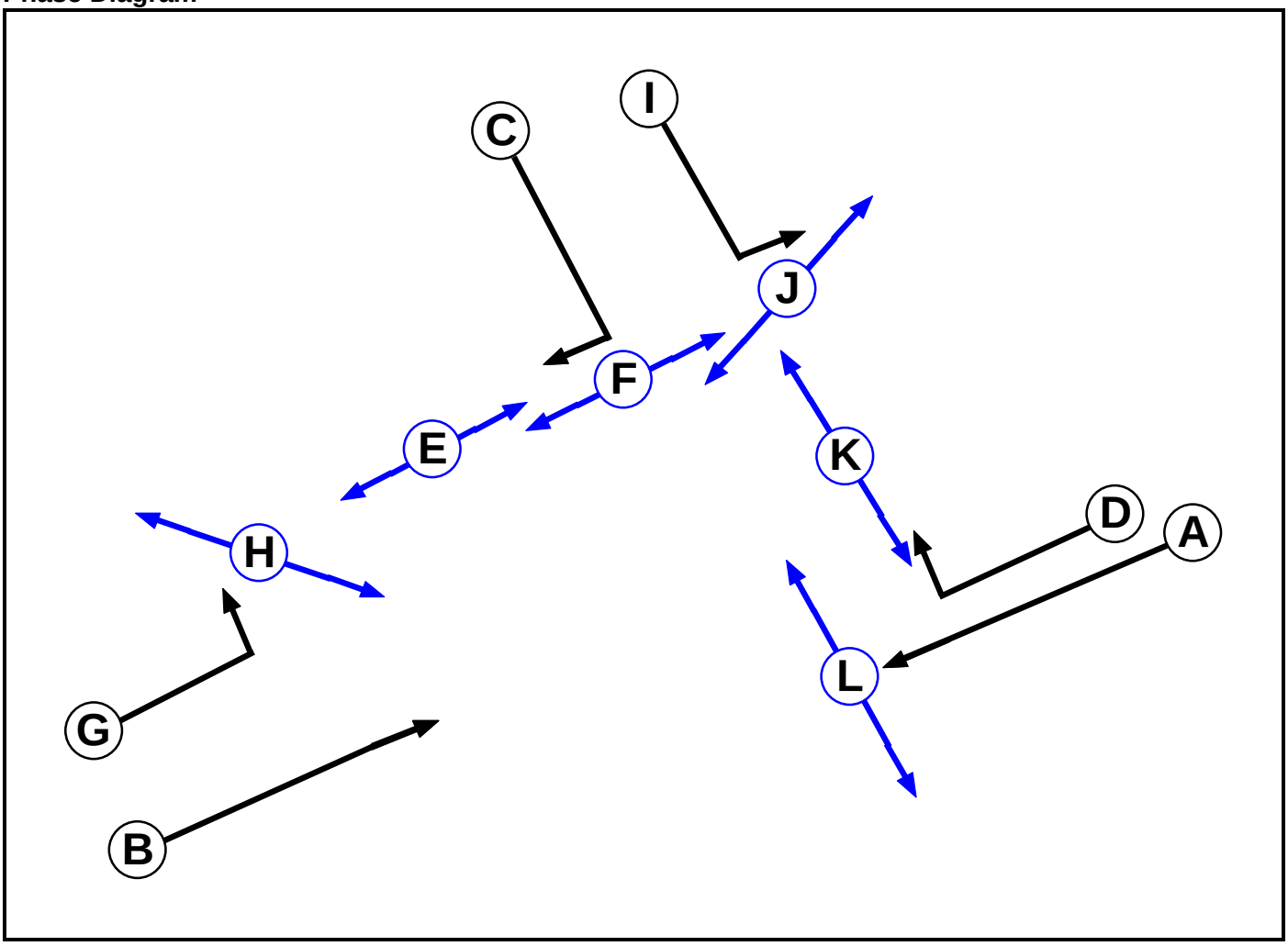
Project:	
Title:	
Location:	
Additional detail:	
File name:	A1085 Trunk Rd_Site Access_2024 construction traffic peaks_concept layout_v02.lsg3x
Author:	
Company:	
Address:	

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Full Input Data And Results

Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	1		7	7
B	Traffic	1		7	7
C	Traffic	1		7	7
D	Traffic	1		7	7
E	Pedestrian	1		5	5
F	Pedestrian	1		5	5
G	Traffic	2		7	7
H	Pedestrian	2		5	5
I	Traffic	3		7	7
J	Pedestrian	3		5	5
K	Pedestrian	1		5	5
L	Pedestrian	1		5	5

Phase Intergreens Matrix

		Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K	L
Terminating Phase	A		-	6	-	-	-	-	-	-	-	-	5
	B	-		6	6	-	-	-	-	-	-	8	-
	C	6	6		6	-	5	-	-	-	-	-	-
	D	-	6	6		8	-	-	-	-	-	-	5
	E	-	-	-	6		-	-	-	-	-	-	-
	F	-	-	8	-	-		-	-	-	-	-	-
	G	-	-	-	-	-	-		5	-	-	-	-
	H	-	-	-	-	-	-	7		-	-	-	-
	I	-	-	-	-	-	-	-	-		5	-	-
	J	-	-	-	-	-	-	-	-	7		-	-
	K	-	8	-	-	-	-	-	-	-	-		-
	L	12	-	-	12	-	-	-	-	-	-	-	

