

LACKENBY ENVIRONMENTAL STATEMENT

VOLUME 3: TECHNICAL APPENDICES
APPENDICES TO CHAPTER C
(TRANSPORT)

Lackenby, South Tees

Volume 3: Appendices

Chapter C: Transport

December 2020

Appendix C1: Transport Assessment

South Tees Development
Corporation

Lackenby

Transport Assessment

Issue | 20 January 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Introduction

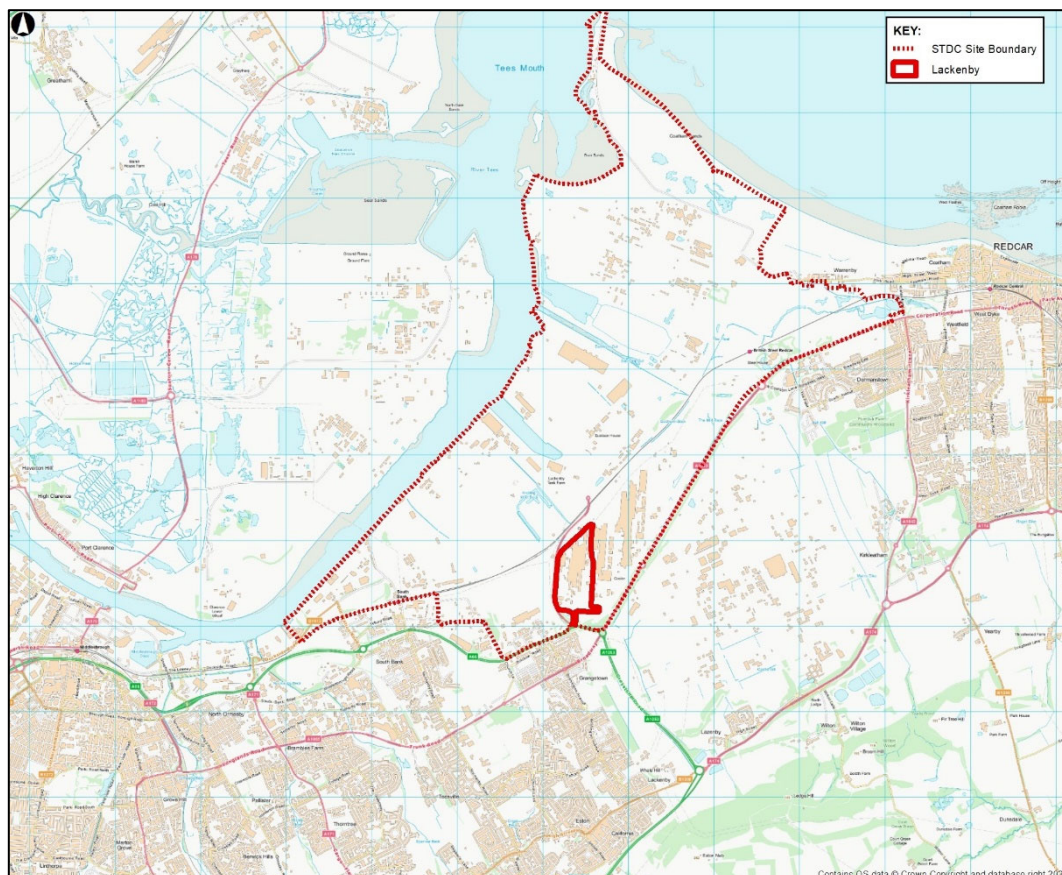
1.1 Background

Arup has been commissioned by the South Tees Development Corporation (STDC) to develop a Transport Assessment (TA), which incorporates a Travel Plan framework, in support of an outline planning application for the development of industrial (B2/B8) land use on the area known as Lackenby within the STDC site. The STDC site is now known as ‘Teesworks’.

The application site is located in the south-western part of the Teesworks area and the proposed maximum floorspace is just under 93,000sqm. It is currently occupied by buildings and structures associated with the former steelmaking facilities. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with up to 10% ancillary office accommodation. The development is forecast to employ approximately 1,080 people when operational (direct and full-time jobs).

The site is located north of the A66, approximately 8km to the west of Redcar town centre and 8km to the east of Middlesbrough town centre. The site location is shown in **Figure 1** and an indicative site plan is attached in **Appendix A**.

Figure 1: Site Location



This document sets out the purpose, methodology, findings and recommendations of the TA. Arup has also prepared the traffic and transportation assessment chapter of the Environmental Statement (ES). This TA forms Appendix C1 of the ES.

The aim of this report is to demonstrate to Redcar and Cleveland Borough Council (RCBC), the local planning and highway authority, and Highways England (HE), that the development proposals are aligned with relevant planning policy and will not have a severe impact on surrounding transport networks.

1.2 Scoping

A TA Scoping Report for the proposed development was shared with RCBC, Middlesbrough Council (as the neighbouring highway authority) and HE on 26 November 2020. The report aimed to agree the methodology and main parameters of the transport assessment of the proposed development and is attached in **Appendix B**.

Consultation responses to the Scoping Report are included in **Appendix B** of this TA. Some of the issues raised by the consultees have been addressed. Specifically, HE asked that the study area be extended to include the SRN and that future growth scenarios should match those applied to the South Bank development (planning application number R/2020/0357/OOM). Further information about the mode share assumptions was requested, and it was advised that traffic distributions be informed by Census data. The methodology of the assessment for traffic forecasting follows the approach used for South Bank, and Census journey to work data has been analysed to inform trip distributions. The mode share assumptions, and adjustments to car mode share forecasts to account for the provision of a bus service, are outlined in this assessment.

RCBC noted that the assessment should set out how pedestrians and cyclists will access the site from first occupation. In addition, RCBC request that further infrastructure for electric vehicles and hydrogen filling stations should be considered. The application is for outline planning and therefore these matters have not been addressed in the assessment, however, they will be subject to review at reserved matters stage.

There may be some requests from stakeholders that have not been fully addressed prior to planning submission. Arup will continue to liaise with all parties on transport matters following submission and throughout the determination of the application.

1.3 Context

The proposed development is one of five outline planning applications being submitted for development on the Teesworks sites in December 2020. The other development sites are at Dorman Point, Long Acres, The Foundry and Steel House. A plan is shown in **Figure 2**.

Figure 2: Location plan of Teesworks sites



The application follows a submission in summer 2020 for development on the South Bank site (planning application number R/2020/0357/OOM).

2 Planning Policy and Strategy Context

This section outlines the national, regional and local transport policy context within which the development is assessed. Planning policies and strategies relevant to the development proposal are as follows:

- National Planning Policy Framework;
- Tees Valley Combined Authority Strategic Transport Plan 2020 - 2030;
- Tees Valley Design Guide and Specification – Residential and Industrial Estates Development;
- Transport for the North Strategic Transport Plan;
- Redcar and Cleveland Local Plan;
- Redcar and Cleveland South Tees Area Supplementary Planning Document; and
- South Tees Regeneration Master Plan.

2.1 National Planning Policy

2.1.1 National Planning Policy Framework (2019)

The National Planning Policy Framework (NPPF) 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.

Core planning principles related to sustainable transport and relevant to the proposed development are outlined below:

108. In assessing sites that may be allocated for development in plans, or specific applications for development, it should be ensured that:
 - a. Appropriate opportunities to promote sustainable transport modes can be – or have been – taken up, given the type of development and its location;
 - b. Safe and suitable access to the site can be achieved for all users; and
 - c. Any significant impacts from the development on the transport network (in terms of capacity and congestion), or on highway safety, can be cost effectively mitigated to an acceptable degree.
109. 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.
110. Within this context, applications for development should:
 - a. Give priority first to pedestrians and cycle movements, both within the scheme and with neighbouring areas; and second – so far as possible – to facilitating access to high quality public transport, with layouts that

- maximise the catchment area for bus or other public transport services, and appropriate facilities that encourage public transport use;
- b. Address the needs of people with disabilities and reduced mobility in relation to all modes of transport;
 - c. Create places that are safe, secure and attractive – which minimise the scope for conflicts between pedestrians, cyclists and vehicles, avoid unnecessary street clutter, and respond to local character and design standards;
 - d. Allow for the efficient delivery of goods, and access by service and emergency vehicles; and
 - e. Be designed to enable charging of plug-in and other ultra-low emission vehicles in safe, accessible and convenient locations.
111. All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of proposal can be assessed.

National Planning Policy Compliance

The application for the proposed development is accompanied by this Transport Assessment which assesses and mitigates, as far as reasonably possible, the forecast impact on the local highway network, as well as encouraging sustainable travel behaviours. The development meets these stated objectives as it will form part of the wider Teesworks site, for which a sustainable Transport Strategy is currently being developed. This TA also includes a Travel Plan framework with some initial measures that can be implemented at the development, in advance of the Transport Strategy being adopted.

The proposed development is therefore aligned with national transport policy.

2.2 Regional Policy

2.2.1 Tees Valley Combined Authority Strategic Transport Plan 2020-2030

The South Tees area is included in the Strategic Transport Plan (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 the South Tees Development Corporation Master Plan as one of the key actions towards achieving this goal.

The transport vision for Tees Valley that is set out in the STP is as follows:

“To provide a high quality, quick, affordable, reliable, low carbon and safe transport network for people and freight to move within, to and from Tees Valley.”

The STP outlines key issues within the region such as high car mode share, despite a high majority of local residents working within the Tees Valley region. The STP therefore identifies opportunities from these issues and focuses on providing an effective transport system for local people and businesses by connecting centres, improving journey times, upgrading major roads and enhancing existing rail links.

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.

2.2.2 Tees Valley Design Guide and Specification – Residential and Industrial Estates Development

The Design Guide and Specification presents the standards for car parking and cycle parking provisions for residential and industrial developments in the Tees Valley area.

For industrial developments, the maximum car parking and minimum cycle parking standards are as follows:

- Sufficient operational parking and area for manoeuvring within the site;
- 1 space per 45m² gross floor area or 4 spaces per 10 employees (whichever is the greater); and
- Provision for the parking of 2 cycles per 200m² gross floor area.

The document also specifies that disabled car parking spaces should be in addition to the maximum parking standards for each site, and provision for car parks associated with employment premises and provided for employees and visitors should be as follows:

- Up to 10 spaces 1 space;
- Between 10 and 200 spaces; 5% of capacity, subject to a minimum of 2 spaces, to be reserved; and
- Over 200 spaces: 2% plus 6 spaces.

2.2.3 Transport for the North Strategic Transport Plan

Transport for the North (TfN) published its Strategic Transport Plan in 2019. The document sets out the priorities for transport infrastructure investment for the next 30 years. TfN’s vision is of *‘a thriving North of England, where world class*

transport supports sustainable economic growth, excellent quality of life and improved opportunities for all’.

Supporting the vision are four pan-Northern transport objectives which align with the Government’s Industrial Strategy:

- Transforming economic performance;
- Increasing efficiency, reliability, integration and resilience in the transport system;
- Improving inclusivity, health and access opportunities for all; and
- Promoting and enhancing the built, historic, and natural environment.

The Investment Programme for the Transport Plan includes the following outcomes and actions which are of relevance to the proposed development and the wider South Tees site:

Table 1: TfN Strategic Transport Plan Outcomes and Actions relevant to the Site

Outcome	Actions
Facilitating significant private sector investment to support economic growth and UK competitiveness	Allowing larger freight trains to access Tees Valley directly to/from the south through gauge enhancements and journey time improvements
Enhancing North-South strategic connections across the North to support UK competitiveness	Darlington Station Growth Hub, Northallerton to Newcastle capacity enhancements and New Tees Crossing
Improve connectivity and resilience to the Tees Valley City Region economic clusters, particularly the South Tees Development Corporation site	Journey time improvements on the Bishop and Saltburn railway lines, and between Middlesbrough and York A66 Darlington to Teesport capacity improvements A174 / A1053 Greystones Roundabout

The proposed development is expected to benefit from future improvements to the transport network delivered through the TfN Investment Programme.

Regional Planning Policy Compliance

The site will include active transport measures to connect to the existing network on the local roads in the vicinity of the site. In addition, there is the opportunity for the site to seek to align with the active transport principles in accordance with the emerging wider South Tees Transport Strategy once approved. Cycle parking and associated supporting facilities in exceedance of local standards will be provided within the site. The details of these provisions will be agreed once the detailed nature of the scheme is known.

The development is located in close proximity to South Bank railway station. The development will also benefit from new sustainable transport provisions across the wider site and improvements to existing provisions in the wider area, through the emerging Transport Strategy. The proposed development is therefore aligned with regional planning policy.

2.3 Local Planning Policy

2.3.1 Redcar and Cleveland Local Plan (2018)

The Redcar and Cleveland Local Plan was adopted in May 2018. 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.

Of particular relevance is Policy LS4: South Tees Spatial Strategy. With regards to transport, the policy seeks to:

- Improve links between South Tees and the Strategic Road Network;
- Support improvements to the road network to support economic growth;
- Deliver rail improvements to support rail freight;
- Investigate the feasibility of a new rail halt at Wilton International;
- Maintain and improve public transport connectivity;
- Support the extension of the road network to unlock the development potential of South Tees; and
- Maintain and enhance walking routes from nearby towns to the South Tees employment areas.

In March 2019, the Council agreed a motion which declared a climate emergency and made commitments to:

- Make the Borough carbon neutral by 2030 taking account of production and consumption emissions;
- Seek powers and resources from Government to make the 2030 target possible; and

- Work with other local and regional Governments (both within the UK and internationally).

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, access to energy and utilities. Specific policies of relevance include:

- Policy SD4 relates to the general development principles and includes the requirements for locating development on appropriate sites with compatible surroundings, ensuring development is located in a sustainable and safe location, and ensuring there is adequate infrastructure to serve the development.
- Policy LS4 includes the objective to improve the accessibility of employment sites by a range of transport methods.
- Policy TA1 relates to transport and new development and includes the requirement for new developments to encourage transport choice and non-car modes.
- Policies TA2 and TA3 relate to improving accessibility by bus across the borough and improving the walking cycling and public rights of way networks respectively.

With regards to connectivity opportunities, Policy TA2 identifies schemes for improving accessibility within and beyond the borough. One of the key actions included in the policy refers to the delivery of the South Tees Dockside Road access to the site.

Local Planning Policy Compliance

Junction capacity assessments have been undertaken at key junctions in the vicinity of the site, to assess the impact of the proposed development on the local and Strategic Road Network. Whilst the assessment has identified significant effects on specific junctions, it is noted that the assessment represents a worst-case scenario in terms of future mode share and potentially development vehicle traffic distribution. In reality, it is expected that the physical walking and cycling measures and the public transport improvements that will be provided as part of the sustainable transport measures of the emerging wider Transport Strategy will promote greater mode shift to sustainable modes across the wider site.

The proposed development is therefore aligned with local planning policy.

2.4 South Tees Area Specific Documents

2.4.1 Redcar and Cleveland South Tees Area Supplementary Planning Document (2018)

The SPD for the South Tees area was adopted in May 2018. One of the key objectives of the SPD is delivering efficient connectivity across the South Tees

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.

In terms of phasing of the Teesworks site, the SPD indicates that early phases for the site should be the areas where transport access/egress is presently afforded.

With regards to transport infrastructure, Development Principle STDC5 states that the Council will, in partnership with the STDC and transport operators, other stakeholders and developers, seek to improve and enhance the transport infrastructure serving the South Tees 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 South Tees Area is a major attribute for development and a key opportunity for improving access to significant employment opportunities by public transport. The existing South Bank railway station is optimally located to serve the South Industrial Zone. 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.

2.4.2 South Tees Regeneration Master Plan (November 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 Teesworks 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.

Lackenby is located within the South Industrial Zone of the Master Plan. The Master Plan refers to the new highway access proposed off the A66 / Tees Dock Road roundabout via the introduction of a fourth arm off the roundabout. It notes that as this is located at the interface of the existing highway corridor, it should be achieved relatively cost effectively.

On a wider scale, the Master Plan also discusses freight and passenger rail connectivity to the Teesworks site, referencing the opportunities for improvements at the under-used freight rail infrastructure, as well as the proposed improvements to the South Bank station to address the increase in passenger demand.

The Master Plan also 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.

Site-specific Policy and Strategy Compliance

The proposed development is aligned with the site specific policies and the Master Plan for the site, as it will provide improvements to the transport network to allow access to the development by sustainable and active travel modes, including physical measures (e.g. cycle parking and associated facilities, internal walking and cycling network), as well as other measures included in the Transport Strategy for the wider site, currently being developed.

This Transport Assessment assesses the impact of the proposed development on the local and Strategic Road Network, to identify the impact of the proposed development on neighbouring junctions, and provides embedded mitigation, in the form of sustainable transport initiatives from the emerging site-wide Transport Strategy.

3 Baseline Conditions

3.1 Site Description and Location

The application site, Lackenby, is a brownfield site located within the Teesworks area and makes up part of the area known as the South Industrial Zone within the STDC Master Plan. It extends to an area of approximately 35.8 hectares. The site's history includes iron and steel industries and is currently extensively occupied by buildings associated with the Cleveland Iron and Steel Works. The site is located north of the A66, approximately 8km to the west of Redcar town centre and 8km to the east of Middlesbrough town centre.

The site is bounded by internal Teesworks road infrastructure to the north west, the east and the south and Tees Dock Road to the west.

3.2 Sustainable Transport Networks

3.2.1 Walking and Cycling

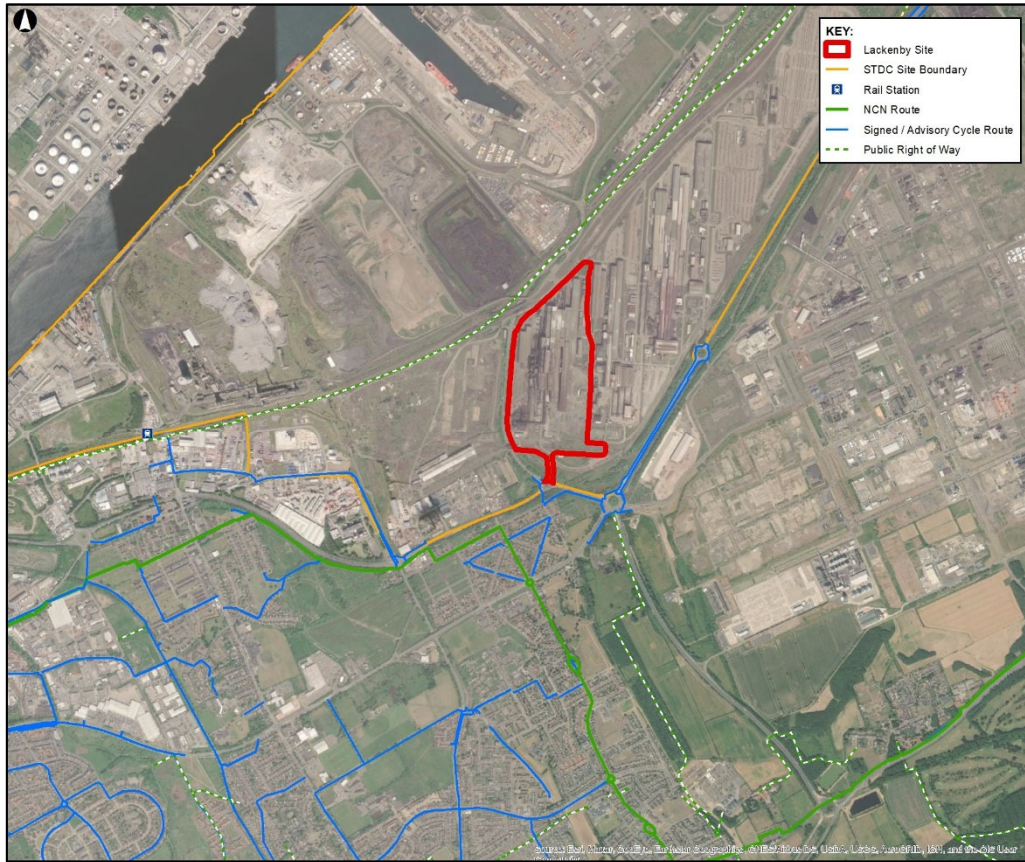
Walking facilities in the vicinity of the site are currently limited. All roads have footways on at least one side of the carriageway.