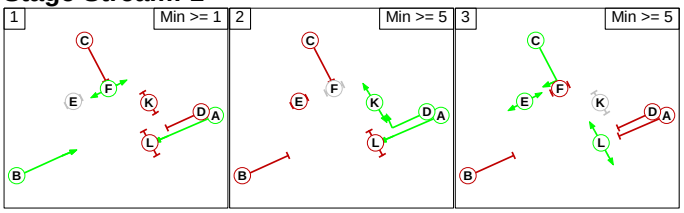
Phases in Stage

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

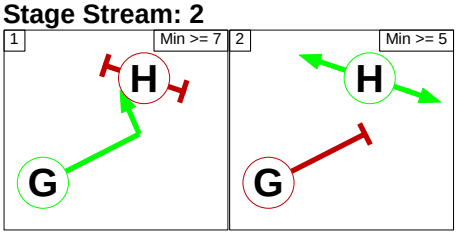
Full Input Data And Results

Stage Diagram

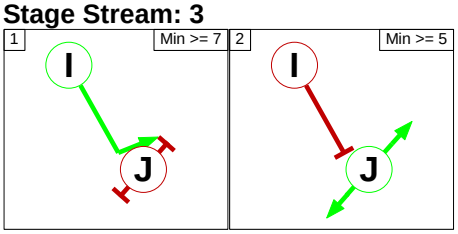
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3



Phase Delays

Stage Stream: 1

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Stage Stream: 2

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Stage Stream: 3

Term. Stage	Start Stage	Phase	Type	Value	Cont value
There are no Phase Delays defined					

Prohibited Stage Change

Stage Stream: 1

		To Stage		
		1	2	3
From Stage	1		8	8
	2	8		8
	3	12	12	

Full Input Data And Results

Stage Stream: 2

	To Stage		
		1	2
From Stage	1		5
	2	7	

Stage Stream: 3

	To Stage		
		1	2
From Stage	1		5
	2	7	

Full Input Data And Results

Give-Way Lane Input Data

Junction: A1085 Trunk Road / Site Access											
Lane	**Movement**	**Max Flow when Giving Way (PCU/Hr)**	**Min Flow when Giving Way (PCU/Hr)**	**Opposing Lane**	**Opp. Lane Coeff.**	**Opp. Mvmnts.**	**Right Turn Storage (PCU)**	**Non-Blocking Storage (PCU)**	**RTF**	**Right Turn Move up (s)**	**Max Turns in Intergreen (PCU)**
2/1 (A1085 Trunk Road West - entry)	6/1 (Left)	1439	0	1/3	1.09	All	2.00	-	0.50	2	2.00
3/1 (Site Access - entry)	4/1 (Left)	715	0	2/2	0.22	All	-	-	-	-	-
				2/3	0.22	All					

Full Input Data And Results

Lane Input Data

Junction: A1085 Trunk Road / Site Access												
Lane	**Lane Type**	**Phases**	**Start Disp.**	**End Disp.**	**Physical Length (PCU)**	**Sat Flow Type**	**Def User Saturation Flow (PCU/Hr)**	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Turns**	**Turning Radius (m)**
1/1 (A1085 Trunk Road East - entry)	U	A	2	3	60.0	User	1900	-	-	-	-	-
1/2 (A1085 Trunk Road East - entry)	U	A	2	3	60.0	User	1900	-	-	-	-	-
1/3 (A1085 Trunk Road East - entry)	U	D	2	3	13.9	User	1900	-	-	-	-	-
2/1 (A1085 Trunk Road West - entry)	O	G	2	3	13.0	User	1900	-	-	-	-	-
2/2 (A1085 Trunk Road West - entry)	U	B	2	3	60.0	User	1900	-	-	-	-	-
2/3 (A1085 Trunk Road West - entry)	U	B	2	3	60.0	User	1900	-	-	-	-	-
3/1 (Site Access - entry)	O	I	2	3	5.0	User	1900	-	-	-	-	-
3/2 (Site Access - entry)	U	C	2	3	60.0	User	1900	-	-	-	-	-
3/3 (Site Access - entry)	U	C	2	3	60.0	User	1900	-	-	-	-	-
4/1 (A1085 Trunk Road East - exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
4/2 (A1085 Trunk Road East - exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/1 (A1085 Trunk Road West - exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
5/2 (A1085 Trunk Road West - exit)	U		2	3	60.0	Inf	-	-	-	-	-	-
6/1 (Site Access - exit)	U		2	3	60.0	Inf	-	-	-	-	-	-

Full Input Data And Results

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
1: 'Early AM Peak'	06:00	07:00	01:00	
2: 'Late PM Peak'	19:00	20:00	01:00	

Scenario 1: '2024 AM Construction Peak' (FG1: 'Early AM Peak', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	433	303	736
	B	242	0	745	987
	C	9	69	0	78
	Tot.	251	502	1048	1801

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 1: 2024 AM Construction Peak
Junction: A1085 Trunk Road / Site Access	
1/1	433
1/2 (with short)	303(In) 0(Out)
1/3 (short)	303
2/1 (short)	745
2/2 (with short)	747(In) 2(Out)
2/3	240
3/1 (short)	9
3/2 (with short)	53(In) 44(Out)
3/3	25
4/1	11
4/2	240
5/1	477
5/2	25
6/1	1048

Lane Saturation Flows

Junction: A1085 Trunk Road / Site Access								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (A1085 Trunk Road East - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900
1/2 (A1085 Trunk Road East - entry Lane 2)	This lane uses a directly entered Saturation Flow						1900	1900
1/3 (A1085 Trunk Road East - entry Lane 3)	This lane uses a directly entered Saturation Flow						1900	1900
2/1 (A1085 Trunk Road West - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900
2/2 (A1085 Trunk Road West - entry Lane 2)	This lane uses a directly entered Saturation Flow						1900	1900
2/3 (A1085 Trunk Road West - entry Lane 3)	This lane uses a directly entered Saturation Flow						1900	1900
3/1 (Site Access - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900

3/2 (Site Access - entry Lane 2)	This lane uses a directly entered Saturation Flow	1900	1900
3/3 (Site Access - entry Lane 3)	This lane uses a directly entered Saturation Flow	1900	1900
4/1 (A1085 Trunk Road East - exit Lane 1)	Infinite Saturation Flow	Inf	Inf
4/2 (A1085 Trunk Road East - exit Lane 2)	Infinite Saturation Flow	Inf	Inf
5/1 (A1085 Trunk Road West - exit Lane 1)	Infinite Saturation Flow	Inf	Inf
5/2 (A1085 Trunk Road West - exit Lane 2)	Infinite Saturation Flow	Inf	Inf
6/1 (Site Access - exit Lane 1)	Infinite Saturation Flow	Inf	Inf

Scenario 2: '2024 PM Construction Peak' (FG2: 'Late PM Peak', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	173	9	182
	B	223	0	69	292
	C	309	739	0	1048
	Tot.	532	912	78	1522

Full Input Data And Results

Traffic Lane Flows

Lane	Scenario 2: 2024 PM Construction Peak
Junction: A1085 Trunk Road / Site Access	
1/1	79
1/2 (with short)	103(In) 94(Out)
1/3 (short)	9
2/1 (short)	69
2/2 (with short)	206(In) 137(Out)
2/3	86
3/1 (short)	309
3/2 (with short)	575(In) 266(Out)
3/3	473
4/1	446
4/2	86
5/1	345
5/2	567
6/1	78

Lane Saturation Flows

Junction: A1085 Trunk Road / Site Access								
Lane	**Lane Width (m)**	**Gradient**	**Nearside Lane**	**Allowed Turns**	**Turning Radius (m)**	**Turning Prop.**	**Sat Flow (PCU/Hr)**	**Flared Sat Flow (PCU/Hr)**
1/1 (A1085 Trunk Road East - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900
1/2 (A1085 Trunk Road East - entry Lane 2)	This lane uses a directly entered Saturation Flow						1900	1900
1/3 (A1085 Trunk Road East - entry Lane 3)	This lane uses a directly entered Saturation Flow						1900	1900
2/1 (A1085 Trunk Road West - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900
2/2 (A1085 Trunk Road West - entry Lane 2)	This lane uses a directly entered Saturation Flow						1900	1900
2/3 (A1085 Trunk Road West - entry Lane 3)	This lane uses a directly entered Saturation Flow						1900	1900
3/1 (Site Access - entry Lane 1)	This lane uses a directly entered Saturation Flow						1900	1900

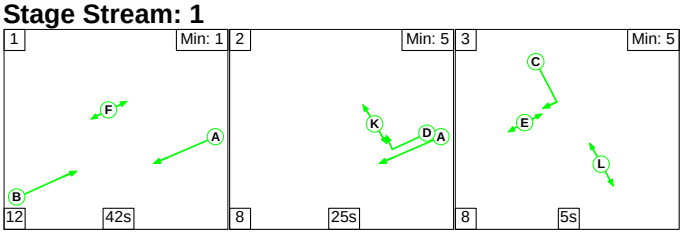
Full Input Data And Results

3/2 (Site Access - entry Lane 2)	This lane uses a directly entered Saturation Flow	1900	1900
3/3 (Site Access - entry Lane 3)	This lane uses a directly entered Saturation Flow	1900	1900
4/1 (A1085 Trunk Road East - exit Lane 1)	Infinite Saturation Flow	Inf	Inf
4/2 (A1085 Trunk Road East - exit Lane 2)	Infinite Saturation Flow	Inf	Inf
5/1 (A1085 Trunk Road West - exit Lane 1)	Infinite Saturation Flow	Inf	Inf
5/2 (A1085 Trunk Road West - exit Lane 2)	Infinite Saturation Flow	Inf	Inf
6/1 (Site Access - exit Lane 1)	Infinite Saturation Flow	Inf	Inf

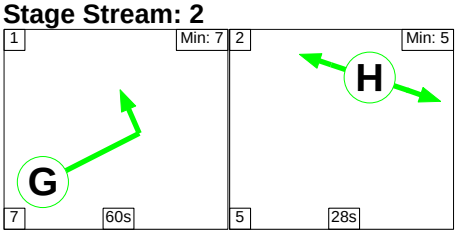
Scenario 1: '2024 AM Construction Peak' (FG1: 'Early AM Peak', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram

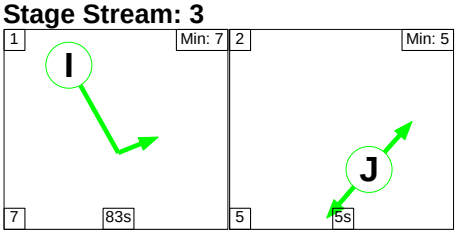
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3