The nearest National Cycle Route (NCR) is NCR1 which runs along Bolckow Road, approximately 400m (linear distance) from the south of the site. NCR1 provides strategic connections between Saltburn, Marske, Redcar and Middlesbrough.

On-road local cycle routes are also provided through Eston, Grangetown and South Bank to the south of the site, (on-road signed routes in some locations and advisory routes through quiet streets in other locations).

Owing to the scale and the historic use of the site, existing access to and from the site to nearby residential areas or local transport connections on foot or by bicycle is limited. There is a Public Right of Way (PRoW) that traverses the site. This forms part of the Teesdale Way which extends from Cumbria to the east coast. Through the site it generally runs parallel to the railway corridor until Coatham Marsh where it travels north/south through the site to the coast.

An overview of active travel provisions in the wider area is shown in **Figure 3**.

Figure 3: Active travel provisions in the vicinity of the site

3.2.2 Public Transport

Bus Services

There are currently no bus services in the immediate vicinity of the site, with the nearest bus stops located in the residential area of Grangetown, approximately 1.2km walking distance to the south of the site. The bus stops are served by bus services 62 and 64/64A and the services are shown in **Table 2**. Additional bus stops are located on the Trunk Road the east of the A1053/Trunk Road roundabout.

Table 2: Bus Services

Route No.	Bus Stop	Route	Daytime frequency (minutes) per direction	
			Monday – Saturday	Sunday
62	St George's Road/Broadway	Marske – Redcar – Dormanstown – Grangetown – Middlesbrough	Every 30 minutes	Every hour
64 / 64A	St George's Road/Broadway	Eston – Redcar – Dormanstown – Grangetown - Bankfields – South Bank - Middlesbrough	Every 30 minutes	Every hour

**Only key intermediate stops noted*
***Services shown above reflect timetable changes due to travel restrictions during the Covid 19 pandemic*
Sources: Arriva

Railway Services

South Bank railway station is located approximately 3km to the west of the site. The station is serviced by Northern, which provides hourly services between Bishop Auckland (via Darlington) and Saltburn.

Additional railway services are provided at Redcar Central railway station (approximately 6km linear distance to the east of the site). The station is serviced by Transpennine Express and Northern, which provides hourly services between Manchester Airport, Bishop Auckland (via Darlington) and Saltburn.

3.3 Highway Network

3.3.1 Local Highway Network

The local highway network consists of the following key roads:

- A66, a dual four-lane carriageway in the vicinity of the site, runs in an east-west direction to the south of the site, and connects to the A19 to the west and to the A1053 and Trunk Road to the east. The A66 is a key east-west corridor that links Middlesbrough to Redcar;
- A1085 Trunk Road, a four-lane dual carriageway, runs in a north-south direction to the east of the site.
- Tees Dock Road is a two-lane single carriageway along most of its length, that runs to the west of the site.

3.3.2 Strategic Road Network

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 A66, Tees Dock Road, and Trunk Road, which is the key corridor into Redcar town centre in the north. To the south, the A1053 connects to the A174 and B1380 High Street at the Greystones roundabout; 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.

3.4 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 **Figure 4** and **Table 3**.

Figure 4: Study Area Collision Map (Source: <https://www.crashmap.co.uk/>)

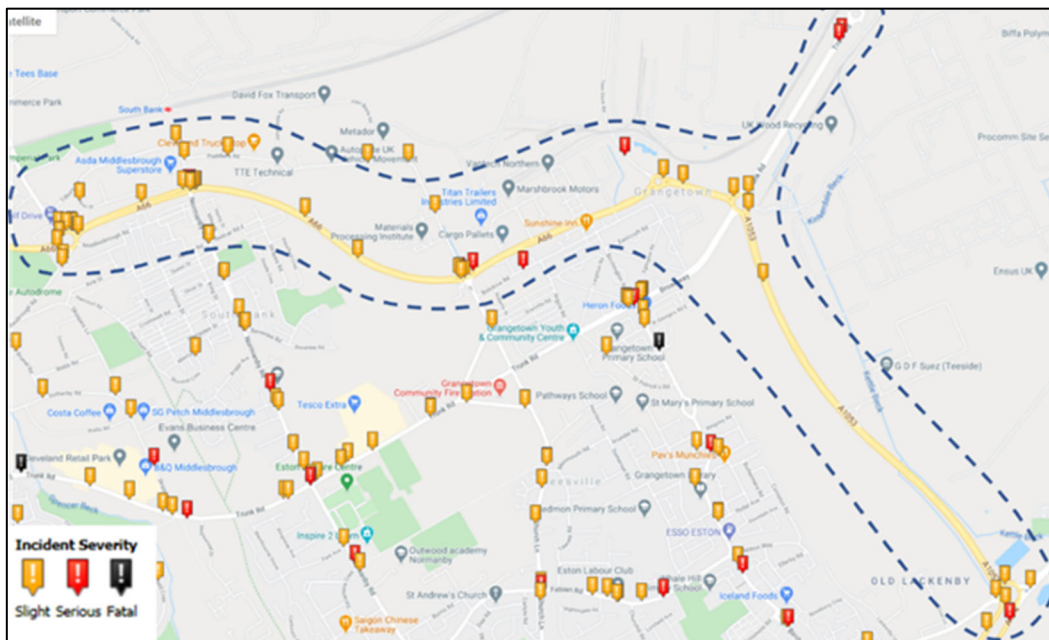


Table 3: Study Area Collision Data (2015-2019)

Severity	2015	2016	2017	2018	2019	Total
Fatal	0	0	0	0	0	0
Serious	4	0	1	1	1	7
Slight	10	9	6	6	7	38
Total	14	9	7	7	8	45

Table 3 shows that 2015 recorded the most collisions within the study area, with a total of 14 collisions, and both 2017 and 2018 recorded the least amount, with 7 collisions recorded each of these years. The most recent year of data recorded, 2019, noted a total of 8 collisions within the study area.

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.

3.4.1 A66 / Eston Road

Five collisions took place between 2015 and 2019 at the A66 / Eston Road junction. Two of these collisions resulted in serious injuries, both of which took place in 2015, and three were slight injuries. Four out of the total five collisions happened in 2015 and one in 2017. All collisions involved two vehicles and one casualty per incident.

At the A66 / Eston Road junction there are two collisions classified as serious, involving pedal cyclists, but there appears to be no common causation factor to these collisions.

3.4.2 A66 / Tees Dock Road / A1053

Two collisions with slight injuries were recorded at the A66 / Tees Dock Road / A1053 roundabout during the study period; one in 2015 and one in 2018. A collision resulting in serious injuries occurred in 2017 on Tees Dock Road, further north of the junction. This collision comprised of two vehicles and one casualty.

3.4.3 A66 / Normanby Road

Nine collisions were recorded at the A66 / Normanby Road junction during the 2015-2019 study period. Two resulted in serious injuries (one in 2018 and one in 2019), with the remaining seven collisions resulting in slight injuries. Three of the collisions took place in 2015, three occurred in 2016, and one happened each year between 2017 and 2019.

There is a trend that the collisions at the A66 / Normanby Road crossroads appear to be related to vehicles making a turning manoeuvre. One of the collisions that took place at the junction between 2015 and 2019 also involved a vulnerable road user (cyclist), resulting in serious injury to the cyclist.

3.4.4 A66 / Middlesbrough Road / Old Station Road

At the A66 / Middlesbrough Road / Old Station Road roundabout, the data indicates that ten collisions resulting in slight injuries were recorded between 2015 and 2019. The majority of these collisions occurred on approach to the junction, and two were located on Middlesbrough Road, away from approaches to the junction. Three collisions happened during 2019, four took place in 2018, and one collision occurred in each year between 2015 and 2017.

All the collisions recorded at this roundabout are categorised as slight and there are no common causation factors, with collisions distributed around the junction and appearing to be minor shunt type collisions. No collisions involving vulnerable road users were noted at the junction during the reviewed time period.

3.4.5 A1053 / A1085 Trunk Road

Three collisions with slight injuries were recorded in the study period at the A1053 / A1085 Trunk Road roundabout. Two of the collisions happened in 2019 and one in 2016. All incidents consisted of two vehicles and one casualty per incident.

3.4.6 A174 / A1053 Greystone Road (Greystones Roundabout)

Six collisions were noted at the A1053 Greystones roundabout between 2015 and 2019. Three collisions occurred in 2016 and two took place in 2015, all of which were slight injuries. Another collision happened in 2015 which was of serious severity. There does not appear to be any common theme between the collisions.

3.4.7 A1085 Trunk Road

Two serious collisions have occurred, between 2015 and 2019, on approach to the A1085 Trunk Road roundabout. One collision happened in 2015 involving two vehicles, resulting in one injury. Another collision happened in 2018, which involved 2 vehicles and resulted in 3 injuries.

3.4.8 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:

- A66 / Eston Road signalised junction,
- A66 / Normanby Road signalised crossroads; and
- A66 / Middlesbrough Road / Old Station Road roundabout.

No common causation factors have been identified except at the A66 / Normanby Road junction where vehicles turning right was recorded as the vehicle manoeuvre in five of the nine collision records.

4 Development Proposals

4.1 Development Description

It is expected that the proposed outline planning application will be for the development of up to 92,903sqm (gross) of general industry (use class B2) and storage and distribution facilities (use class B8) with up to 10% ancillary office accommodation (use class E), HGV and car parking and associated works.

The site is expected to be fully operational by 2031. When fully operational, the site is forecast to be able to accommodate approximately 1,080 employees.

4.2 Vehicular Site Access

Access into the site will be via a new arm on the A66 / Tees Dock Road / A1053 roundabout. All matters are reserved for the planning application, and therefore a highway design of the access has not yet been developed. For the purpose of the highway capacity assessment, it has been assumed that the new access off the roundabout will be four lanes wide (two lane approach and two-lane exit). An additional access point will be available from the Teesworks internal road network.

The vehicular access arrangement is as proposed within the STDC Master Plan adopted in November 2019 (see Section 2.4.2).

4.3 Pedestrian and Cycling Facilities

A walking and cycling network will be provided across the site and will connect to existing facilities on the site accesses and surrounding area. The internal walking and cycling network will be developed (where possible) alongside the emerging Transport Strategy for the wider Teesworks site and agreed through the reserved matters application for the proposed development, or via an appropriately worded planning condition. Associated facilities such as cycle parking, showers and lockers etc will also be provided within the proposed development, the details of which will be agreed through the reserved matters application.

The Transport Strategy is currently being developed. Some of the key outcomes included in the strategy are expected to include the following:

- High quality public transport, walking and cycling routes and connections are prioritised over other transport modes;
- Cycling and walking connections to local residential centres are safer, more attractive, widely used and support local town centre regeneration;
- Transport options enable improved individual health and wellbeing and access to jobs; and
- Transport options will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers.

It is expected that the strategy for the wider site will propose a series of measures to be implemented across the Teesworks site in order to achieve these outcomes, which is expected to include, amongst other things, limiting car parking provision, introducing mobility hubs, providing high quality cycling parking and improving public transport provision. There is an opportunity for future occupiers of the proposed development to sign up to the Transport Strategy to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). Furthermore, they will benefit from the measures introduced to enhance the accessibility of the site. This strategy provides the opportunity to help minimise the impact of the proposed development.

4.4 Public Transport Facilities

The proposed development will benefit from improvements to the existing public transport facilities in the wider area and new provisions within the Teesworks site, as part of the emerging Transport Strategy for the wider site.

A dedicated bus service is proposed to connect the local towns of Middlesbrough and Redcar to the development site. The bus service will travel into the site to provide a service that connects directly to the development.

4.5 Car Parking

As an outline planning application, the internal site layout has not yet been developed and therefore the level of car parking provision is expected to be agreed once the detailed design of the scheme is known.

It is envisaged that the emerging Transport Strategy for the area will limit car parking within the site as far as reasonably possible, to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). Therefore, this TA does not include a car parking assessment but assumes that car mode share is in line with baseline conditions, to assess a worst-case scenario with regards to the potential highway impact. However, it is expected that investment will be made in alternative transport provision to support the wider South Tees strategy and limit private car trips to / from the site.

The emerging Transport Strategy includes aims to prioritise public transport and active travel over other modes, ensure that the site does not feel dominated by cars and other vehicles, and the transport options provided will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers. To achieve these outcomes, it is expected that the Strategy will propose a series of measures to limit car use to the site, such as providing centralised car parks, providing priority parking for car sharers, providing EV charging infrastructure, and enforcing car parking restrictions, amongst others.

4.6 Cycle Parking

The development will provide cycle parking spaces in excess of the current Tees Valley standards (*Tees Valley Design Guide and Specification – Residential and Industrial Estates Development*) in accordance with the Transport Strategy that is

being developed for the wider South Tees site. The development will also provide supporting facilities for walking and cycling, such as showers, changing rooms, land lockers, as mentioned in Section 8.

Details about the cycle parking spaces and associated facilities for the proposed development will be agreed through the reserved matters application.

5 Trip Generation

5.1 Person Trips

The development proposals are for B2/B8 industrial use, with ancillary office use (up to 10%). It has been forecast that when fully operational (2031), the development could accommodate approximately 1,080 employees.

To determine how many trips the employees would generate on a daily basis, we have derived trip rates from the TRICS database. TRICS is a recognised database widely used by transport professionals, which predicts trip rates of developments based on survey information of comparable sites.

It is difficult to find comparable sites given the scale of the proposed development, but four industrial estate type sites were identified in the TRICS database that were of similar scale and predominately B2/B8 use (with 10% office use). However, during the consultation process for the South Bank planning application, Middlesbrough Council indicated that the trip rates that were applied on the TeesAMP development (planning application number 18/0308/FUL) should be applied at the Teesworks site. The TeesAMP trip rates are more applicable to smaller sized industrial sites and therefore could be applicable at Lackenby.

The trip rates per employee are shown in **Table 4** with further details contained in the TA Scoping Report (see **Appendix B**).

Table 4: Person Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Trip Rate	0.475	0.245	0.720	0.175	0.425	0.60	3.434	3.435	6.869

No information is provided within the TeesAMP Transport Assessment regarding service vehicle trip rates. Therefore, the proportion of LGV and HGV trips from the South Bank TA analysis has been applied to the data to distinguish service vehicle trips. **Table 5** presents the HGV and LGV proportions extracted from the South Bank TA.

Table 5: LGV and HGV proportions

Trip rates/employee	AM Peak (08:00 – 09:00)		PM Peak (17:00 – 18:00)		Daily (7am – 7pm)	
	In	Out	In	Out	In	Out
LGV %	9%	25%	13%	5%	14%	14%
HGV %	6%	18%	18%	3%	10%	10%

The service and delivery vehicle proportions (light goods vehicles and heavy goods vehicles) have been shown to disaggregate the overall person trip rate and determine how many trips are likely to be made by commuters, versus service

vehicle trips. The trips for each mode, based on 1,080 employees, are shown in **Table 6**.

Table 6: Total Trips

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	513	265	778	189	459	648	3,709	3,710	7,419
LGVs	46	66	112	25	23	48	519	519	1,039
HGVs	31	48	78	34	14	48	371	371	742
Person Trips (excluding LGVs/HGVs)	436	151	587	130	422	553	2,819	2,819	5,638

The data in **Table 6** shows that LGVs account for approximately 14% of total daily trips, with HGVs accounting for 10% of total daily trips based on the surveys from other industrial estates. Excluding servicing trips, the site is forecast to generate 5,638 two-way commuter trips on a daily basis (and approximately 590 and 550 two-way trips in the AM and PM peak hour respectively).

5.2 Trips by Mode of Transport

Having established a method for calculating the number of trips generated by the proposed development, the person trips (excluding servicing) have been distributed onto transport modes using data from the 2011 UK Census Journey to Work dataset. This data records how people working in this area (Census zone E02002517) travelled to work in 2011 and the results are shown in **Table 7**.

Table 7: 2011 Census Method of Journey to Work (Destination Zone - E02002517)

Mode	2011 UK Census Southern Zone
Car Driver	69%
Car Passenger	8%
Bus	5%
Bicycle	2%
Walking	13%
Motorcycle	0%
Other	3%

It can be seen that 69% of trips to the South Tees area for the purpose of work were made by car in 2011. It is expected that the emerging Transport Strategy for the site will seek to reduce this mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.

It is however proposed that one of the earlier measures implemented be a dedicated bus service to connect the local towns of Middlesbrough and Redcar to

the development site. The existing bus stops are outside a reasonable walking distance to the centre of the site, so it is proposed that a service be provided that travels into the Lackenby site. This service will be extended to serve other Teesworks developments as they come forward. If at least 5% of people who would usually travel by car could be encouraged to travel by the bus service, it would remove 30 two-way car trips in the AM peak hour. This forecast seems reasonable and would be realistic given that the bus would operate at least every 15 minutes and therefore be capable of accommodating a much higher number of passengers. It would therefore be hoped that many more would use the bus service than the conservative forecast estimates.

The provision of a bus service, alongside other travel planning measures, is therefore considered to enable at least a 5% reduction in those travelling to the site by car when these sites are operational.

It is therefore assumed that the maximum baseline car mode share for Dorman Point be 64%. Applying this mode share to the person trip generation (excluding servicing), results in the commuter vehicular trip generation outlined in **Table 8**.