Stage Timings

Stage Stream: 1

Stage	1	2	3
Duration	42	25	5
Change Point	0	54	87

Full Input Data And Results

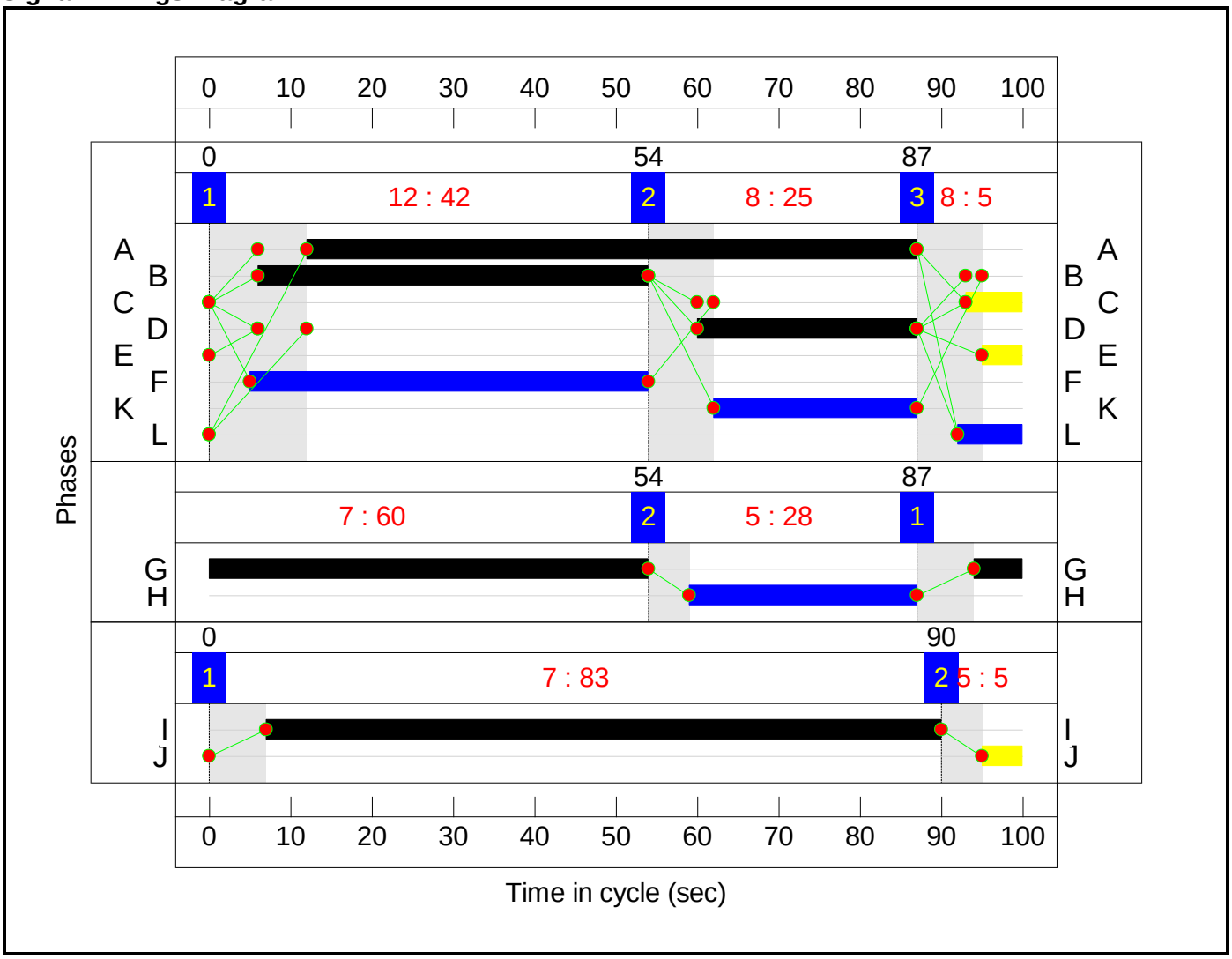
Stage Stream: 2

Stage	1	2
Duration	60	28
Change Point	87	54

Stage Stream: 3

Stage	1	2
Duration	83	5
Change Point	0	90

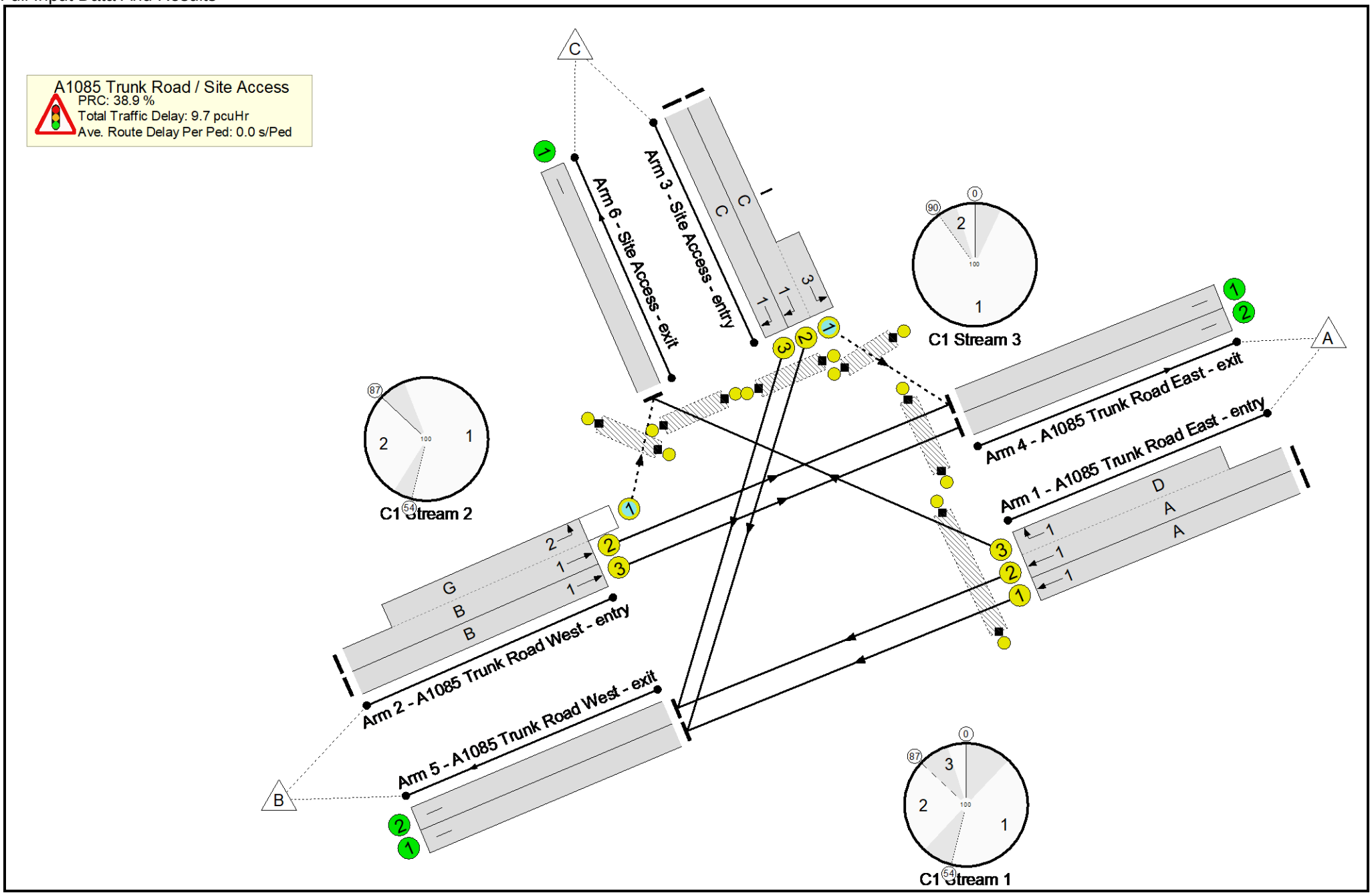
Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram

Full Input Data And Results



Full Input Data And Results

Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**64.8%**
A1085 Trunk Road / Site Access	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**64.8%**
1/1	A1085 Trunk Road East - entry Ahead	U	1	N/A	A		1	75	-	433	1900	1444	30.0%
1/2+1/3	A1085 Trunk Road East - entry Ahead Right	U	1	N/A	A D		1	75:27	-	303	1900:1900	0+532	0.0 : 57.0%
2/2+2/1	A1085 Trunk Road West - entry Ahead Left	U+O	1	N/A	B G		1	48:60	-	747	1900:1900	3+1150	64.8 : 64.8%
2/3	A1085 Trunk Road West - entry Ahead	U	1	N/A	B		1	48	-	240	1900	931	25.8%
3/2+3/1	Site Access - entry Left Right	U+O	1	N/A	C I		1	7:83	-	53	1900:1900	152+31	28.9 : 28.9%
3/3	Site Access - entry Right	U	1	N/A	C		1	7	-	25	1900	152	16.4%
4/1	A1085 Trunk Road East - exit	U	N/A	N/A	-		-	-	-	11	Inf	Inf	0.0%
4/2	A1085 Trunk Road East - exit	U	N/A	N/A	-		-	-	-	240	Inf	Inf	0.0%
5/1	A1085 Trunk Road West - exit	U	N/A	N/A	-		-	-	-	477	Inf	Inf	0.0%
5/2	A1085 Trunk Road West - exit	U	N/A	N/A	-		-	-	-	25	Inf	Inf	0.0%
6/1	Site Access - exit	U	N/A	N/A	-		-	-	-	1048	Inf	Inf	0.0%
Ped Link: P1	Unnamed Ped Link	-	1	-	E		1	5	-	0	-	0	0.0%
Ped Link: P2	Unnamed Ped Link	-	1	-	F		1	49	-	0	-	0	0.0%

Full Input Data And Results

Ped Link: P3	Unnamed Ped Link	-	3	-	J		1	5	-	0	-	0	0.0%
Ped Link: P4	Unnamed Ped Link	-	2	-	H		1	28	-	0	-	0	0.0%
Ped Link: P5	Unnamed Ped Link	-	1	-	K		1	25	-	0	-	0	0.0%
Ped Link: P6	Unnamed Ped Link	-	1	-	L		1	8	-	0	-	0	0.0%