Table 8: Total Vehicular Trip Generation

	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Employee Car Trips	279	97	376	83	270	354	1,804	1,804	3,608
LGVs	46	66	112	25	23	48	519	519	1,039
HGVs	31	48	78	34	14	48	371	371	742
Total Vehicular Trips	356	210	566	142	307	449	2,694	2,695	5,389

5.3 Vehicular Trip Distribution and Assignment

The development site could have two vehicular access points when operational. The main access will be via a new fourth arm provided on the A66/Tees Dock Road roundabout into the site. A further access could be via the internal Teesworks road network.

Census data has been used to inform trip distribution at the development access. Travel to work data from the 2011 Census has been downloaded for those travelling to the South Tees area in 2011. In 2011 the site was operating as a steel works and whilst noting that the proposed use could alter the trip attraction of the site, the zone includes the Wilton International Site, so it was likely to have a relatively mixed geographical draw in 2011. Origins with 1% of total trips or more were extracted and the most likely direction of travel to the site identified based on Google Maps directions. The detailed data is attached in **Appendix C** but to summarise, it was concluded that approximately 80% of trips would travel to the site from the east (via routes including A1053, Trunk Road and A174) and approximately 20% would be from the west (via the A66 and A19).

Traffic has been distributed on the remainder of the network using the turning proportions in the baseline traffic flow diagrams. The traffic distribution, and resultant morning and evening peak hour vehicular development trips, are shown in **Appendix D**.

6 Sustainable Transport Network Impact Assessment

6.1 Public Transport

A dedicated bus service will be provided to support the development, providing a service at least every 15 minutes in the peak hour between the site and neighbouring towns of Middlesbrough and Redcar.

It is expected that the emerging Transport Strategy for the South Tees Regeneration Master Plan will bring forward accessibility enhancements to encourage a greater proportion of people to travel to and from the site sustainably. In the longer term, it is therefore expected that the activity generated by the proposed development will have a positive impact on the viability of sustainable transport networks in the vicinity of the site.

6.2 Walking and Cycling

The proposed development will provide a series of physical measures to encourage active travel to / from the site, including an internal network of walking and cycling routes and associated facilities, such as cycle parking, showers and changing facilities. The development will also benefit from walking and cycling measures that will be provided across the wider Teesworks site. The proposed active travel and sustainable transport measures will aim to create a site that is not dominated by vehicles, but a site where trips by sustainable and active travel modes are enabled and encouraged.

7 Highway Impact Assessment

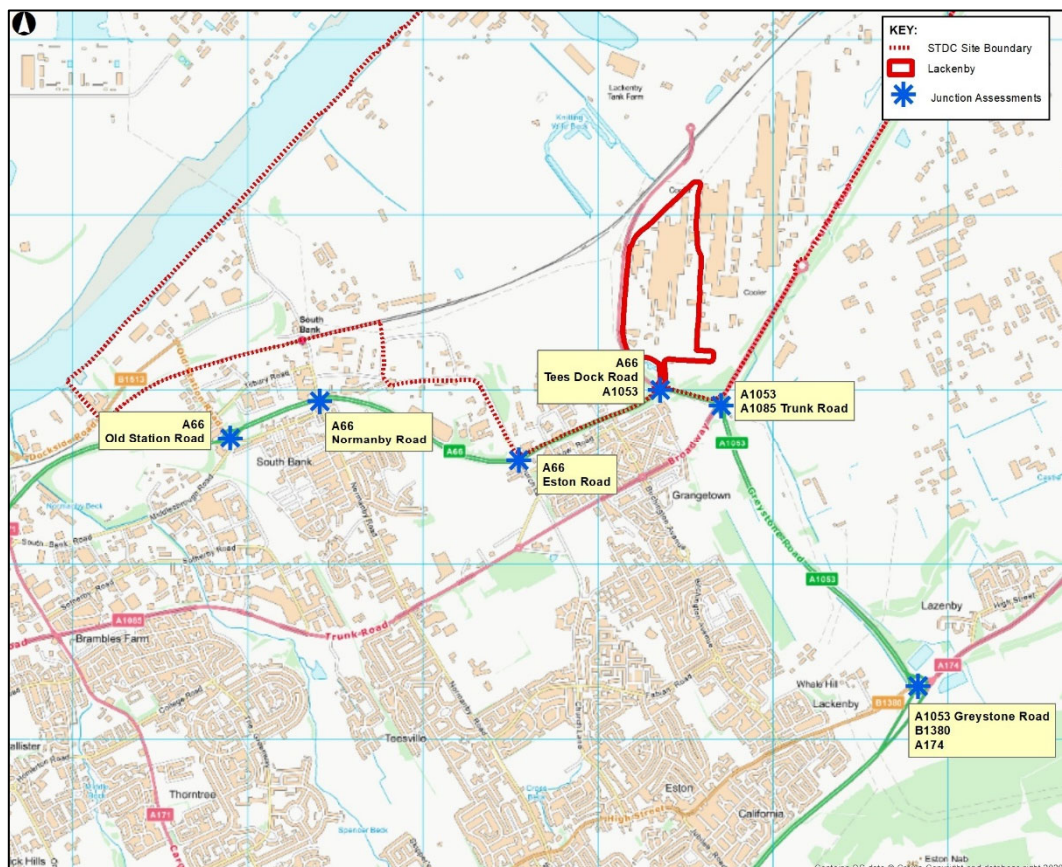
7.1 Assessment Scope

Based on the location of the proposed development and the current conditions at the local and SRN junctions, the impact of the development on the following junctions has been assessed:

1. A66 / Tees Dock Road / A1053 roundabout;
2. A66 / Middlesbrough Road / Old Station Road roundabout;
3. A66 / Normanby Road signalised junction;
4. A66 / Eston Road signalised junction;
5. A1053 / A1085 Trunk Road signalised roundabout; and
6. A174 / A1053 Greystone Road roundabout.

The locations of the junctions to be assessed is shown in **Figure 5**.

Figure 5: Location of junctions to be assessed



7.2 Methodology and Assessment Scenarios

Due to current circumstances with the Covid-19 pandemic and lockdown measures, it is not possible for traffic surveys to be undertaken to inform the

baseline condition assessment. To establish the baseline traffic flows, the following data sources have been utilised:

- Traffic data from HE North Regional Transport Model (NRTM);
- Traffic data from the Tees Valley Combined Authority (TVCA) Tees Valley Cube Model (TVM);
- Department for Transport traffic counts available online;
- WebTRIS (HE) online data;
- Traffic surveys collected on behalf of Capita in 2019 to construct a VISSIM model of the area for RCBC – permission to obtain a copy of these surveys was granted by RCBC, Capita and NETDC Ltd; and
- Survey data publicly available online from other local developments, including the planning application for the York Potash development (application number R/2013/0669/OOM).

Peak hour data from the two traffic models (NRTM and TVM) was input into two separate traffic flow diagrams for the study area. On both diagrams, any observed data was added above the links to enable a comparison to be made and determine which data source provided the most comparable base. The NRTM was found to be a comparable match against the baseline flows, and therefore the NRTM flows were predominantly used to inform the baseline, except for where observed data was available. All data has been adjusted to 2020 and 2033 (for operational year assessment) using NRTM growth.

The traffic flow diagrams are attached in **Appendix E** and the base flows are categorised to indicate which data source was used at each junction.

Based on the above, two assessment scenarios have been developed as follows:

- 2033 Base,
- 2033 Base + Proposed Development; and
- 2033 Base + all five proposed developments + South Bank development (cumulative assessment).

As requested by HE for the South Bank development, the scope of the traffic assessment will extend to include the A19 corridor. Jacobs has provided a copy of the 2015 New Tees Crossing AIMSUN Model so that the impact of trips from the Teesworks sites on the A19 can be assessed. The impact of each development site, and the cumulative scenarios, will be undertaken. It should also be noted that for the purpose of the assessment, it has been assumed that all freight traffic travels by road.

Given the inability to gather site specific baseline data, it should be noted that preparing the baseline traffic flow forecasts has relied on information provided by others and whilst all data was checked, Arup and STDC do not accept responsibility for the accuracy of such information. Arup emphasise that any forward-looking projections, forecasts, or estimates have been based upon interpretations or assessments of available information at the time of production.

7.3 Cumulative Impact Assessment

A cumulative assessment has been undertaken to consider the cumulative effects of all five developments on the Teesworks site, plus the South Bank development (application number R/2020/0357/OOM). This cumulative assessment of all recent planning submissions on Teesworks has been undertaken for a future year of 2033. This is known as the Tier 2 cumulative assessment within the ES.

Rather than review and extract traffic flows for the committed developments that have been identified, growth has been extracted from the NRTM. This approach is considered to be reasonable as it is underpinned by the National Trip End Model (NTEM) which informs TEMPro growth, as well as a full variable demand model, accounting for changing economic conditions and competing transport modes. Growth in the NRTM is controlled to NTEM at district level (as per TAG guidance) however individual developments are explicitly accounted for. This means that local trip end growth is calculated in a detailed way.

7.4 Junction Capacity Assessments

This section presents the junction modelling outputs for each assessed junction. The following non-signalised junctions have been developed using the ARCADY module of the Junctions 9 junction modelling software:

- A66 / Tees Dock Road / A1053 roundabout; and
- A66 / Middlesbrough Road / Old Station Road roundabout.

The remaining junctions have been developed using the LinSig signalised junction modelling software.

- A66 / Eston Road signalised junction;
- A66 / Normanby Road signalised junction;
- A1053 / A1085 Trunk Road signalised roundabout; and
- A174 / A1053 Greystone Road roundabout.

This section summarises the modelling outputs for each junction. The detailed modelling results for each junction are included in **Appendix F**.

7.4.1 A66 / Tees Dock Road / A1053 Roundabout

The A66 / Tees Dock Road / A1053 roundabout will provide access to the proposed Lackenby site. **Table 9**, **Table 10** and **Table 12** show the junction modelling results for the A66 / Tees Dock Road / A1053 roundabout.

Table 9: A66 / Tees Dock Road / A1053 roundabout – ‘2033 Base’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
A1053 Tees Dock Road	0.91	10	19.48	0.44	1	2.92
A66	0.58	2	4.15	0.93	13	22.18
Tees Dock Road	0.63	3	7.49	0.79	5	19.97

For the ‘2033 Base’ scenario, in the AM peak hour the ARCADY model results indicate that the A1053 Tees Dock Road of the junction is forecast to approach its theoretical capacity ($0.85 < \text{RFC} = 0.91 < 1$). In the PM peak hour, the A66 arm is forecast to approach its theoretical capacity ($0.85 < \text{RFC} = 0.93 < 1$).

The ‘2033 Base + Development’ scenario includes an additional arm, which will provide access to the proposed Lackenby site. For the purpose of the assessment, the new access road has been assumed to be two lanes wide in each direction.

Table 10: A66 / Tees Dock Road / A1053 roundabout – ‘2033 Base + Development’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
A1053 Tees Dock Road	1.09	108	149.15	0.51	2	3.50
A66	0.68	3	5.90	1.00	33	51.88
Tees Dock Road	0.74	4	12.30	0.87	8	34.14
Lackenby Access	0.22	1	4.11	0.45	1	9.66

Based on the ARCADY model outputs, the junction is forecast to exceed its theoretical capacity for the ‘2033 Base + Development’ scenario. The A1053 Tees Dock is predicated to operate above capacity in the AM peak hour ($\text{RFC} = 1.09 > 1$). The A66 is expected to operate at capacity and Tees Dock Road is predicted to approach capacity during the PM peak hour ($\text{RFC} = 1$ and $0.85 < \text{RFC} = 0.87 < 1$ respectively). **Table 11** presents the junction modelling results for the ‘2033 Cumulative Assessment’ scenario.

Table 11: A66 / Tees Dock Road / A1053 roundabout – ‘2033 Cumulative Assessment’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
A1053 Tees Dock Road	1.57	909	1523.68	0.86	7	11.91
A66	1.08	97	142.27	1.30	373	581.03
Tees Dock Road	1.11	71	188.86	1.40	277	1082.60
Lackenby access	0.35	1	7.74	0.53	2	13.26

The ARCADY outputs indicate that the junction is forecast to significantly exceed capacity for the ‘2033 Cumulative Assessment’ scenario. The A66 and Tees Dock Road are forecast to operate above capacity in both the AM and PM peak hour (RFC>1), whilst the A1053 Tees Dock Road is expected to exceed capacity in the AM peak hour (RFC>1) but approach capacity in the PM peak hour (0.85<RFC=0.86<1).

Given that the results indicate that with the Lackenby development traffic the junction, with the additional fourth arm, operates above capacity, it is suggested that additional upgrades be made when the fourth arm is provided to ensure it can also accommodate the cumulative traffic growth.

An indicative mitigation has been tested at this stage, which includes widening of all junction entry arms to accommodate three lanes, and widening of the roundabout to accommodate three lanes for circulatory traffic. These indicative measures have been assessed using the ARCADY module of the Junctions 9 software and the modelling results for the ‘2033 Base + Development’ and the ‘2033 Cumulative Assessment’ scenarios are shown in **Table 12** and **Table 13** respectively.

Table 12: A66 / Tees Dock Road / A1053 – ‘2033 Base + Development’ scenario (with indicative mitigation)

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
A1053 Tees Dock Road	0.74	3	4.81	0.35	1	1.81
A66	0.46	1	2.41	0.68	3	3.69
Tees Dock Road	0.40	1	2.90	0.41	1	3.83
Lackenby Access	0.13	1	2.18	0.23	1	3.44

Based on the model outputs, the junction is forecast to operate within capacity for the ‘2033 Base + Development’ scenario when the indicative mitigation measures are applied. The highest RFC is noted for the Tees Dock Road westbound arm of

the roundabout for the AM peak hour, which is well below its theoretical capacity (RFC=0.74<1).

Table 13: A66/Tees Dock Road – ‘2033 Cumulative Assessment’ scenario (with indicative mitigation)

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
A1053 Tees Dock Road	1.08	139	133.26	0.62	2	3.27
A66	0.80	5	7.26	0.88	8	9.99
Tees Dock Road	0.59	2	5.26	0.81	6	14.32
Lackenby access	0.20	1	3.59	0.49	2	11.13

The modelling outputs for the indicative mitigation scheme show a betterment of the junction operation compared to the junction without the additional capacity.

It should however be stressed that a detailed design exercise will need to be undertaken to establish the type and scale of the mitigation required. As with all junctions that are identified as operating above capacity, the development of mitigation should be considered alongside other measures that will be introduced as part of the emerging Transport Strategy for the wider Teesworks site to encourage sustainable and active travel in line with Regional and National policy to reduce carbon emissions from transport.

7.4.2 A66 / Middlesbrough Road / Old Station Road Roundabout

Table 14, **Table 15** and **Table 16** show the junction modelling results for the A66 / Middlesbrough Road / Old Station Road roundabout.

Table 14: A66 / Middlesbrough Road / Old Station Road – ‘2033 Base’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Middlesbrough Road WB	0.19	1	7.22	0.13	1	3.95
Middlesbrough Road NB	0.29	1	6.33	0.35	1	5.06
A66 EB	0.58	2	3.77	0.72	3	5.34
Old Station Road	0.24	1	4.68	0.43	1	8.17
A66 WB	0.92	12	16.97	0.62	2	3.89

The junction modelling results for the ‘2033 Base’ scenario indicate that the junction is expected to be approaching capacity in the AM peak hour (all arms are

forecast to operate within capacity with the exception of the A66 westbound arm approaching theoretical capacity, as $0.85 < RFC = 0.92 < 1$).

Table 15: A66 / Middlesbrough Road / Old Station Road – ‘2033 Base + Development’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Middlesbrough Road WB	0.20	1	7.70	0.13	1	4.11
Middlesbrough Road NB	0.30	1	6.64	0.36	1	5.33
A66 EB	0.61	2	4.10	0.73	3	5.61
Old Station Road	0.25	1	4.93	0.43	1	8.49
A66 WB	0.94	15	21.71	0.64	2	4.18

The junction modelling results for the ‘2033 Base+Development’ scenario indicate that the junction is expected to continue approaching capacity in the AM peak hour (all arms are forecast to operate within capacity with the exception of the A66 westbound arm approaching theoretical capacity, as $0.85 < RFC = 0.94 < 1$).

Table 16: A66 / Middlesbrough Road / Old Station Road – ‘2033 Cumulative Assessment’ scenario

Arm	AM peak hour			PM peak hour		
	RFC	Max Queue (PCU)	Delay (s)	RFC	Max Queue (PCU)	Delay (s)
Middlesbrough Road WB	0.38	1	11.67	0.28	1	9.24
Middlesbrough Road NB	0.58	2	12.71	0.67	2	16.81
A66 EB	1.00	39	56.17	0.84	6	9.41
Old Station Road	0.45	1	9.21	1.21	85	303.28
A66 WB	1.10	142	152.76	0.98	26	38.81

The junction is forecast to operate above capacity for the ‘2033 Cumulative Assessment’ scenario. The A66 eastbound arm of the roundabout is forecast to operate at capacity and the A66 westbound arm to exceed capacity in the AM peak hour ($RFC=1$ and $RFC=1.10 > 1$ respectively). In the PM peak hour, Old Station Road is expected to operate above capacity ($RFC=1.21 > 1$) whilst the A66 westbound is forecast to approach capacity ($0.85 < RFC = 0.98 < 1$).

A mitigation scheme is likely to be required for the junction to operate efficiently with the addition of traffic associated with the proposed Teesworks sites and the committed South Bank site. A detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken.

Potential mitigation for the junction could include a partial signalisation scheme for the A66 (eastbound and westbound approaches) and Middlesbrough Road northbound approach, and layout changes such as formalising the Middlesbrough Road South two-lane entry, lengthening the short lane of the Old Station Road entry arm and providing an additional short entry lane on both A66 entry arms of the junction. Such measures could help with balancing out the queues across the arms of the junction. This mitigation has been reviewed and found to have the potential to reduce queuing on the A66 westbound approach in the AM peak hour and on the Old Station Road approach in the PM peak hour for the ‘2033 Cumulative Assessment’ scenario.

7.4.3 A66 / Normanby Road Junction

Table 17, Table 18 and Table 19 show the LinSig model results for the A66 / Normanby Road signalised junction.

Table 17: A66 / Normanby Road junction – ‘2033 Base’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)
JUNCTION PRC (%)	1.1%			9.4%		
Cycle time	102 seconds			102 seconds		
Normanby Rd SB, Right	82.4%	5	4	73.8%	5	3
Normanby Rd SB, Left Ahead	14.2%	1	1	75.5%	8	6
A66 WB, Right	47.1%	3	2	24.9%	3	1
A66 WB, Left/ Ahead	89.0%	28	10	70.2%	16	5
A66 WB, Ahead	83.3%	25	8	59.1%	13	4
Normanby Rd NB, Ahead/ Left	79.1%	9	6	61.1%	5	4
Normanby Rd NB, Right	15.5%	1	1	79.5%	5	3
A66 WB	52.3%	23	1	36.1%	11	1
A66 EB, Right	88.5%	8	6	79.5%	9	5
A66 EB, Left/ Ahead	48.2%	10	3	80.6%	20	7
A66 EB, Ahead	50.3%	11	3	82.4%	23	8

The modelling outputs for the ‘2033 Base’ scenario outline that this junction will operate within theoretical capacity during both AM and PM peak hours (PRC>0).