Full Input Data And Results

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	**-**	**-**	**4**	**735**	**15**	**7.5**	**2.3**	**0.0**	**9.7**	**-**	**-**	**-**	**-**
A1085 Trunk Road / Site Access	**-**	**-**	**4**	**735**	**15**	**7.5**	**2.3**	**0.0**	**9.7**	**-**	**-**	**-**	**-**
1/1	433	433	-	-	-	0.4	0.2	-	0.7	5.5	3.7	0.2	3.9
1/2+1/3	303	303	-	-	-	2.6	0.7	-	3.3	38.7	7.2	0.7	7.8
2/2+2/1	747	747	0	730	15	2.6	0.9	0.0	3.5	16.9	13.4	0.9	14.3
2/3	240	240	-	-	-	1.0	0.2	-	1.2	17.5	3.9	0.2	4.0
3/2+3/1	53	53	4	5	0	0.5	0.2	-	0.7	50.0	1.1	0.2	1.4
3/3	25	25	-	-	-	0.3	0.1	-	0.4	57.1	0.6	0.1	0.7
4/1	11	11	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
4/2	240	240	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/1	477	477	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2	25	25	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	1048	1048	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
Ped Link: P1	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P2	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P3	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P4	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P5	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P6	0	0	-	-	-	-	-	-	-	-	-	-	-

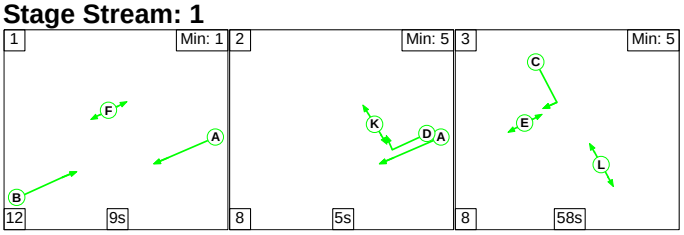
C1 Stream: 1 PRC for Signalled Lanes (%):	38.9	Total Delay for Signalled Lanes (pcuHr):	9.73	Cycle Time (s): 100
C1 Stream: 2 PRC for Signalled Lanes (%):	0.0	Total Delay for Signalled Lanes (pcuHr):	0.00	Cycle Time (s): 100
C1 Stream: 3 PRC for Signalled Lanes (%):	0.0	Total Delay for Signalled Lanes (pcuHr):	0.00	Cycle Time (s): 100
PRC Over All Lanes (%):	38.9	Total Delay Over All Lanes(pcuHr):	9.73	

Full Input Data And Results

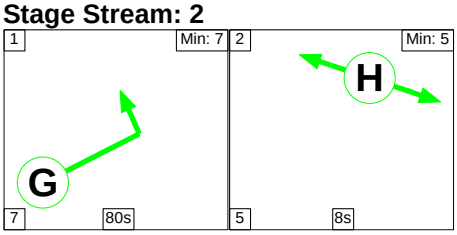
Scenario 2: '2024 PM Construction Peak' (FG2: 'Late PM Peak', Plan 1: 'Network Control Plan 1')

Stage Sequence Diagram

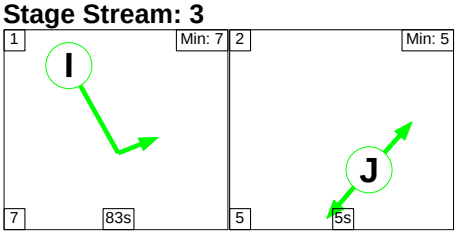
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3



Stage Timings

Stage Stream: 1

Stage	1	2	3
Duration	9	5	58
Change Point	0	21	34

Stage Stream: 2

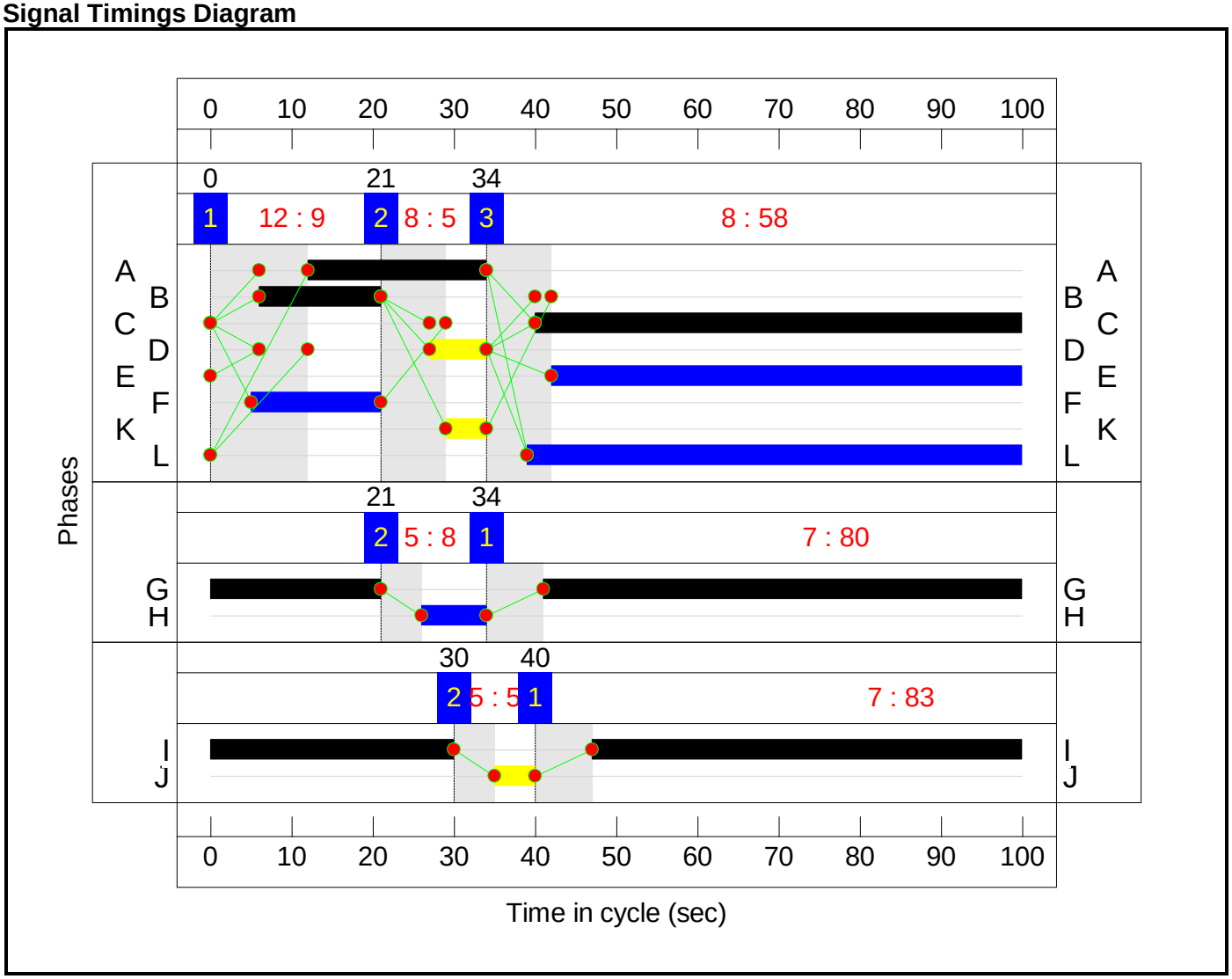
Stage	1	2
Duration	80	8
Change Point	34	21