Table 18: A66 / Normanby Road junction – ‘2033 Base + Development’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)
JUNCTION PRC (%)	-1.5%			7.1%		
Cycle time	102 seconds			102 seconds		
Normanby Rd SB, Right	82.4%	5	4	73.8%	5	3
Normanby Rd SB, Left Ahead	14.2%	1	1	75.5%	8	6
A66 WB, Right	47.1%	3	2	24.9%	3	1
A66 WB, Left/ Ahead	91.3%	30	11	73.5%	17	6
A66 WB, Ahead	86.1%	27	9	62.7%	14	5
Normanby Rd NB, Ahead/ Left	79.1%	9	6	61.1%	5	4
Normanby Rd NB, Right	16.6%	2	1	81.2%	5	4
A66 WB	53.8%	24	1	37.9%	12	1
A66 EB, Right	88.5%	8	6	79.5%	9	5
A66 EB, Left/ Ahead	51.9%	11	3	82.5%	21	8
A66 EB, Ahead	53.8%	12	4	84.1%	24	8

The modelling outputs identify that for the ‘2033 Base + Development’ scenario the junction is forecast to approach theoretical capacity in the AM peak hour (PRC<0 and DoS<100% for all movements) and to operate within capacity in the PM peak hour (PRC>0).

Table 19: A66 / Normanby Road junction – ‘2033 Cumulative Assessment’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-18.1%			-16.3%		
Cycle time	102 seconds			102 seconds		
Normanby Rd SB, Right	96.4%	8	5.8	78.5%	6	3.3
Normanby Rd SB, Left Ahead	16.5%	2	0.9	80.2%	10	5.9
A66 WB, Right	54.8%	3	1.7	32.1%	3	1.2
A66 WB, Left/ Ahead	106.3%	73	49.8	104.2%	59	37.9
A66 WB, Ahead	104.5%	69	44.0	99.4%	43.4	22.0
Normanby Rd NB, Ahead/ Left	78.6%	10	5.6	61.1%	5	3.6
Normanby Rd NB, Right	24.8%	2	0.9	104.6%	10	8.4
A66 WB	61.9%	31	1.3	58.4%	28	1.1
A66 EB, Right	100.1%	12	8.7	99.7%	16	11.5
A66 EB, Left/ Ahead	82.0%	22	6.9	98.8%	39	19.5
A66 EB, Ahead	83.6%	25	7.7	100.2%	46	24.1

The junction is forecast to exceed its theoretical capacity for the ‘2033 Cumulative Assessment’ scenario in both the AM and PM peak hour (AM peak hour: A66 westbound left turning and ahead movements, and A66 eastbound right turning movements over capacity. PM peak hour: A66 westbound left turning and ahead movements, Normanby Road northbound right turning movements and A66 eastbound ahead movements over capacity).

A review of the traffic signal operation will need to be undertaken to ascertain if there are improvements that could be made with the existing infrastructure. Additional mitigation may be required for the junction to operate efficiently for the ‘2033 Cumulative Assessment’ scenario. A detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken.

7.4.4 A66 / Eston Road Junction

Table 20, Table 21 and Table 22 show the LinSig model results for the A66/Eston Road signalised junction.

Table 20: A66 / Eston Road junction – ‘2033 Base’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-1.0%			4.7%		
Cycle time	110 Seconds			110 Seconds		
Eston Road, Left/ Ahead	10.2%	1	1	29.6%	2	1
Eston Road, Right	31.3%	3	2	76.4%	7	4
A66 WB, Right	63.7%	4	3	40.8%	3	2
A66 WB, Left/ Ahead	89.6%	29	10	42.9%	8	2
A66 WB, Ahead	89.6%	31	11	40.8%	9.0	3
Eston Rd, Ahead	6.5%	0	0	7.6%	0.0	0
Church Lane, Ahead/ Left	90.9%	14	8	80.3%	8.0	5
Church Lane, Right	13.2%	2	1	9.9%	1.0	1
A66 EB, Right	62.6%	4	3	65.8%	4.0	3
A66 EB, Left/ Ahead	58.8%	12	4	85.9%	26.0	8
A66 EB, Ahead	52.6%	12	4	82.4%	27.0	8

The junction modelling results indicate that for the ‘2033 Base’ scenario, the junction is forecast to approach its theoretical capacity in the AM peak hour (PRC<0 and DoS<100%) and to operate within theoretical capacity during the PM peak period (PRC>0).

Table 21: A66 / Eston Road junction – ‘2033 Base + Development’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCU Hr)
JUNCTION PRC (%)	-2.6%			4.4%		
Cycle time	110 seconds			110 seconds		
Eston Road, Left/ Ahead	10.2%	1	1	29.8%	2	1
Eston Road, Right	31.3%	3	2	81.9%	8	5
A66 WB, Right	63.7%	4	3	40.8%	3	2
A66 WB, Left/ Ahead	92.3%	32	12	45.3%	9	3
A66 WB, Ahead	92.3%	34	13	43.0%	10	3
Eston Rd, Ahead	6.5%	0	0	7.6%	0	0
Church Lane, Ahead/ Left	90.9%	14	8	86.0%	9	6
Church Lane, Right	14.0%	2	1	11.5%	1	1
A66 EB, Right	62.6%	4	3	65.8%	5	3
A66 EB, Left/ Ahead	62.7%	13	4	86.2%	27	8
A66 EB, Ahead	56.7%	14	4	82.8%	27	8

The modelling outputs identify that the junction is forecast to continue approaching theoretical capacity in the AM peak hour but operate within capacity in the PM peak hour for the ‘2033 Base + Development’ scenario.

Table 22: A66 / Eston Road junction – ‘2033 Cumulative Assessment’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Delay (PCUhr)
JUNCTION PRC (%)	-36.7%			-23.1%		
Cycle time	110 seconds			110 seconds		
Eston Road, Left/ Ahead	47.0%	3	1.1	80.3%	11	3.6
Eston Road, Right	70.9%	8	3.7	108.5%	28	22.5
A66 WB, Right	117.5%	50	42.2	103.0%	17	12.5
A66 WB, Left/ Ahead	123.0%	181	120.5	80.1%	22	6.7
A66 WB, Ahead	123.1%	148	127.1	78.9%	23	7.1
Eston Rd, Ahead	8.3%	0	0.0	10.3%	1	0.1
Church Lane, Ahead/ Left	117.1%	44	37.2	73.9%	8	4.1
Church Lane, Right	25.1%	3	1.0	11.8%	1	0.5
A66 EB, Right	28.7%	3	1.3	54.1%	4	2.0
A66 EB, Left/ Ahead	101.7%	51	29.3	110.8%	118	78.8
A66 EB, Ahead	95.9%	34	15.5	107.9%	86	60.6

The LinSig outputs indicate that the junction is forecast to operate significantly above capacity for the ‘2033 Cumulative Assessment’ scenario both in the AM and PM peak hour. More specifically in the AM peak, the A66 westbound arm, the Church Lane ahead and left turning movements and the A66 eastbound left and ahead movements are forecast to operate above capacity (DoS>100%). In the PM peak hour, the Eston Road right movements, the A66 westbound right turning movements, and the A66 eastbound left turning and ahead movements are expected to exceed capacity (DoS>100%).

The results indicate a mitigation scheme may be required for the junction to operate efficiently for the ‘2033 Cumulative Assessment’ scenario. A detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken. As noted for the other junctions, this mitigation exercise needs to consider other measures that will be introduced as part of the emerging Transport Strategy for the wider Teesworks site.

7.4.5 A1053 / A1085 Trunk Road Roundabout

Table 23, Table 24 and Table 25 show the LinSig model results for the A1053 / A1085 Trunk Road roundabout signalised roundabout.

Table 23: A1053 / A1085 Trunk Road roundabout – ‘2033 Base’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	20.6%			11.0%		
Cycle time	60 seconds			60 seconds		
A1085 Trunk Road NB, Left/ Ahead	28.7%	1	1	29.9%	2	1
A1085 Trunk Road NB, Ahead	37.1%	2	1	25.8%	1	1
A1053 Tees Dock Road, Left	32.1%	4	1	58.3%	8	2
A1053 Tees Dock Road, Ahead	51.3%	7	2	80.5%	15	5
A1085 Trunk Road SB, Left/ Ahead	25.1%	2	1	36.8%	3	2
A1085 Trunk Road SB, Ahead	74.2%	11	4	72.5%	8	4
A1053 Greystone Road, Ahead/ Left	73.4%	11	4	29.4%	3	1
A1053 Greystone Road, Ahead	74.6%	11	4	32.9%	4	2
Wilton site access, Ahead/ Left	9.7%	1	1	12.4%	1	1
Wilton site access, Ahead	31.5%	1	1	55.2%	2	1

The modelling outputs identify that the junction is forecast to operate within its theoretical capacity for the ‘2033 Base’ scenario in both the AM and PM peak hour (PRC>0).

Table 24: A1053 / A1085 Trunk Road roundabout – ‘2033 Base + Development’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	8.9%			-1.2%		
Cycle time	60 seconds			60 seconds		
A1085 Trunk Road NB, Left/ Ahead	81.1%	4	3	35.5%	2	1
A1085 Trunk Road NB, Ahead	35.2%	2	1	26.2%	1	1
A1053 Tees Dock Road, Left	36.4%	4	1	66.1%	10	3
A1053 Tees Dock Road, Ahead	54.6%	7	2	91.1%	22	8
A1085 Trunk Road SB, Left/ Ahead	23.6%	2	1	35.8%	3	2
A1085 Trunk Road SB, Ahead	81.8%	14	5	80.1%	10	5
A1053 Greystone Road, Ahead/ Left	82.3%	14	5	34.8%	4	2
A1053 Greystone Road, Ahead	78.6%	12	5	35.2%	4	2
Wilton site access, Ahead/ Left	14.5%	1	1	14.8%	1	1
Wilton site access, Ahead	47.5%	2	1	66.0%	3	2

The modelling outputs identify that the junction is forecast to operate within its theoretical capacity for the ‘2033 Base’ scenario and the AM peak hour of the ‘2033 Base + Development’ scenario. In the PM peak hour the junction is expected to approach its theoretical capacity.

Table 25: A1053 / A1085 Trunk Road roundabout – ‘2033 Cumulative Assessment’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-57.7%			-49.8%		
Cycle time	60 seconds			60 seconds		
A1085 Trunk Road NB, Left/ Ahead	59.0%	3	1.3	60.4%	3	1.2
A1085 Trunk Road NB, Ahead	141.9%	75	62.4	43.5%	2	0.7
A1053 Tees Dock Road, Left	94.9%	24	10.9	106.8%	69	53.1
A1053 Tees Dock Road, Ahead	75.0%	12	3.9	133.3%	235	218.3
A1085 Trunk Road SB, Left/ Ahead	49.0%	4	1.8	109.5%	62	53.4
A1085 Trunk Road SB, Ahead	138.7%	207	194.9	134.8%	159	150.5
A1053 Greystone Road, Ahead/ Left	141.9%	211	201.2	57.2%	6	2.3
A1053 Greystone Road, Ahead	136.3%	212	200.3	59.0%	6	2.6
Wilton site access, Ahead/ Left	23.8%	1	0.3	26.4%	1	0.3
Wilton site access, Ahead	89.8%	5	3.6	130.2%	23	18.5

The junction is expected to operate significantly above its theoretical capacity for the ‘2033 Cumulative Assessment’ scenario in both the AM and PM peak hour (AM peak hour: A1085 Trunk Road northbound and southbound ahead movements and A1053 Greystone Road over capacity. PM peak hour: A1053 Tees Dock Road, A1085 Trunk Road southbound and Wilton access road ahead movements over capacity).

A mitigation scheme may be required for the junction to operate efficiently for the ‘2033 Cumulative Assessment’ scenario. Possible mitigation for the junction could be to extend the short/pocket/flared lanes on approach to the roundabout. A detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken.

7.4.6 A174 / A1053 Greystone Road Roundabout

Table 26, Table 27 and Table 28 show the LinSig model results for the A174 / A1053 Greystone Road roundabout.

Table 26: A174 / A1053 Greystone Road roundabout – ‘2033 Base’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-5.0%			-19.6%		
Cycle time	90 seconds			90 seconds		
High Street, Left/ Ahead	74.8%	5	2.2	32.6%	3	0.5
A1053 Greystone Road, Left	53.6%	6	1.9	125.3%	106	91.7
A1053 Greystone Road, Ahead	46.4%	5	1.7	64.4%	8	2.7
A174 SB, Ahead	66.1%	1	1.0	64.5%	1	0.9
A174 SB, Ahead	70.8%	11	5.3	33.1%	4	2.4
A174 NB, Left/ Ahead	65.3%	13	3.6	78.0%	15	5.5
A174 NB, Ahead	81.0%	13	6.2	103.9%	76	142.0

For the ‘2033 Base’ scenario, the junction is forecast to approach its theoretical capacity in the AM peak hour. The junction is forecast to operate above capacity in the PM peak hour (A1053 Greystone Road left turning movements and A174 northbound ahead movements over capacity).

We understand that an improvement scheme has been developed by HE for the Greystones Roundabout junction, to address capacity issues currently experienced at the junction. This scheme has not been included in this modelling exercise.

Table 27: A174 / A1053 Greystone Road roundabout – ‘2033 Base + Development’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queue (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-18.7%			-85.4%		
Cycle time	90 seconds			90 seconds		
High Street, Left/ Ahead	88.1%	4	2.7	35.6%	3	8.0
A1053 Greystone Road, Left	67.2%	8	2.8	166.9%	235	812.0
A1053 Greystone Road, Ahead	36.2%	4	1.8	51.5%	5	17.8
A174 SB, Ahead	64.9%	1	0.9	54.0%	1	2.0
A174 SB, Ahead	74.5%	11	5.2	156.2%	130	727.2
A174 NB, Left/ Ahead	68.1%	14	4.1	96.1%	23	74.2
A174 NB, Ahead	88.7%	19	8.9	166.3%	298	816.6

For the ‘2033 Base + Development’ scenario, the modelling outputs identify that the junction is forecast to approach capacity in the AM peak hour. In the PM peak

hour the junction is forecast to significantly exceed theoretical capacity (A1053 Greystone Road left turning movements, A174 southbound ahead movements and A174 northbound ahead movements forecast to operate above capacity).

Mitigation measures to address the traffic impacts associated with the proposed development are likely to be required for this junction. We understand that an improvement scheme has been developed by HE to address capacity issues currently experienced at the junction.

Table 28: A174 / A1053 Greystone Road roundabout – ‘2033 Cumulative Assessment’ scenario

	AM peak hour			PM peak hour		
	DoS (%)	Mean Max Queuc (PCU)	Total Delay (PCUhr)	DoS (%)	Mean Max Queuc (PCU)	Total Delay (PCUhr)
JUNCTION PRC (%)	-37.1%			-111.9%		
Cycle time	90 seconds			90 seconds		
High Street, Left/ Ahead	122.9%	51	40.0	25.9%	2	0.5
A1053 Greystone Road, Left	76.6%	12	4.1	190.7%	431	366.8
A1053 Greystone Road, Ahead	44.3%	5	2.4	59.6%	7	2.4
A174 SB, Ahead	66.1%	1	1.0	62.6%	1	0.8
A174 SB, Ahead	123.4%	213	188.8	164.9%	125	130.2
A174 NB, Left/ Ahead	106.4%	58	42.2	157.8%	166	155.6
A174 NB, Ahead	106.2%	73	55.6	189.6%	345	330.7

The junction is forecast to operate significantly above capacity for the ‘2033 Cumulative Assessment’ scenario in both the AM and PM peak hour (AM peak hour: High Street, A174 southbound ahead movements and A174 northbound all movements expected to operate above capacity. PM peak hour: PRC<0 and A1053 Greystone Road left turning movements, A174 southbound ahead movements and A174 northbound all movements expected to operate above capacity).

As stated above, it is understood that HE is looking at an improvement scheme to assess capacity. The need or otherwise for additional mitigation measures will be discussed with HE during the determination of this outline planning application.

7.4.7 Junction Assessment Summary

The **A66 / Tees Dock Road / A1053 junction** is forecast to approach capacity for the ‘2033 Base’ scenario (3 arm roundabout) and exceed capacity with the addition of the proposed development (4 arm roundabout). For the ‘2033 Cumulative Assessment’ scenario, the junction is forecast to operate significantly above capacity. As part of the junction upgrade to accommodate the fourth arm, additional measures are expected to be delivered to mitigate the development and cumulative development impact on the operation of the junction. Indicative

mitigation measures, such as widening the roundabout to accommodate three lane entries and circulatory, have been tested and show a betterment in the operation of the junction. A detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken.

The **A66 / Middlesbrough Road / Old Station Road junction** is forecast to approach capacity for the '2033 Base' scenario, continue to approach capacity with the addition of the proposed development traffic and exceed capacity for the '2033 Cumulative Assessment' scenario. A mitigation scheme is expected to be required to mitigate the cumulative development impact on the junction. Potential mitigation for the junction could include a partial signalisation scheme and layout changes; however, a detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken.

The **A66 / Normanby Road junction** is expected to operate within capacity for the '2033 Base' scenario and approach capacity with the addition of the proposed development. The junction is expected to exceed capacity for the '2033 Cumulative Assessment' scenario. The operation of the signals will be reviewed but a detailed optioneering, modelling and design exercise with phased build-out may need to be undertaken for the junction.

The **A66 / Eston Road junction** approaches capacity for the '2033 Base' scenario and is forecast to continue approaching capacity with the addition of the proposed development. The junction is expected to operate significantly above capacity for the '2033 Cumulative Assessment' scenario. A review of the traffic signal operation will need to be undertaken to ascertain if there are improvements that could be made with the existing infrastructure. Mitigation measures may still be required but should take account of other measures that will be introduced as part of the emerging Transport Strategy for the wider Teesworks site to encourage sustainable and active travel in line with Regional and National policy to reduce carbon emissions from transport.

The **A1053 / A1085 Trunk Road junction** is expected to operate within capacity for the '2033 Base' scenario, approach capacity in the PM peak hour with the addition of the proposed development and operate significantly above its theoretical capacity for the '2033 Cumulative Assessment' scenario. Possible mitigation for the junction could be to extend the short/pocket/flared lanes on approach to the roundabout. As with the other junctions operating over capacity, a detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken to ascertain if changes to the highway infrastructure are required following the introduction of other transport measures.

The **A174 / A1053 Greystone Road roundabout** is forecast to be approaching capacity for both the '2033 Base' and the '2033 Base + Development' AM peak hour scenarios, and to exceed capacity for both PM peak hour scenarios. The junction is forecast to operate significantly above capacity for the '2033 Cumulative Assessment' scenario in both the AM and PM peak hour. We understand that a HE scheme has been developed to improve the current operation of the junction. An updated modelling exercise will need to be undertaken to assess whether the cumulative development impact can be accommodated at the improved junction, based on the HE scheme.

7.5 Strategic Road Network Impact Assessment

Jacobs have developed a microsimulation model of the A19 and A66 to support their work for the New Tees Crossing scheme (2015 New Tees Crossing AIMSUN Model). Since this is a calibrated and validated model, Jacobs have provided Arup with a copy of the model so that an impact of development trips on the A19 could be assessed. The New Tees Crossing, which would provide additional capacity on the A19 corridor, could be operational by 2027. However, the assessment has been undertaken on the base model, without the New Tees Crossing in place.

The model reports journey times with and without the development traffic added. The specific routes where journey time results have been extracted from the model for this assessment are shown in **Appendix G**.

The results include a 30-minute warm up and 30-minute cool down period for both the AM and PM peak hour, to ensure that a robust assessment for the impact of the Teesworks sites on the strategic road network has been undertaken. Traffic flows for the warm-up and cool-down period have been estimated using the TRICS trip rate profiles for the South Bank development (**Table 29** and **Table 30**).

Table 29: AM Peak Period Traffic Profile

% of AM peak hour traffic	
07:00 - 08:00	94%
09:00 - 10:00	82%

Table 30: PM Peak Period Traffic Profile

% of PM peak hour traffic	
16:00 - 17:00	94%
18:00 - 19:00	63%

The change in journey times on the A19 is shown in **Table 31** for the AM peak period and in **Table 32** for the PM peak period.

Table 31: AM Peak Journey Times from AIMSUN Model – Lackenby scenario

Time Period	Route	Do Minimum	With Development	Difference
08:00 – 08:15	A19 North - A66 EB	01:53	01:59	00:06
	A19 South - A66 EB	02:36	02:33	-00:03
08:15 – 08:30	A19 North - A66 EB	02:30	02:25	-00:05
	A19 South - A66 EB	04:23	04:49	00:26
08:30 – 08:45	A19 North - A66 EB	01:59	02:13	00:14
	A19 South - A66 EB	05:04	06:14	01:10
08:45 – 09:00	A19 North - A66 EB	01:34	01:58	00:24
	A19 South - A66 EB	04:11	06:51	02:40
<i>08:00 – 09:00 Average</i>	<i>A19 North - A66 EB</i>	<i>01:59</i>	<i>02:09</i>	<i>00:10</i>
	<i>A19 South - A66 EB</i>	<i>04:04</i>	<i>05:07</i>	<i>01:03</i>

The results of the AM peak hour assessment show that the greatest change in journey time is in the 08:45-09:00 period, when the journey time for those travelling on the A19 South to the A66 eastbound is forecast to increase by 2 minutes and 40 seconds. Across the morning peak hour, the average change in journey time on this section is 1 minute and 3 seconds with the addition of development traffic.

Table 32: PM Peak Journey Times from AIMSUN Model – Lackenby scenario

Time Period	Route	Do Minimum	With Development	Difference
17:00 – 17:15	A66 WB - A19 North	02:36	02:33	-00:03
	A66 WB - A19 South	01:14	01:14	00:00
17:15 – 17:30	A66 WB - A19 North	02:52	02:54	00:02
	A66 WB - A19 South	01:14	01:15	00:01
17:30 – 17:45	A66 WB - A19 North	02:12	02:09	-00:03
	A66 WB - A19 South	01:12	01:12	00:00
17:45 – 18:00	A66 WB - A19 North	01:19	01:18	-00:01
	A66 WB - A19 South	01:20	01:17	-00:03
<i>17:00 – 18:00 Average</i>	<i>A19 North - A66 EB</i>	<i>02:15</i>	<i>02:13</i>	<i>-00:02</i>
	<i>A19 South - A66 EB</i>	<i>01:15</i>	<i>01:14</i>	<i>-00:01</i>

Due to existing congestion at Newport Road Interchange, it is difficult to assess the impact of the proposed development on the journey times on the A19. This congestion restricts traffic flow on the A66 mainline, and therefore reduces the number of vehicles that can progress towards the A19. Unlike the AM peak, where journey times increase as more traffic is added to the model, the PM ‘with development’ scenario journey times are similar to those in the base scenario due to this area of congestion restricting onward traffic through the network.

Table 33 and **Table 34** show the change in journey times on the A19 as a result of the cumulative impact of all traffic associated with the Teesworks and South Bank sites (in addition to the Lackenby site traffic), in the AM and PM peak hour respectively.

Table 33: AM Peak Journey Times from AIMSUN Model – Cumulative Assessment scenario

Time Period	Route	Do Minimum	With Cumulative Development	Difference
08:00 – 08:15	A19 North - A66 EB	01:53	02:34	00:41
	A19 South - A66 EB	02:36	04:27	01:51
08:15 – 08:30	A19 North - A66 EB	02:30	04:47	02:17
	A19 South - A66 EB	04:23	08:33	04:10
08:30 – 08:45	A19 North - A66 EB	01:59	06:28	04:29
	A19 South - A66 EB	05:04	10:18	05:13
08:45 – 09:00	A19 North - A66 EB	01:34	06:23	04:49
	A19 South - A66 EB	04:11	10:40	06:29
<i>08:00 – 09:00 Average</i>	<i>A19 North - A66 EB</i>	<i>01:59</i>	<i>05:03</i>	<i>03:04</i>
	<i>A19 South - A66 EB</i>	<i>04:04</i>	<i>08:29</i>	<i>04:26</i>

The AM peak hour results for the cumulative assessment scenario show that the greatest change in journey time is in the 08:45-09:00 period when the journey time for those travelling on the A19 South to the A66 eastbound is forecast to increase by 6 minutes and 29 seconds. Across the morning peak hour, the average change in journey time on this section is 4 minutes and 26 seconds with the addition of the five Teesworks sites and South Bank site traffic.

Table 34: PM Peak Journey Times from AIMSUN Model – Cumulative Assessment scenario

Time Period	Route	Do Minimum	With Cumulative Development	Difference
17:00 – 17:15	A66 WB - A19 North	02:36	02:29	-00:07
	A66 WB - A19 South	01:14	01:14	00:00
17:15 – 17:30	A66 WB - A19 North	02:52	02:18	-00:34
	A66 WB - A19 South	01:14	01:12	-00:02
17:30 – 17:45	A66 WB - A19 North	02:12	01:31	-00:41
	A66 WB - A19 South	01:12	01:11	-00:01
17:45 – 18:00	A66 WB - A19 North	01:19	01:16	-00:03
	A66 WB - A19 South	01:20	01:12	-00:08
<i>17:00 – 18:00 Average</i>	<i>A19 North - A66 EB</i>	<i>02:15</i>	<i>01:53</i>	<i>-00:22</i>
	<i>A19 South - A66 EB</i>	<i>01:15</i>	<i>01:12</i>	<i>-00:03</i>

As for the individual development assessment, the PM peak cannot be adequately assessed due to the existing congestion at Newport Road Interchange, and therefore the resultant journey times are similar to the base.

It should be noted that once the New Tees Crossing is open, traffic conditions will improve on the A19. Vehicles however will still need to use the A66, across Newport Road Interchange, to access the A19 from the east. Therefore, further testing could be undertaken in the Aimsun model, with the New Tees Crossing in place, to understand the betterment gained from the re-routing of development traffic as a result of the new crossing.

7.6 Additional Mitigation

The junction modelling has identified that two junctions are forecast to exceed capacity, and four junctions are expected to approach capacity with the addition of the proposed development traffic (with three out of the six junctions already approaching capacity and Greystones roundabout forecast to operate above capacity in the future base). It is also expected that the cumulative impact of the Teesworks and South Bank sites will be significant on all assessed junctions. Section 7.4 provided indicative suggestions for potential mitigation measures for the assessed junctions, noting that a detailed optioneering, modelling and design exercise with phased build-out will need to be undertaken. However, it should also be noted that sustainable and active travel measures should be implemented, in alignment with the developing Transport Strategy for the site (where possible), to effectively mitigate the impact of the Teesworks sites on the surrounding highway network. STDC and Arup will engage with HE throughout the determination of the outline planning application to discuss these options further.

The Transport Strategy for the wider Teesworks site, currently in development, will set out the vision for the wider site to become an exemplar, world class industrial park that is renowned as a destination for manufacturing excellence. To achieve the vision, the emerging Transport Strategy has agreed eight outcomes with the Transport Steering Group that the Teesworks site should aim to deliver where possible. The outcomes are:

- A range of high-quality transport options, which are all inclusive, accessible, fast, frequent, convenient, affordable, reliable, safe and resilient;
- High quality public transport, walking and cycling routes and connections are prioritised over other transport modes;
- The site should not be dominated by cars and other vehicles or severed from local areas by transport infrastructure;
- Transport connections with local, inter-regional, national and international transport networks for people and goods are seamless and will attract developers / investors to the site;
- Cycling and walking connections to local residential centres are safer, more attractive, widely used and support local town centre regeneration;
- Transport options enable improved individual health and wellbeing and access to jobs;

- Transport options will support the transition to zero carbon and contribute to a high-quality environment that will attract future occupiers; and
- Transport infrastructure can adapt to market demand, new transport technology and market disruptors, attracting developers / investors to the site.

The emerging Strategy will develop a delivery plan of interventions to meet the outcomes, which is expected to include, amongst other things, measures such as limiting car parking provision, introducing mobility hubs, providing high quality cycle parking and improving public transport provision. It is expected that the Teesworks sites would also consolidate freight movements; at this stage no consideration has been made of the potential to discount trips due to consolidating servicing and delivery trips. Similarly, there is potential for the quayside to be developed providing the opportunity for freight movement by sea. This would reduce freight movements in and out of the site via the highway network. However, for the purpose of the assessment, it has been assumed that all freight traffic travels by road.

8 Travel Plan Framework

A Transport Strategy is currently being developed for the wider Teesworks site, which will include a series of outcomes and measures as agreed with the South Tees Transport Steering Group.

It is expected that a Teesworks site-wide Travel Plan will be implemented based on the core principles outlined in this framework and to meet with the objectives of the emerging Transport Strategy. The site-wide Travel Plan could also be hosted online. An online Interactive Travel Plan would provide interactive maps with sustainable transport routing and timetable information, active travel routes and walking times etc. Such a Travel Plan would make sustainable and active travel information easy to use and update, whilst helping promote the Travel Plan objectives and vision.

This framework identifies a list of measures for the proposed development that could be applied in advance of wider strategy initiatives coming forward, and also outlines how the site will be incorporated into the wider Master Plan in due course.

Details about the Travel Plan management and monitoring processes will be identified as part of the emerging Transport Strategy.

8.1 Travel Plan Measures

8.1.1 Facilitating Public Transport Use

This framework proposes a list of measures to help promote the use of sustainable transport for trips to / from the site including:

- Providing a dedicated bus service for the Teesworks site. This is imperative to establishing sustainable travel patterns and to ensure the site is fully accessible to those who want to work at Teesworks. Given the size of the site, the majority of end destinations are currently outside a desirable walking distance from a public transport connection. By providing a dedicated service, it will be possible for the route to travel into the site and stop close to building entrances. When initially introduced, it is expected that the service will provide a connection every 15 minutes to / from Middlesbrough and Redcar; from these central locations it will be possible to connect to the wider bus and rail network. In the longer term, it is hoped that the service will become commercially viable and/or one of the existing public bus services will be diverted through the site.
- Briefing staff on sustainable transport provisions to / from the site and providing information in employee starter packs. Personalised help and support will also be provided to individuals requiring further help with travel. Information on the internal public transport provisions within the wider Teesworks site will also be provided, when the Transport Strategy for the wider site is adopted;

- Displaying up to date public transport information, including timetables, maps, fare information and available ticket deals for buses and train services within staff common areas, as well as on the occupier's website; and
- Exploring the opportunities for corporate public transport ticketing, by liaising with transport operators.

8.1.2 Facilitating Walking and Cycling

This section provides a list of physical and promotional measures to enable and encourage walking and cycling to / from the proposed development.

- Providing secure, well located cycle parking spaces on the site in exceedance of local cycle parking requirements. The occupiers will also be encouraged to provide supporting facilities for walking and cycling, such as shower and changing facilities, safe storage / lockers for bicycle gear / shoes / umbrellas etc. The potential for providing pool bikes / cycle hire facilities / cycle hubs across the site will also be explored as part of the emerging Transport Strategy for the wider site;
- Ensuring footway and cycleway connections are provided to connect the development both to other Teesworks developments but also to the external network;
- Briefing staff on walking / cycling opportunities to travel to / from the site and providing information on provisions within the site as well as in the wider area in employee starter packs. Personalised help and support will also be provided to individuals requiring further help with travel;
- Providing information on walking and cycling routes in the vicinity as well as within the site, and on the health benefits of walking and cycling, on noticeboards in staff common areas, as well as on the occupier's website;
- Encouraging those who walk to join a "Walking Buddy" scheme so employees can walk together rather than alone;
- Developing partnerships with local cycle shops to organise Bike Doctor events for the occupier, for employees to bring bicycles in for servicing and minor repairs;
- Enabling efficient cycle purchase by participating in the Cycle to Work scheme;
- Promoting National Travel Awareness Days including Walk to Work Week, World Environment Day, European Mobility Week etc; and
- Working with RCBC and TVCA to promote their travel awareness initiatives and brands such as 'Let's Go Tees Valley', alongside initiatives run by other stakeholders such as Sustrans.

8.1.3 Reducing Car Dependency

In addition to the measures to encourage travel by sustainable modes, it is important that a series of measures to reduce dependency on the private car is also implemented at the proposed development:

- Providing an appropriate number of car parking spaces for the proposed development, in agreement with the wider Transport Strategy, which is currently being developed. The details on car parking provision for the proposed development will be agreed through a reserved matters application;
- Developing and enforcing a car parking management strategy / plan, which is expected to be conditioned, to allow adequate parking for those who need it, whilst encouraging the use of sustainable transport;
- Promoting opportunities for car sharing to employees (e.g. publicising car sharing websites such as liftshare.com) and the benefits of car sharing on building noticeboards and the occupier's website. It should also be ensured that employees are provided with a guaranteed lift home in the event of an emergency;
- Providing dedicated car parking spaces for car sharers;
- Liaising with neighbouring businesses to promote car sharing; and
- Providing information on noticeboards and on the official occupier's website on car club opportunities (or similar) provided at the wider Teesworks site, as and when these come forward.

8.1.4 Managing Delivery and Servicing Trips

- Consolidating servicing, where possible, will be encouraged across the wider Teesworks site. More information on managing servicing and delivery trips to the site will be provided within the emerging Transport Strategy.
- There is potential for the quayside to be developed providing the opportunity for freight movement by sea. This would reduce freight movements in and out of the site via the highway network.

8.1.5 Implementation Timescales

The measures outlined in this section will be implemented as follows:

- **Physical measures:** implemented during construction at the same time as the proposed development, in time for opening;
- **Promotional measures:** implemented prior to occupation during the marketing of the development and staff interviews/induction, and on a continuous basis with specific initiatives on at least an annual frequency; and
- **Other site-wide measures:** This section has referred to some potential measures that will be developed to promote active and sustainable transport and manage vehicular trips, as part of the emerging wider site Transport

Strategy. These measures, among others, will be implemented when the site wide Transport Strategy gets adopted.

8.2 Travel Plan Management, Production and Monitoring

A site-wide Travel Plan Coordinator(s) will be appointed to develop a marketing strategy for the site-wide Travel Plan, to ensure and oversee its implementation, and monitor and review its effectiveness. More details on the role of the Coordinator(s) will be included within the emerging Transport Strategy and the site-wide Travel Plan. The TP Coordinator(s) will also be responsible for the implementation of the initial Travel Plan measures that have been developed for the proposed development.

If the Travel Plan is hosted online, it would have clear benefits compared to a traditional Travel Plan, such as the following, among others:

- The User Interface can display data in an engaging format and link to other online client resources, making the Travel Plan information easy to use and helping maintain the momentum of the Travel Plan;
- Clear and customisable graphics can provide and combine sustainable and active travel information, recommended routes, walking and journey times, making the information easy to find, customise and use;
- Maintenance of the Interface can be undertaken remotely and therefore the information can be updated more easily than static plans or noticeboards;
- The Interface can provide links to online feedback or travel surveys and present results; and
- Can help incorporate and promote current and future technologies, such as micro mobility services, MaaS platforms etc.

Regular monitoring of the site-wide Travel Plan will be undertaken to review its targets and the effectiveness of its measures, and it will be updated accordingly.

9 Summary and Conclusions

Arup has been commissioned by the South Tees Development Corporation to develop a Transport Assessment in support of a planning application for the development of industrial (B2/B8) land-use at the Lackenby site on Teesworks.

9.1 Summary of Assessment

The key findings of the Transport Assessment are summarised below:

- Current walking and cycling provisions in the vicinity of the site are limited. All matters are reserved at this stage of the planning application, however the layout of the proposed development will provide an internal network of walking and cycling routes, along with cycle parking spaces and associated facilities. The development will also benefit from additional measures to encourage active travel to / from the site, as part of the Transport Strategy for the wider Teesworks site, which is currently in development;
- There are no bus services in the immediate vicinity of the site. It is proposed that a dedicated bus service be provided for the Teesworks site. By providing a dedicated service, it will be possible for the route to travel into the site and stop close to building entrances. Such a service is expected to provide a connection every 15 minutes to / from Middlesbrough and Redcar, when initially introduced. In the longer term, it is hoped that the service will become commercially viable and / or one of the existing public bus services will be diverted through the site. It is therefore expected that the activity generated by the proposed development will have a positive impact on the viability of future sustainable transport networks in the vicinity of the site;
- The A66 / Tees Dock Road / A1053, A66 / Eston Road and the A66 / Middlesbrough Road / Old Station junctions are forecast to approach capacity, whilst the A174 / A1053 Greystone Road junction is forecast to exceed capacity for the '2033 Base' scenario. This is exacerbated by the addition of the proposed development traffic, with two of these junctions forecast to operate above capacity (A66 / Tees Dock Road / A1053 and A174 / A1053 Greystone Road junctions). The A66 / Middlesbrough Road / Old Station Road, A66 / Normanby Road, A66 / Eston Road and A1053 / A1085 Trunk Road junctions are forecast to approach capacity with the addition of the proposed development and exceed capacity with the addition of the other Teesworks and South Bank sites;
- It is forecast that the cumulative impact of the five Teesworks sites, plus South Bank development, will have a significant adverse effect on the operation of the junctions on the local highway network. A detailed optioneering, modelling and design exercise, with phased build-out, will need to be undertaken to determine when mitigation measures are required;
- However, the design and implementation of any mitigation scheme for the junctions must take into account active and sustainable infrastructure measures which should be implemented to reduce vehicle trips and ensure that the forecasts of a worst-case assessment are not realised. This is in alignment with

the developing Transport Strategy for the wider Teesworks site. These measures will help to mitigate, to some extent, the impact of the development on the highway network. The emerging Transport Strategy measures will aim to promote sustainable transport and active travel patterns to / from the site, and substantially reduce the commuter car mode share. This should therefore reduce the volume of traffic generated by the proposed development; and

- It is expected that a site-wide Travel Plan will be developed for the Teesworks site based on the emerging Transport Strategy. However, if the Lackenby site is developed in advance of the Transport Strategy being adopted, this Transport Assessment identifies a list of initial measures and a Framework for a Travel Plan that could be applied in advance of the wider strategy coming forward, also outlining how the development will be incorporated into the wider Master Plan in due course.