Full Input Data And Results

Stage Stream: 3

Stage	1	2
Duration	83	5
Change Point	40	30

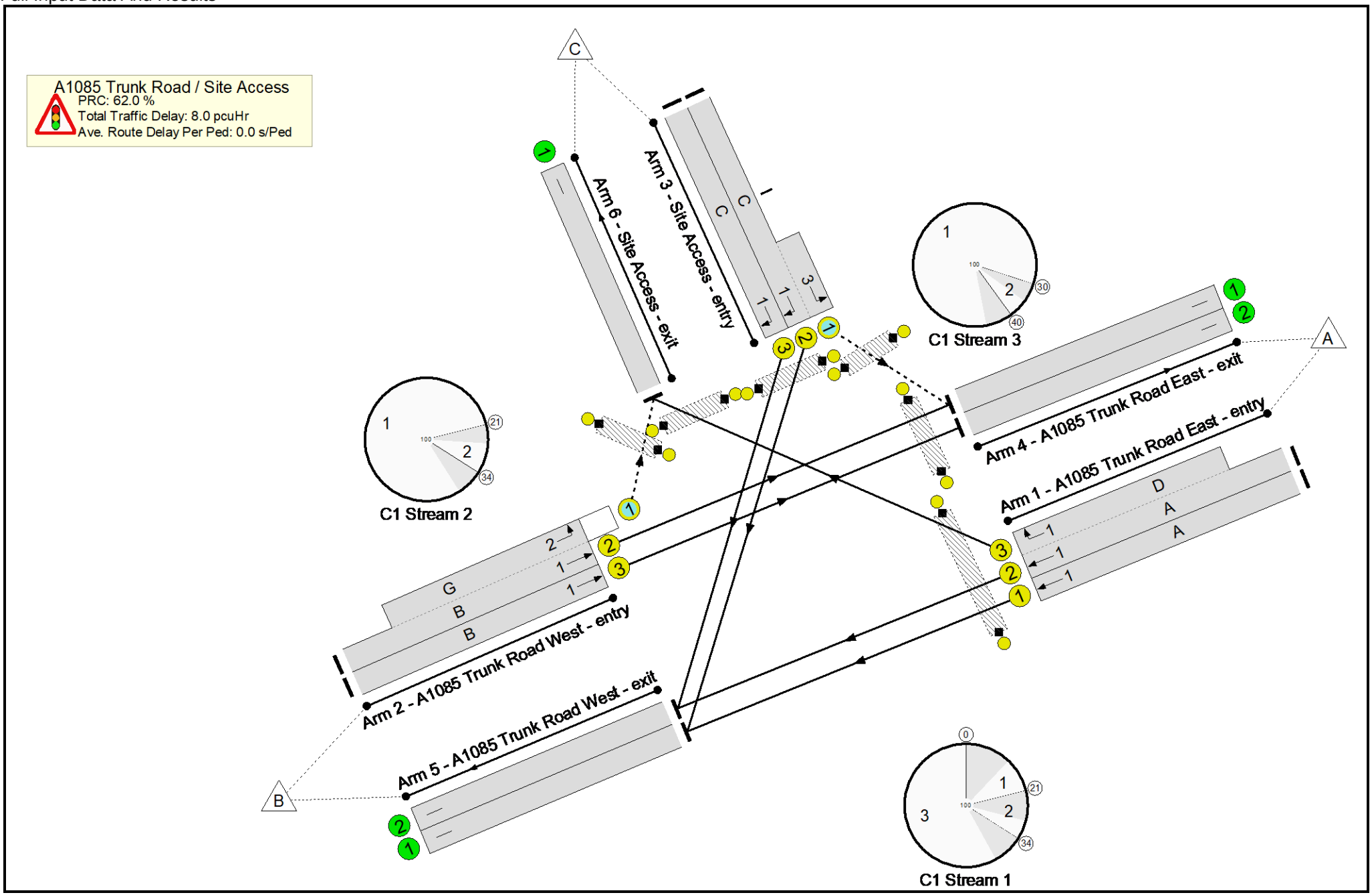
Signal Timings Diagram



Full Input Data And Results

Network Layout Diagram

Full Input Data And Results



Full Input Data And Results

Full Input Data And Results

Network Results

Item	Lane Description	Lane Type	Controller Stream	Position In Filtered Route	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)
Network	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**55.5%**
A1085 Trunk Road / Site Access	**-**	**-**	**N/A**	**-**	**-**		**-**	**-**	**-**	**-**	**-**	**-**	**55.5%**
1/1	A1085 Trunk Road East - entry Ahead	U	1	N/A	A		1	22	-	79	1900	437	18.1%
1/2+1/3	A1085 Trunk Road East - entry Ahead Right	U	1	N/A	A D		1	22:7	-	103	1900:1900	437+42	21.5 : 21.5%
2/2+2/1	A1085 Trunk Road West - entry Ahead Left	U+O	1	N/A	B G		1	15:80	-	206	1900:1900	304+153	45.1 : 45.1%
2/3	A1085 Trunk Road West - entry Ahead	U	1	N/A	B		1	15	-	86	1900	304	28.3%
3/2+3/1	Site Access - entry Left Right	U+O	1	N/A	C I		1	60:83	-	575	1900:1900	479+556	55.5 : 55.5%
3/3	Site Access - entry Right	U	1	N/A	C		1	60	-	473	1900	1159	40.8%
4/1	A1085 Trunk Road East - exit	U	N/A	N/A	-		-	-	-	446	Inf	Inf	0.0%
4/2	A1085 Trunk Road East - exit	U	N/A	N/A	-		-	-	-	86	Inf	Inf	0.0%
5/1	A1085 Trunk Road West - exit	U	N/A	N/A	-		-	-	-	345	Inf	Inf	0.0%
5/2	A1085 Trunk Road West - exit	U	N/A	N/A	-		-	-	-	567	Inf	Inf	0.0%
6/1	Site Access - exit	U	N/A	N/A	-		-	-	-	78	Inf	Inf	0.0%
Ped Link: P1	Unnamed Ped Link	-	1	-	E		1	58	-	0	-	0	0.0%
Ped Link: P2	Unnamed Ped Link	-	1	-	F		1	16	-	0	-	0	0.0%

Full Input Data And Results

Ped Link: P3	Unnamed Ped Link	-	3	-	J		1	5	-	0	-	0	0.0%
Ped Link: P4	Unnamed Ped Link	-	2	-	H		1	8	-	0	-	0	0.0%
Ped Link: P5	Unnamed Ped Link	-	1	-	K		1	5	-	0	-	0	0.0%
Ped Link: P6	Unnamed Ped Link	-	1	-	L		1	61	-	0	-	0	0.0%

Full Input Data And Results

Item	Arriving (pcu)	Leaving (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Uniform Delay (pcuHr)	Rand + Oversat Delay (pcuHr)	Storage Area Uniform Delay (pcuHr)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Max. Back of Uniform Queue (pcu)	Rand + Oversat Queue (pcu)	Mean Max Queue (pcu)
Network	**-**	**-**	**49**	**327**	**1**	**6.2**	**1.8**	**0.0**	**8.0**	**-**	**-**	**-**	**-**
A1085 Trunk Road / Site Access	**-**	**-**	**49**	**327**	**1**	**6.2**	**1.8**	**0.0**	**8.0**	**-**	**-**	**-**	**-**
1/1	79	79	-	-	-	0.7	0.1	-	0.8	36.0	1.8	0.1	1.9
1/2+1/3	103	103	-	-	-	0.9	0.1	-	1.1	37.0	2.1	0.1	2.3
2/2+2/1	206	206	0	68	1	1.5	0.4	0.0	1.9	33.1	3.4	0.4	3.8
2/3	86	86	-	-	-	0.9	0.2	-	1.1	45.2	2.1	0.2	2.3
3/2+3/1	575	575	49	260	0	0.9	0.6	-	1.5	9.3	3.3	0.6	3.9
3/3	473	473	-	-	-	1.3	0.3	-	1.7	12.7	6.7	0.3	7.0
4/1	446	446	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
4/2	86	86	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/1	345	345	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
5/2	567	567	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
6/1	78	78	-	-	-	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0
Ped Link: P1	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P2	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P3	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P4	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P5	0	0	-	-	-	-	-	-	-	-	-	-	-
Ped Link: P6	0	0	-	-	-	-	-	-	-	-	-	-	-

C1	Stream: 1 PRC for Signalled Lanes (%):	62.0	Total Delay for Signalled Lanes (pcuHr):	7.99	Cycle Time (s): 100
C1	Stream: 2 PRC for Signalled Lanes (%):	0.0	Total Delay for Signalled Lanes (pcuHr):	0.00	Cycle Time (s): 100
C1	Stream: 3 PRC for Signalled Lanes (%):	0.0	Total Delay for Signalled Lanes (pcuHr):	0.00	Cycle Time (s): 100
	PRC Over All Lanes (%):	62.0	Total Delay Over All Lanes(pcuHr):	7.99	