9.2 Conclusions

To conclude, the proposed development is in compliance with local, regional and national policy as it contributes towards the regeneration of the Teesworks site and brings back into use former industrial land-use.

The development is one of several phases of the Master Plan which will be incorporated into the emerging Transport Strategy for the wider Teesworks site (where possible), which will continue to work with stakeholders to minimise the cumulative impact of Teesworks on the highway network. At the outset, the Lackenby development is committed to providing a bus service to ensure there is an alternative travel choice to the car, for those who live too far away to walk or cycle to the site. The proposed development will also develop a Travel Plan based upon the proposed Framework and / or will be incorporated into an interactive site wide Travel Plan (whichever comes first).

To account for the bus service, the highway impact assessment has assumed only a minor reduction in car mode share and is based on traffic increasing in the forecast future year of 2033. No discount in trip generation has been made to account for trips generated by previous uses, or the likelihood of some efficiencies being achieved in vehicular trips, particularly future goods and delivery trips which are expected to be subject to some extent of consolidation.

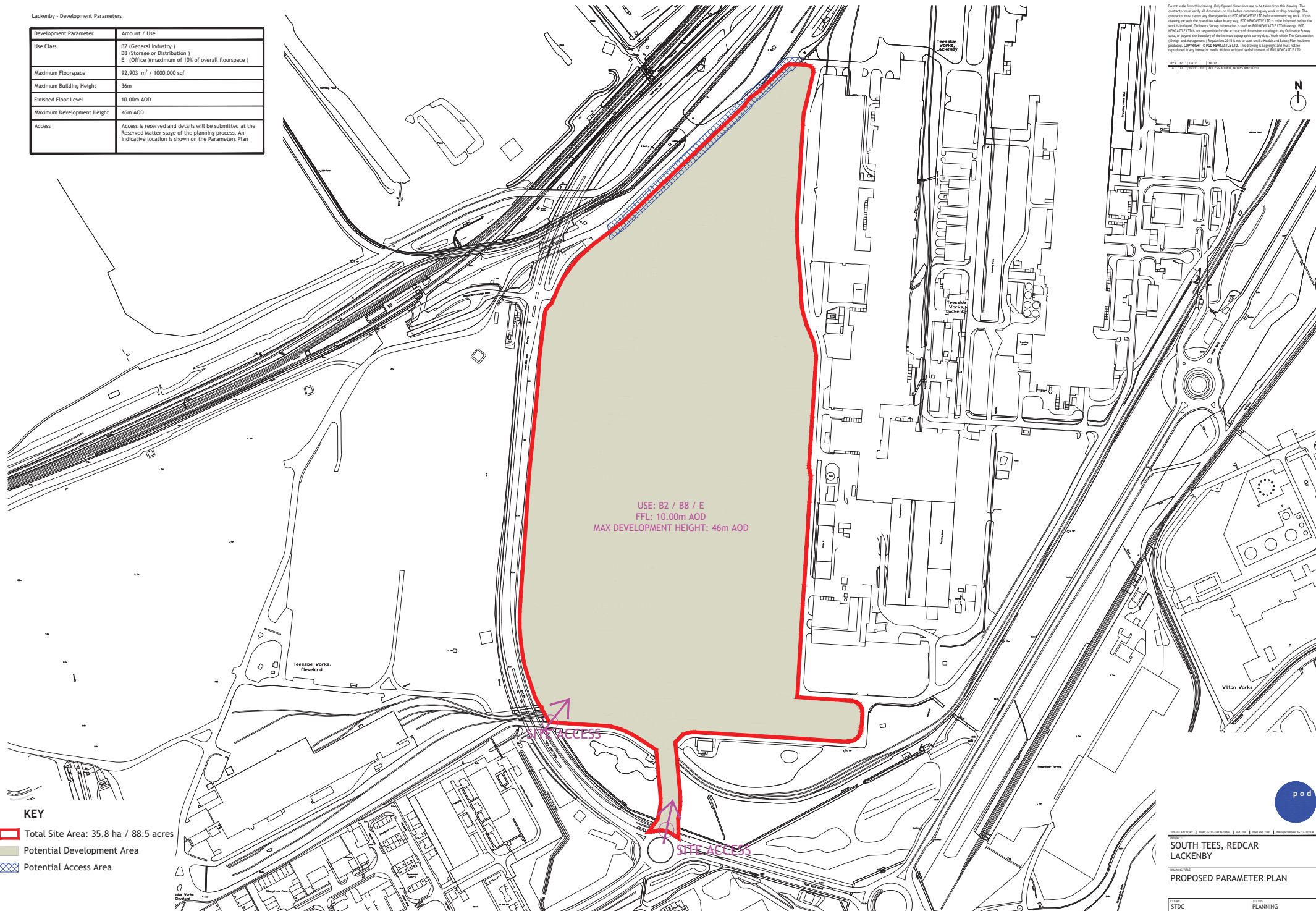
This robust assessment approach has identified locations on the highway network where additional capacity is anticipated to be required, and the assessment has indicated what amendments could be implemented to provide that additional capacity. However, the requirement to provide the additional highway capacity needs to be considered alongside the development of the wider site and the implementation of the emerging Transport Strategy, and the impact of national and local government policy initiatives to decarbonise the transport network.

On review, the assessment concludes that subject to agreeing and providing any highway mitigation considered to be essential, there would be no transport related reasons why this development should not be granted planning consent and its commitment to providing sustainable travel choices should have a long-term positive impact on the regeneration of the former industrial site and local area.

Appendix A

Indicative Site Plan

Development Parameter	Amount / Use
Use Class	B2 (General Industry) B8 (Storage or Distribution) E (Office) (maximum of 10% of overall floorspace)
Maximum Floorspace	92,903 m ² / 1000,000 sqf
Maximum Building Height	36m
Finished Floor Level	10.00m AOD
Maximum Development Height	46m AOD
Access	Access is reserved and details will be submitted at the Reserved Matter stage of the planning process. An indicative location is shown on the Parameters Plan



Do not scale from this drawing. Only figured dimensions are to be taken from this drawing. The contractor must verify all dimensions on site before commencing any work or deep drawing. The contractor must report any discrepancies to POD NEWCASTLE LTD before commencing work. It is the drawing maker's responsibility to ensure that the drawing is accurate. POD NEWCASTLE LTD is not responsible for the accuracy of dimensions relating to any Ordnance Survey data or beyond the boundary of the marked topographic survey data. We warrant that the Construction Design and Management / Regulations 2015 to not to start until a Health and Safety Plan has been produced. COPYRIGHT: POD NEWCASTLE LTD. This drawing is copyright and must not be reproduced in any format or media without written consent of POD NEWCASTLE LTD.

REV: 01 | DATE: 11/20/2020 | ACCESS ADDED, NOTES ADDED



KEY

- Total Site Area: 35.8 ha / 88.5 acres
- Potential Development Area
- Potential Access Area



POD NEWCASTLE LTD
SOUTH TEES, REDCAR LACKENBY

PROPOSED PARAMETER PLAN

DATE: 11/20/2020	PROJECT: A1	DATE: 11/20/2020	DESIGNED BY: LC	DRAWN BY: MEC
SCALE: 1:2500	PROJECT: A1	DATE: 11/20/2020	DESIGNED BY: LC	DRAWN BY: MEC
PROJECT: 1401-TM	PROJECT: LK-SD-10.01	DATE: 11/20/2020	DESIGNED BY: LC	DRAWN BY: MEC



Appendix B

TA Scoping Report and Consultation Responses

B1 Scoping Report

South Tees Development
Corporation

Teesworks

Transport Assessments - Scoping
Report

001

Issue | 26 November 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 602669-41

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ARUP

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1 Introduction

1.1 Purpose of the Scoping Report

Arup has been commissioned by the South Tees Development Corporation (STDC) to develop a Transport Assessment (TA) and Framework Travel Plan in support of five separate outline planning applications for development on the South Tees Development Corporation (STDC) site, known as 'Teesworks'.

An outline planning application for each of the five sites will be submitted separately and there will be five TA's produced. However, rather than producing five Scoping Reports, this document provides details of all five sites and outlines the key principles of the assessments.

Arup will also undertake the traffic and transportation assessment of the Environmental Impact Assessment.

The purpose of this scoping report is to agree the methodology and main parameters of the assessment with Redcar and Cleveland Borough Council (RCBC), the local planning and highway authority, and Highways England (HE). A copy will also be sent to the neighbouring highway authority, Middlesbrough Council (MC).

Decision points throughout the document are provided in a text box

1.2 Development Sites

The five development sites are as follows:

Dorman Point

The development site is located in the south-western part of the Teesworks area and the proposed maximum floorspace is just under 140,000sqm. It is largely free of active use, although the former Torpedo Ladle Workshop is present in the southern part of the site. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 1,620 people when operational.

Lackenby

The development site is located in the southern part of the Teesworks area and lies between Dorman Point and the British Steel area. It provides just under 93,000sqm of floorspace and is currently occupied by buildings and structures associated with the former steelmaking facilities. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 1,080 people when operational.

The Foundry

The development site, providing a maximum floorspace of 464,515sqm, is located in the northern part of the Teesworks area and is largely vacant industrial land, sparsely occupied by building and structures associated with the former steel making complex. The development proposals for the site are that it will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. It is forecast that the site could employ approximately 5,401 people when operational.

Long Acres

The development site is located between Steel House to the south and the Foundry to the north and provides just under 186,000sqm of floorspace. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 2,161 people when operational.

Steel House

The development site is bound to the south by the A1085 Trunk Road and is currently occupied by the Steel House office complex. It is proposed that the floor area, of around 16,000sqm, provides office and incubator space (use class E). It is forecast that the site could employ approximately 1,128 people when operational.

The location of the five sites is shown in **Figure 1**. The construction of the development sites will be phased, and all are expected to be operational by 2033.

Figure 1 Site Locations



2 Planning Policy Review

2.1 Literature Review

The TA for each of the five sites will address the relevant transport related policy documents as follows:

- National Planning Policy Framework (NPPF) 2019;
- Tees Valley Combined Authority Strategic Transport Plan 2020 - 2030;
- Redcar and Cleveland Local Plan 2018;
- Redcar and Cleveland Local Transport Plan 2011-2021;
- South Tees Regeneration Masterplan 2019; and
- South Tees Area Supplementary Planning Document (SPD) 2018.

It is proposed that the development considers relevant transport policies from the policy and guidance documents listed above. RCBC to advise if any other documents should be considered.

3 Baseline Conditions

The scope of each TA will include a full audit of available transport modes following the methodology outlined in this section.

3.1 Site Description and Location

This section of each TA will provide a high-level description of the characteristics of the site and the surrounding area.

3.2 Sustainable Transport Networks

A desktop audit of existing facilities and routes will be provided in this section of the TA. Information such as bus and rail routes, destinations and example journey times will be provided. For scheduled services, information such as frequencies and service times will be included.

3.3 Highway Network

This section of each TA will provide an overview of the main local roads and Strategic Road Network connecting the site to the wider area.

Due to current circumstances with the Covid 19 pandemic and lockdown measures, it is not possible for traffic surveys to be undertaken to inform the baseline condition assessment. To establish the baseline traffic flows, the following data sources have been utilised:

- Traffic data from HE North Regional Transport Model (NRTM);
- Traffic data from the Tees Valley Combined Authority (TVCA) Tees Valley Cube Model (TVM);
- Department for Transport traffic counts available online;
- WebTRIS (HE) online data;
- Traffic surveys collected on behalf of Capita in 2019 to construct a VISSIM model of the area for RCBC – permission to obtain a copy of these surveys was granted by RCBC, Capita and NETDC Ltd; and
- Survey data publicly available online from other local developments, including the planning application for the York Potash development (application number R/2013/0669/OOM).

Peak hour data from the two traffic models (NRTM and TVM) was input into two separate traffic flow diagrams for the study area. On both diagrams, any observed data was added above the links to enable a comparison to be made and determine which data source provided the most comparable base. The NRTM was found to be a comparable match against the baseline flows, and therefore the NRTM flows were predominantly used to inform the baseline, except for where observed data was available. All data has been adjusted to 2020 and 2033 (for operational year assessment) using NRTM growth.

The methodology described above was also used on application number R/2020/0357/OOM for development on the South Industrial Zone of the Teesworks site (referred to as ‘South Bank’).

3.4 Road Safety Analysis

To inform road safety considerations associated with the development proposals, a high-level review of five years’ worth of accident data on the roads within the vicinity of each site will be undertaken.

Should any common factors pertaining to road traffic accidents be identified, suitable mitigation features may be considered as part of the development proposal.

This section seeks agreement that:

- The scope of the transport networks audit is acceptable;
- The methodology for establishing baseline traffic flows is acceptable; and
- The scope of the accident appraisal is adequate.

4 Development Proposals

This section of each TA will provide an overview of the proposed development, including details about site accesses and proposed transport provisions for the site.

4.1 Vehicular Access

The TA for each development site will provide details about the site access arrangements. It is anticipated at this stage that the development sites will be accessed as follows:

Dorman Point

The parameter plan shows four indicative access points into the Dorman Point site:

- One via a new roundabout junction on Eston Road, the works for which have planning permission (application number R/2020/0270/FFM);
- One at the north east corner of the site where an existing Teesworks internal road enters the site;
- One at the south east corner where an existing Teesworks internal road enters the site; and
- One potentially to be provided at the south west corner of the site at the Bessemer Gate entrance into the Bolckow Industrial Estate.

For the purpose of the assessment, the main vehicular access will be the new roundabout junction on Eston Road with all trips generated by the site using the roundabout to access the wider highway network.

Lackenby

It is proposed that the main vehicular access into the Lackenby site will be via a new fourth arm provided on the A66/Tees Dock Road roundabout into the site. All development trips will be assigned to this main access for the purpose of junction impact assessments. Access is expected to also be permitted via the internal Teesworks road network that connects to Dorman Point.

Long Acres, Foundary and Steel House

It is proposed that these sites access the public highway network via the Trunk Road Roundabout (also known as Steel House Roundabout).

4.2 Walking and Cycling Facilities

The TA for each of the five sites will provide information about the proposed walking and cycling facilities for each development and how these connect to the external network.

4.3 Public Transport Facilities

Details of existing public transport connections will be provided in each of the TA's.

4.4 Cycle Parking

High quality cycle parking is expected to be provided, in excess of the usual standards, in support of a more sustainable travel policy for the site.

4.5 Car Parking

As all five applications will be in outline, the internal site layouts have not yet been developed, and therefore the level of car parking provision is unknown. A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.

This section seeks agreement on the transport proposals for the proposed development.

5 Trip Generation

5.1 Person Trips

The approach to trip generation will follow the same methodology as that agreed for the South Bank development (planning application number R/2020/0357/OOM). The methodology applies trip rates from the TRICS database based on employee numbers. TRICS is a recognised database widely used by transport professionals which predicts trip rates of developments based on survey information of comparable sites.

The industrial trip rates used in the South Bank assessment are shown in **Table 1**.

Table 1: Industrial Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.322	0.089	0.411	0.078	0.314	0.392	2.134	2.121	4.255
LGVs	0.029	0.022	0.051	0.01	0.016	0.026	0.294	0.287	0.581
HGVs	0.19	0.16	0.035	0.014	0.01	0.024	0.218	0.208	0.426

These were identified and agreed as comparable trip rates to apply to large scale industrial sites and will therefore be applied at Long Acres and the Foundry. However, during the consultation process for the South Bank planning application, Middlesbrough Council indicated that the trip rates that were applied on the TeesAMP development (planning application number 18/0308/FUL) should be applied at the Teesworks site. The TeesAMP trip rates are more applicable to smaller sized industrial sites and therefore could be applicable at both Dorman Point and Lackenby. These trip rates are shown in **Table 2** and will be applied at Dorman Point and Lackenby.

Table 2: TeesAMP Industrial Person Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Trip Rates	0.475	0.245	0.720	0.175	0.425	0.60	3.434	3.435	6.869

The Steel House site is proposed for office type use (use class E) and therefore office trip rates have been obtained from TRICS and these are shown in **Table 3**.

Table 3: Office Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.317	0.023	0.340	0.025	0.317	0.342	1.370	1.311	2.681
LGVs	0.003	0.002	0.005	0	0.001	0.001	0.029	0.029	0.058
HGVs	0.001	0.001	0.002	0	0	0	0.002	0.002	0.004

The trip rate for service and delivery vehicle trips (light goods vehicles and heavy goods vehicles) has been shown to disaggregate the overall person trip rate and determine how many trips are likely to be made by commuters, versus service vehicle trips. No information is provided in the TeesAMP Transport Assessment regarding service vehicle trip rates. It is useful to distinguish service trips, particularly HGVs, to assist assessments into noise and air quality. Therefore, the proportion of LGV and HGV trips from the TRICS analysis will be applied to the trip rates from the TeesAMP assessment to distinguish service vehicle trips.

The resultant person trips for each site, excluding LGVs and HGVs, is summarised in **Table 4**.

Table 4: Person Trips by Site

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Dorman Point	654	226	921	196	633	846	4,228	4,229	8,457
Lackenby	436	151	614	130	422	564	2,819	2,819	5,638
The Foundry	1,480	275	1,755	292	1,555	1,847	8,760	8,782	17,542
Long Acres	592	110	702	117	622	739	3,505	3,514	7,019
Steel House	353	23	376	28	356	385	1,510	1,444	2,954

All sites were previously occupied. However, as the development sites are currently vacant, it is proposed that the trip generation does not take into account previous or permitted uses and therefore the overall trip generation will not be discounted; all trips will be added to the network as new trips.

5.2 Trips by Mode

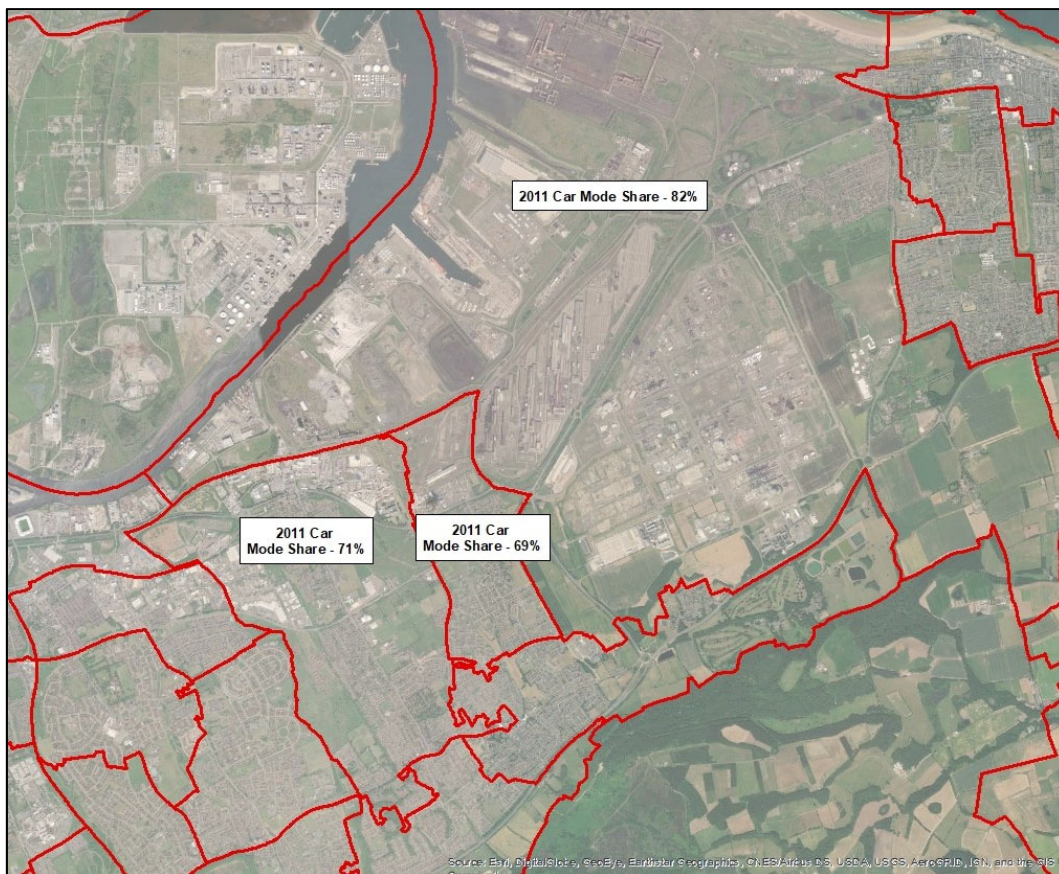
Having established a method for calculating the number of trips, the mode of transport for commuters has been informed by reviewing data from the 2011 UK Census Journey to Work dataset. The Teesworks area is split across two travel to work areas, Census zone E02002517 to the north and E02002523 to the south. Data regarding how people working in these areas travelled to work in 2011 is shown in **Table 5**.

Table 5 2011 Census Method of Journey to Work

Mode	2011 UK Census Northern Zone %	2011 UK Census Southern Zone %
Car Driver	82%	69%
Car Passenger	8%	8%
Bus	3%	5%
Bicycle	3%	2%
Walking	3%	13%
Motorcycle	1%	0%
Taxi	0%	2%

It can be seen that car mode share in 2011 varied between 82% and 69% and the areas this applies to is shown in **Figure 2**. The Dorman Point and Lackenby sites are located in the area where car mode share, in 2011, was 69% and the other sites are located to the north where travel to work, by car, was the higher 82% in 2011.

Figure 2 2011 Census Data – Car Mode Share



The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.

It is proposed that measures will be implemented to support sustainable accessibility to the site, including a dedicated bus service that will connect the

local towns of Middlesbrough and Redcar to the development sites. The bus service, funded initially by the Teesworks development, will travel into the site to provide a service that connects directly to each of the five development sites. The provision of a bus service, alongside other travel planning measures, is considered to enable at least a 5% reduction in those travelling to the site by car when these sites are operational. It is therefore assumed that the maximum car mode share for Dorman Point and Lackenby be 64%, with the other sites having a car mode share of 77%. **Table 6** shows how the base and adjusted car mode share equates to commuter car trips in the AM peak hour for each site.

Table 6 Car Trips

Site	Base Car Mode Share			Adjusted Mode Share (-5%)		
	AM In	AM Out	Total	AM In	AM Out	Total
Dorman Point	451	156	635	419 (-33)	145 (-11)	590 (-46)
Lackenby	301	104	424	279 (-22)	97 (-8)	393 (-31)
The Foundry	1,214	226	1,439	1,138 (-76)	212 (-14)	1,350 (-88)
Long Acres	485	90	576	455 (-30)	85 (-5)	540 (-35)
Steel House	289	19	308	272 (-18)	17 (-2)	289 (-19)
Total	2,741	595	3,382	2,562 (-178)	555 (-40)	3,164 (-218)

It can be seen from **Table 6** that the travel planning measures must aim to remove around 200 trips from private cars in the morning peak hour onto more sustainable modes to achieve a 5% car mode share reduction.

5.3 Trip Distribution

Feedback received on the South Bank planning application (application number R/2020/0357/OOM) from HE indicated that consideration should be given to journey to work data from the UK Census (which indicates the origin and destination trips for commuters), as well as existing turning proportions on the highway network, to assign development traffic to the highway network.

For all five sites the trip distribution at the main access will be informed by Census data. It is proposed to distribute traffic on the remainder of the highway network using the turning proportions in the baseline traffic flow diagrams.

Traffic will be distributed as far west to the A19 corridor, south to the A174 corridor and east to the Trunk Road / Kirkleatham Lane junction. The site is bound by the River Tees to the north.

5.4 Cumulative Assessment and Future Growth

A cumulative assessment will be undertaken to consider the cumulative effects of all five developments, plus the South Bank development. This cumulative assessment of all STDC sites will be undertaken for a future year of 2033. Rather than review and extract traffic flows for the committed developments that have been identified, it is proposed to extract growth from Highways England's North Regional Transport Model (NRTM). This approach is considered to be

reasonable as it is underpinned by the National Trip End Model (NTEM) which informs TEMPro growth, as well as a full variable demand model, accounting for changing economic conditions and competing transport modes. Growth in the NRTM is controlled to NTEM at district level (as per TAG guidance) however individual developments are explicitly accounted for. This means that local trip end growth is calculated in a detailed way.

This scoping report seeks agreement on:

- The employee trip rate approach which applies large industrial site trip rates to the Long Acres and Foundry sites, and the TeesAMP trip rates to the Dorman Point and Lackenby sites. Office trip rates will be applied to the Steel House development;
- Applying 2011 Census mode share proportions to determine trips by mode, but reducing car mode by 5% to account for trips transferred onto the proposed bus service and other sustainable travel initiatives. This results in the assumed car mode share at Dorman Point and Lackenby of 64% and 77% at the other three sites;
- The approach to vehicular trip distribution; and
- The approach to use NRTM forecasts to growth traffic to 2033 which will be used to both assess the impact of each development in 2033, but also to assess the cumulative impact of all five sites being operational by 2033. The cumulative assessment will also include trips from the South Bank development.

6 Development Impact Assessment

6.1 Scope of Highway Impact Assessment

6.1.1 Local Junction Assessments

A number of junctions have been identified on the surrounding network where the development trips could have an impact. **Table 7** lists the junctions that will be assessed for each development.

Table 7 Junctions Impact Assessments

Site	Type	Dorman Point	Lackenby	Foundry	Long Acres	Steel House
A66/Old Station Road roundabout	ARCADY	X	X			
A66/Eston Road	LINSIG	X	X			
A66/Normanby Road	LINSIG	X	X			
A66/Tees Dock Road roundabout	ARCADY	X	X			
A66/Trunk Road/A1053 Greystones Road	LINSIG	X	X	X	X	X
Eston Road roundabout	ARCADY	X	X			
Greystones roundabout	LINSIG	X	X	X	X	X
Steel House roundabout	ARCADY			X	X	X
Trunk Road/Kirkleatham Lane	LINSIG			X	X	X

The junction assessments will be undertaken for the following scenarios for both the AM and PM peak hour:

- 2033 Base;
- 2033 Base + 1 development site (x5);
- 2033 Base + all five developments + South Bank development (cumulative assessment).

6.1.2 Strategic Highway Assessment

As requested by HE for the South Bank development, the scope of the traffic assessment will extend to include the A19 corridor. Jacobs has provided a copy of the 2015 New Tees Crossing AIMSUN Model so that the impact of trips from

the Teesworks sites on the A19 can be assessed. The impact of each development site, and the cumulative scenarios, will be undertaken.

6.2 Environmental Impact Assessment

A traffic and transportation assessment will be included in the Environmental Statement (ES) for each development. The Environmental Impact Assessment (EIA) will be carried out in accordance with the EIA Regulations and guidance contained in relevant publications including:

- Environmental Impact Assessment: A Guide to Procedures (Department of the Environment, Transport and the Regions (DETR), 2000); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management & Assessment (IEMA), 2004).

In accordance with the IEMA Guidelines, it is proposed that the following conditions on the transport network within the study area be assessed during the operational phase (2033 with development) for each site:

- Severance (change in traffic flows);
- Driver and bus user delay (derived from the junction assessments);
- Pedestrian and cyclist amenity (change in traffic flows on local routes used by pedestrians and cyclists); and
- Accidents and safety (following a review of existing conditions, a judgement will be made as to whether the proposed development will result in any changes to highway safety).

Construction details are not yet finalised and as such, construction traffic will not be included in the scope of the traffic and transportation assessment of the EIA. A framework Construction Environmental Management Plan (CEMP) will be prepared and will form part of the embedded mitigation of the development. The CEMP will identify that a Construction Traffic Management Plan (CTMP) will be implemented either at site level or for each development phase. The CTMP will identify any necessary mitigation to minimise the impact of construction traffic on the transport networks.

This section of the scoping report seeks agreement on:

- The scope of the junction impact assessments for the TA's;
- The junction assessment scenarios; and
- The scope of the EIA assessment.

7 Travel Plan

7.1 Overview

All of the proposed developments are located within the Teesworks site and subsequently will be encompassed into the Transport Strategy and benefit from the measures that will be delivered to serve the wider site. The Transport Strategy is still under development but is expected to include ambitious targets to reduce car use and recommend measures that significantly improve the accessibility of the site by public transport, walking and cycling.

However, as these sites will be developed in advance of the strategy being adopted, a Travel Plan Framework for each site will be outlined in the TA, detailing measures that will be applied in advance of the wider strategy coming forward, but also outlining how the site will be incorporated into the wider masterplan in due course.

7.2 Bus Service

A key recommendation arising from the Transport Strategy is the need to provide a bus service that travels within the site. The scale of the site means that the location of the public bus stops are well outside the generally accepted 400m walking distance between a bus stop and a destination.

It is therefore anticipated that the TA's will recommend that to provide an attractive alternative to private car travel to the site, a bus service will be required. Further details of this will be provided in the Travel Plan Framework.

RCBC to confirm that this application can be incorporated into the wider STDC Transport Strategy and that a Travel Plan Framework, which outlines the measures that occupiers could introduce prior to more wide-ranging measures coming forward, will be sufficient to support each planning application.

8 Conclusions and Next Steps

This Scoping Report has considered the potential impact of five proposed development sites on the Teesworks site. It has outlined what is proposed to be covered by the Transport Assessment and Environmental Statement that will be submitted as part of the planning application for each of the proposed developments.

Arup would be grateful if RCBC, MC and HE could respond in writing to confirm that the methodology proposed in this report is acceptable. Should there be any significant issues with regards to the scope, an online meeting is requested at the earliest convenience.

B2 Highways England Feedback

South Tees Development Corporation: Teesworks – Response to “Transport Assessments – Scoping Report”

PREPARED FOR: Chris Bell / Sunny Ali (Highways England)
PREPARED BY: Gavin Nicholson (CH2M)
DATE: 14th December 2020
PROJECT NUMBER: 679066.AA.20.18.12
SITE/ DOCUMENT REF: DevTV0062/TM001
REVIEWED / APPROVED BY: Jonathan Parsons (CH2M)

Introduction

CH2M has been commissioned by Highways England to provide a review of the document titled “South Tees Development Corporation: Teesworks, Transport Assessments – Scoping Report” prepared by Arup on behalf of the South Tees Development Corporation and dated 26th November 2020 [the Scoping Report].

The single Scoping Report seeks to set the scope for five separate Transport Assessments [TAs] which will support the five outline planning applications for development within the South Tees Development Corporation [STDC] site.

The STDC site is located on the south bank of the River Tees, between Redcar town centre to the east and Middlesbrough town centre to the west. The site location, indicating each of the five sites that will require a TA, is shown in Figure 1, extracted from the Scoping Report.

The consultation with Highways England at this stage of the process should be welcomed as early engagement enables the assessment to be aligned to Highways England’s requirements. A summary and conclusion are provided at the end of this Technical Memorandum [TM].

Figure 1 – Location of application sites



(Extract from the Scoping Report)

According to the Scoping Report, it is expected that the proposed outline planning applications will be for the level of development identified in Table 1.

Table 1 – Application sites information

Application site	Floorspace (sqm)	Land Use	Approximate operational jobs
Dorman Point	140,000	B2 / B8 with ancillary office	1,620
Lackenby	93,000	B2 / B8 with ancillary office	1,080
The Foundry	464,515	B2 / B8 with ancillary office	5,401
Long Acres	186,000	B2 / B8 with ancillary office	2,161
Steel House	16,000	Office and incubator space (use class E)	1,128
Total	899,515	-	11,390

All of the development sites are expected to be operational by 2033.

Background

For background, it is important to note that Highways England has recently been consulted on an application for an initial element of development within the STDC site – the Southern Industrial Zone. This development (located north of the Dorna Point site (indicated by the red boundary in Figure 1 above) was for a plot of approximately 418,000sqm of B2 / B8 floorspace with ancillary office development, expecting to accommodate 3,870 employees. Highways England were able to accept the development following a period of dialogue and provision of appropriate assessment at the SRN.

Technical Memorandum structure

This TM:

- Firstly, considers the technical elements of the Scoping Note in order to enable a response to be made to that; and
- Then considers the fit of these development aspirations with the wider strategy for the site (Local Plan policy, SPD, Masterplan) to ensure that the sites are being brought forward in a manner that fits this wider context.

Scoping Report review

This TM mirrors the structure of the Scoping Report and specifically aims to focus on the elements of the Scoping Report that are of interest to Highways England and seeks to provide a response to all the decision points identified by Arup.

Baseline conditions

Highway network

The Scoping Report sets out that the TAs will provide an overview of the local road and the SRN connecting the site to the wider area. It is identified that due to current (Covid-19) conditions, it is not possible for traffic surveys to be undertaken to inform the baseline assessment. This situation is recognised by CH2M.

As with the Southern Industrial Zone scoping, the elements of the SRN that are required to be assessed should be informed by the trip assignment analysis and with a view to the absolute level of impact (noting that percentage impacts will not be considered as an indicator). Information in relation to the full assignment of trips should be presented early in the process (prior to completion of the TAs), in order for agreement to the study area to be reached and to inform other elements of the TAs. Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction on the SRN.

Upon definition of the study area (based on the impact analysis), CH2M recommend that a fully defined approach of reflecting typical traffic conditions is established including sourcing all available traffic data (traffic count companies and Highways England).

With regard to growth and future operational scenarios, CH2M recommend that scenarios mirroring those ultimately agreed as part of the Southern Industrial Zone assessment would be reasonable.

Road safety analysis

The Scoping Report proposes that a high-level review of five years' worth of accident data within the vicinity of the site is to be undertaken.

This approach is accepted but the review will also need to cover any SRN geography that is needed to be included in the study area.

Development proposals

Vehicular access points

The Scoping Report identifies that each TA will provide details about the site access arrangements. While these access points will all be located on the local road network and subject to local highway authority review, information should be available to ensure that Highways England can be satisfied that:

- The trip distribution and assignment analyses pay appropriate cognisance to the access points and the routes which vehicles would traverse the networks; and
- Any operational consequences at the local road network that have the potential to cause subsequent operational issues at the SRN are fully detailed.

Car parking

It is identified that, given the five applications will be in outline form, the level of parking provision is unknown at this stage. While the scale of parking is generally a matter for the local highway authority to satisfy itself with, the level of parking has the potential to influence the trip generation and the sustainability credentials of the site, Highways England will need to be subject to consultation on the reserved matters applications that seek to define the level of parking.

Trip generation

Person trips

The Scoping Report identifies that the trip rates are based on:

- For the large scale industrial sites (Long Acres and the Foundry) the application of the trip rates used in the South Industrial Zone assessment;
- For the smaller sized industrial sites (Dorman Point and Lackenby), the application of trip rates from the TeesAMP development (application ref 18/0308/FUL); and
- For the office based site (Steel House), office trip rates from TRICS have been used.

CH2M has undertaken a review of this information and make the following comments (on the basis that the planning application will be specific in relation to the scale and mix of development proposed):

- Long Acres and the Foundry

It can be confirmed that the trip rates utilised are those agreed as part of the Southern Industrial Zone assessment and these can therefore be accepted.

- Dorman Point and Lackenby

The use of the TeesAMP trip rates for these elements of the development are accepted.

- Steel House

The TRICS assessment and parameters used have not been provided to enable validation of the office trip rates and these should be provided to enable these to be agreed.

Trips by mode

Journey to Work data has been used to infer the proportion of highway trips based on Census zones E02002517 and E02002523 for the northern and southern parts of the site respectively. This is considered a reasonable approach by CH2M.

It is identified that it is proposed that measures will be implemented to support sustainable accessibility to the site. On the basis of these measures, it is identified in the Scoping Report that this will enable at least a 5% reduction in travel to the site by car and therefore it is assumed that the number of car trips could be reduced by 5%.

The Scoping Reports does not suggest whether the base car mode share trips or the adjusted (-5%) car trips will be utilised within the operational assessments in the TAs. Should it be proposed that the latter, there will be a requirement for:

- 1) Clarification in relation to how the measures being proposed transpire into the defined 5% reduction – how has the 5% reduction been quantified;

- 2) A detailed commitment to the identified initiatives, secured through appropriate planning conditions requiring measures to be in place prior to occupation; and
- 3) Potential need for consideration of fallback positions within the Travel Plan in the event that the sustainable measure targets have not been achieved.

Vehicular trip distribution

The Scoping Report proposes that vehicular trip distribution is to be based on (i) at the site access, journey to work distribution trips from the Census data and (ii) existing turning proportions on the highway network.

As discussed through the Southern Industrial Zone application, the use of existing turning proportions to distribute development traffic is not considered acceptable. CH2M therefore recommends that the trip distribution analysis is founded on Census data and that the analysis be provided in spreadsheet form to enable checking and validation.

While initial extents of the trip distribution analysis are provided, noting that Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction, the trip distribution analysis should extend to cover all potential elements fitting this criteria.

Cumulative Assessment and Future Growth

The Scoping Report identifies that a cumulative assessment of all five proposed developments alongside the Southern Industrial Zone will be undertaken. This assessment is welcomed by CH2M.

With a view to consideration of other committed developments and other background growth calculations, CH2M consider that the forecasts utilised as part of the ultimately agreed analysis for the Southern Industrial Zone is utilised rather than create a variant set of analyses that require further development, checking and validation.

The provision of the information in spreadsheet form (including all component elements) will enable a review to be undertaken.

Development Impact Assessment

Scope of Highway Impact Assessment

With regards to the SRN, it is identified in the Scoping Report that elements of the network that will be assessed will mirror those ultimately assessed as part of the agreed Southern Industrial Zone assessments. As identified above, the study area will need to be agreed on the basis of the trip assignments determined from the earlier elements of the analysis.

At this time, it is not possible to validate the areas of the network that require assessment (Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction) and these should be clarified prior to the undertaking of any operational assessment.

In addition, the assessment of a 2033 future year assessment is welcomed by CH2M, although it will need to be ensured that validated base models are utilised in assessments.

Environmental Impact Assessment

Given the scale of development, there is the potential that there could be significant construction impacts. It may be necessary for the Construction Traffic Management Plan [CTMP] to be conditioned until a clear view on construction impacts (construction trip impacts and potential abnormal loads) is known.

Travel Plan

The Scoping Report outlines that a Travel Plan framework for each site will be prepared. Whilst it would have been welcomed for the transport strategy for the wider STDC site to have set the strategic sustainable transport framework for the site, in terms of the Travel Plans, as discussed earlier, it will need to be considered that:

- 1) Clarification in relation to how the measures being proposed transpire into the defined 5% reduction – how has the 5% reduction been quantified;
- 2) A detailed commitment to the identified initiatives, secured through appropriate planning conditions requiring measures to be in place prior to occupation; and
- 3) Potential need for consideration of fallback positions within the Travel Plan in the event that the sustainable measure targets have not been achieved.

CH2M would welcome these points being considered as the assessment moves forward.

Fit of sites with wider strategies

The site forms parts of the wider STDC site. Whilst reference to the STDC Transport Strategy is made, it is fully recognised that these sites are coming forward in advance of the Transport Strategy having been completed:

- The Scoping Report acknowledges:
 - Within section 4.5 (relating to car parking) that *“A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets) ... It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.”*
 - Within section 5.2 (relating to trips by mode) that *“The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.”*
- As part of discussions relating to the Southern Industrial Zone site, Arup identified *“The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.”*

Bringing such a scale of site forward in advance of a fully defined Transport Strategy is considered by CH2M to be somewhat of a concern to Highways England as this restricts the ability to bring them forward in a strategically-planned manner.

Rewinding a little back to the Local Plan, the Supplementary Planning Document [SPD], the site Masterplan and the Transport Strategy, the following summary is provided with a view to the current position:

Redcar and Cleveland Local Plan (Adopted May 2018)

Local Plan provisions

In relation to development:

- Policy LS4 (South Tees Spatial Strategy) (which includes the STDC) identifies that Redcar and Cleveland Council [the Council] will:
 - (p) *“support improvements to the strategic and local road network to support economic growth”*

- Para 3.27 identifies that a Master Plan is being prepared and this will help guide development of this area, including infrastructure improvements.
- Policy ED6 (Promoting Economic Growth) identifies that:
 - Land and buildings within existing industrial estates and business parks, as shown on the policies map, will continue to be developed and safeguarded for employment uses.”
 - Specialist uses, such as heavy processing industries and port logistics, will be focussed in the following areas, with 405 hectares of additional land available over the plan period. In these areas proposals falling within Use Classes B1, B2, B8 and suitable employment related sui-generis uses will be supported.
 - ED6.2 Land at South Tees 184 hectares.
 - ED6.4 South Tees Industrial Estates and Business Parks 3.5 hectares

In relation to Infrastructure:

- Para 1.112 identifies that the Council will work with organisations to ensure the infrastructure is delivered when required.
- Para 1.113 identifies the Tees Valley Strategic Infrastructure Plan as setting out the current barriers to growth and priorities for improving infrastructure across Tees Valley.
- Para 1.114 identifies that there are plans to deliver improvements to rail and road infrastructure.
- Para 1.124 identifies that it is important to ensure that the borough’s road infrastructure will have the capacity to cope with the expected increase in traffic levels over the life of the Local Plan.
- Para 1.125 states that “Improving transport links will require continued, proactive joint working with ...the Highways Agency ... with the overall aim of establishing a high quality, safe, secure and reliable network ...”

In relation to Transport:

- Para 9.7 identifies the key objectives of the transport strategy component of the Local Plan, including - improve access and connectivity to and from Teesport and the surrounding South Tees area
- Policy TA1 (Transport and New Development) identifies:
 - The Council and its partners will ensure that the transport requirements of new development, commensurate to the scale and type of development, are taken into account...
- Para 9.8 recognises the borough has particular congestion hotspots at the SRN including the A19, A174 and A66 and that new infrastructure may be needed to tackle these congested areas.
- Para 9.17 indicates that the Council follows the requirements of the Guidance on Transport Assessment as the standards for when TS, TA and TPs are required.
- Policy TA2 (Improving Accessibility Within and Beyond the Borough) identifies that the Council will work together with Developers and transport providers. This will include:
 - (f) working with Highways England to improve capacity to the A66, A1053 and A174, particularly Greystones roundabout.
 - (k) working with the Tees Valley Combined Authority and Highways England to deliver capacity improvements to the Strategic Road Network including across the sub-region including improvements to the A19, A1085 and A689 to improve access to key development sites, all providing indirect benefits to Redcar and Cleveland;

- (m) supporting proposals being prepared by Tees Valley Combined Authority and Highways England to deliver improvements to the A66 and A174 road links to the A19 and beyond to the A1/A1(M), providing appropriate access to the strategic highway network from South Tees, to reduce bottlenecks and maintain highway capacity;
 - Where necessary, developers may be required to fund transport improvement schemes through Section 106 agreements where infrastructure provision and capacity would be affected or could constrain new development.
- Para 9.25 states that Redcar and Cleveland benefits from good highways provision catering for heavy vehicles and industrial uses. Linkages between the South Tees, Greater Eston and Redcar and the strategic highway network on the A66, A174 and A19 make the area highly accessible and attractive to industry, business and commuters. It is imperative that this operational benefit over other areas, where capacity is more limited, is not detrimentally affected by any development proposals. It will be essential that improvements and enhancements to the borough's infrastructure continue in order to facilitate local economic development and growth. The Council will continue to work strategically with its neighbouring local authorities and the LEP to maximise on funding opportunities via the Government. The Local Plan is being developed in parallel with the sub-regional Strategic Economic Plan and the Local Growth Fund and is ensuring consistency of objectives. We will also work proactively with the private sector to secure developer contributions to ensure the highway network advantage is maintained and enhanced wherever possible.

The development principles establish that:

- Policy SD4 (General Development Principles) identifies that in assessing suitability, development will be permitted where it:
 - a) meets the requirements of the locational policy and accords with other Local Plan policies and designations
 - g) will have access to adequate infrastructure ... to serve the development
 - p) provide suitable and safe vehicular access
- Policy SD5 (Developer Contributions) identifies that the Council may secure developer contributions in order to fund necessary infrastructure.

Highways England position

The joint position statement between Highways England and the Council noted that the development in the Local Plan is unlikely to have a significant impact on the SRN and the package of measures proposed are acceptable to both Highways England and the Council in ensuring that the SRN can support the growth aspirations identified in the Local Plan.

The proposed schemes are promoted through the Local Plan in Policy TA3 and the supporting Infrastructure Delivery Plan, specifically identifying improvements to the A19, A1053, A66 and A174; while recognising that further work is required to specifically identify the phasing of the improvements and the quantum of development that can be accommodated on the SRN prior to the improvements being required.

It was noted that applications for development will be managed on an individual basis.

South Tees Area Supplementary Planning Document [SPD] (Adopted May 2018)

During the consultation on the SPD, Highways England noted general support, but that it should be delivered in accordance with Local Plan Policy TA2 and the Infrastructure Delivery Plan and that there

was a need to ensure that the implications at the SRN are understood and addressed in line with the package of SRN improvements detailed within the Local Plan and Tees Valley AAP.

In summary, the SPD:

- Seeks to guide and inform future planning applications in the area and used as a material consideration in determining planning applications.
- Identifies requirements and provides a broad strategy to deliver supporting infrastructure.
- Commits to the development of a Transport Strategy.
- Seeks the creation of up to 20,000 new jobs.
- Contributions relevant to the nature and scale of the development may be sought, including ... in order to fund necessary infrastructure ... required as a consequence of development and in accordance with Local Plan policy SD5.
- Seek to improve and enhance the transport infrastructure serving the South Tees Area, as supported by Local Plan Policy LS4.
- All new development proposals shall be in accordance with Local Plan Policies SD4 and TA1 and will be required to have access to adequate infrastructure to meet their transport requirements.
- Other highways infrastructure proposals will be delivered in line with emerging development priorities and funding availability and will be identified through the Transport Strategy for the Area.
- The Council, working in partnership with the STDC, the Tees Valley Combined Authority and other infrastructure providers will actively seek public sector funding to support infrastructure development in line with the SPD. Necessary off-site infrastructure contributions would be sought through Section 106 planning obligations or through the use of 'Grampian' planning conditions. Obligations could include physical works or contributions towards highway measures to mitigate the transport impacts of the development.
- It is intended that the SPD will be reviewed with a view to the preparation of the technical supporting documents (including the transport strategy).

South Tees Regeneration Master Plan (November 2019)

The South Tees Regeneration Masterplan identifies:

- The Tees Valley's key road transport assets include the strategic growth corridor of the A19, the A1(M), linking North and South, and the A66, providing Trans-Pennine East to West connectivity. Few areas of the UK are better served by road services.
- Centrally placed within the Tees Valley, the STDC area has excellent road transport connections. The A66 East-West route commences at the STDC boundary, and the nearby A174 Parkway provides direct access to the A19. Both the A66 and A19 provide direct connectivity to the A1(M) North-South route, which in turn affords access to the M62 strategic Trans-Pennine road corridor.
- To support the proposed major development of South Tees, coupled with the ambitions of TVCA in its delivery of the Strategic Economic Plan, there will be a need to improve the area's transport connectivity.
- Notwithstanding the STDC's excellent transport connections, there are some wider connectivity barriers, including significant pressure points on the A19 and on the road network accessing the A1(M) and A19.
- The future redevelopment of the STDC area for industrial use will need to consider and address Transport infrastructure requirements.

- Consideration will be given to the impact on the local highway network of the planned major increases in development traffic that will ensue as the proposals for the regeneration programme begin to be realised, so that junction capacities are not adversely impacted and that the current favourable position the South Tees area benefits from is not compromised. The requirements for Transport Appraisals to assess transport impacts, particularly highways, will be given due attention as the development proposals begin to be fleshed-out.
- Next steps: STDC will continue to develop key thematic delivery strategies, as discussed within the South Tees Area SPD, including Transport.

Transport Strategy

Highways England has engaged in the process of the transport strategy development with the last dialogue in April 2020. A Phase 1 Report was produced outlining modelling to be undertaken in Phase 2, but Phase 2 has not been forthcoming to date.

As part of work in reviewing the STDC South Industrial Zone application, it was identified that the next Steering Group meeting would be being arranged in due course.

As part of the initial review of that application scoping, CH2M identified *“The South Tees Regeneration Master Plan states that “consideration will be given to the impact on the local highway network of the planned major increases in development traffic that will ensue as the proposals for the regeneration programme begin to be realised, so that junction capacities are not adversely impacted and the current favourable position the South Tees area benefits from is not compromised. The requirements for Transport Appraisals to assess transport impacts, particularly highways, will be given due attention as the development proposals begin to be fleshed-out”.* With this in mind, CH2M recommend that a view of the full site impacts is provided, either in the Scoping Report itself or alongside it, so that a view can be gained.

Wider Strategies - considerations

The Scoping Report acknowledges:

- Within section 4.5 (relating to car parking) that *“A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets) ... It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.”*
- Within section 5.2 (relating to trips by mode) that *“The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.”*

As part of discussions relating to the Southern Industrial Zone site, Arup identified *“The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.”*

With a view to this, the following comments are made:

- The requirement for consideration of the impact on infrastructure, and the need to work with Highways England in relation to the SRN, is clear throughout the documents.
- The very fact that there is a location-specific SPD, a Masterplan, and a requirement for a Transport Strategy, highlights the need for a strategic approach to this site. It is disappointing that this is not flowing through the work undertaken. Dealing with the sites on an application by application basis may lead to a point whereby later applications on the site / other developments in the area may need infrastructure measures to enable them, due to these developments having consumed the available capacity. Similarly, the competitive advantage that the area has with regard to the

strategic connectivity may be diminished if the impacts are not considered in a more strategic manner.

- The SPD has committed to the production of the Transport Strategy, but this is still forthcoming. Priorities and funding availability for highways infrastructure is suggested as being identified through the Transport Strategy.
- The SPD points towards the creation of 20,000 jobs. The five applications under current consideration, along with the Southern Industrial Zone application, amount to an estimated 15,260 jobs. This is a significant (over 75%) proportion of the sites’ aspirations that are coming forward in the absence of any form of strategic approach to transport.
- The SPD identifies that it would be reviewed 12-18 months post adoption to take account of the various technical documents including the Transport Strategy. Having been adopted in mid-2018 this review being informed by the Transport Strategy (amongst others) would have been expected to have happened by now.
- The Masterplan identifies that there is a need to improve the area’s transport connectivity to support the proposed major development in South Tees.

Summary and Conclusion

The following table lists all the items that were highlighted in the Scoping Report as decision points and Highways England’s response.

Table 2 – Scoping Report Decision Points

Scoping Report Section	Decision point (as defined in Scoping Report)	Highways England response	Suggested Action
2. Planning Policy Review	Documents proposed for planning review	Acceptable	No action
3. Baseline Conditions	Scope of transport networks	Comments made	<p>Definition of the study area, based on the SRN criteria, should be provided early in the process to provide clarity of network to be assessed.</p> <p>At this point the establishment of the baseline position at the SRN should be confirmed.</p> <p>Growth and future operational scenarios should match that considered during the review of the Southern Industrial Zone.</p>
	Methodology for establishing baseline traffic flows	Comments made	<p>At the point of having established the study area, the baseline position at the SRN should be confirmed.</p> <p>Growth and future operational scenarios should match that considered during the review of the Southern Industrial Zone.</p>

Scoping Report Section	Decision point (as defined in Scoping Report)	Highways England response	Suggested Action
	Scope of the accident appraisal	Comments made	Needs to cover extents of SRN geography.
4. Development Proposals	Transport Proposals	Comments made	Access points will need to be considered in as far as they influence definition of SRN impacts.
5. Trip Generation	Trip rates	Comments made	Information supporting the derivation of the office trip rates is required in order to verify their use.
	Mode share proportions	Comments made	The use of Census data is supported. Further information in relation to a proposed 5% reduction would be required in order for this to be accepted.
	Proposed trip distribution	Comments made	Census data distribution is accepted, but assessment using existing turning proportions is not accepted. The analysis should extend as far as is required to ensure appropriate consideration of the SRN.
	Approach to growth forecast	Comments made	The approach should mirror that ultimately used in the Southern Industrial Zone assessment.
6. Development Impact Assessment	Scope of highways impact assessment	Comments made	The starting point for identifying the need of assessment at the SRN is based on an impact exceeding 30 two way trips at a junction
	Junction assessment scenarios	Acceptable	
	Scope of the EIA	Acceptable	The CTMP will need to be conditioned until a clear view on construction impacts is known.

In the wider sense, an update on the Transport Strategy and how the intentions of the wider policies are being secured needs to be questioned. While Highways England need to respond to these planning applications on their own merits, the strategies were put in a place for a reason and without them, a significant proportion of this large employment site is likely to come forward in a manner that is not consistent with the ambitions of the wider strategies.

Finally, with regard the applications currently subject to review, CH2M would promote that these are progressed through proactive collaboration between the parties. While noting that all development applications have time pressures with a view to gaining approval, the discussions allied with the Southern Industrial Zone application involved significant pressure to get things resolved. These timescales did not seem to fit with (i) the scale of development being proposed or (ii) the lack of initial

appetite to give appropriate consideration to the SRN. This should be avoided as part of these applications, which themselves are of a significant nature.

B3 Redcar & Cleveland Borough Council Feedback

From:
To:
Subject: [External] RE: TA Scoping Report for Teesworks
Date: 30 November 2020 14:54:27

Thanks for sharing the draft scoping report.
Collective thoughts from Tony & myself are below.
Please do get in touch if anything needed.
Thanks

Comments so far.

- The Local Transport Plan has been partially replaced by the Tees Valley Strategic Transport Plan and will be fully replaced when the Local Implementation Plan is adopted in 2021.
- Focus should also include how pedestrians, cyclists and public transport users will access each site upon first occupation (we recommend footway & cycleway links on both sides of each internal road from 3m shared surfaces on minor roads up to 2m+2m segregated facilities on the major links). But connectivity may not be along the same alignments as general road access & will connect directly to adjacent residential areas &
- early (temporary) internal connectivity between sites before the masterplan infrastructure is in place needs to be resolved before first occupation. The operation of financially viable and attractive bus services for users will be difficult if the sites are effectively served by a series of dead end roads from the A66 or A1085.
- Dorman Point site – access direct to Tees Dock Road should also be considered for this site. Possibly via the Grangetown Station Road corridor?
- Re-opening of Redcar British Steel Railway Station should be programmed at first occupation of Foundry, Long Acres & Steel House sites.
- Charging point infrastructure for electric vehicles needs to be integral to each car park/or distributed through each site. Solar farms using building roofs should be considered.
- Hydrogen filling stations will be initially provided at Eston Road and Teesport by TVCA, but more hydrogen infrastructure may be required.
- A Teesworks wide travel plan should be developed based on the evidence contained in the Transport Study & best practice. This should establish core principles/actions that developers will be required to sign up to with additional measures introduced as required by each business. Appointing a Travel Plan Co-ordinator for the Teesworks site with a delivery budget before first occupation would be preferable.

Transport Strategy Manager
Redcar & Cleveland Borough Council
Redcar & Cleveland House
Kirkleatham Street
Redcar
TS10 1RT

Appendix C

2011 Census Journey to Work Data

C1 Journey to Work Data

C1.1 Introduction

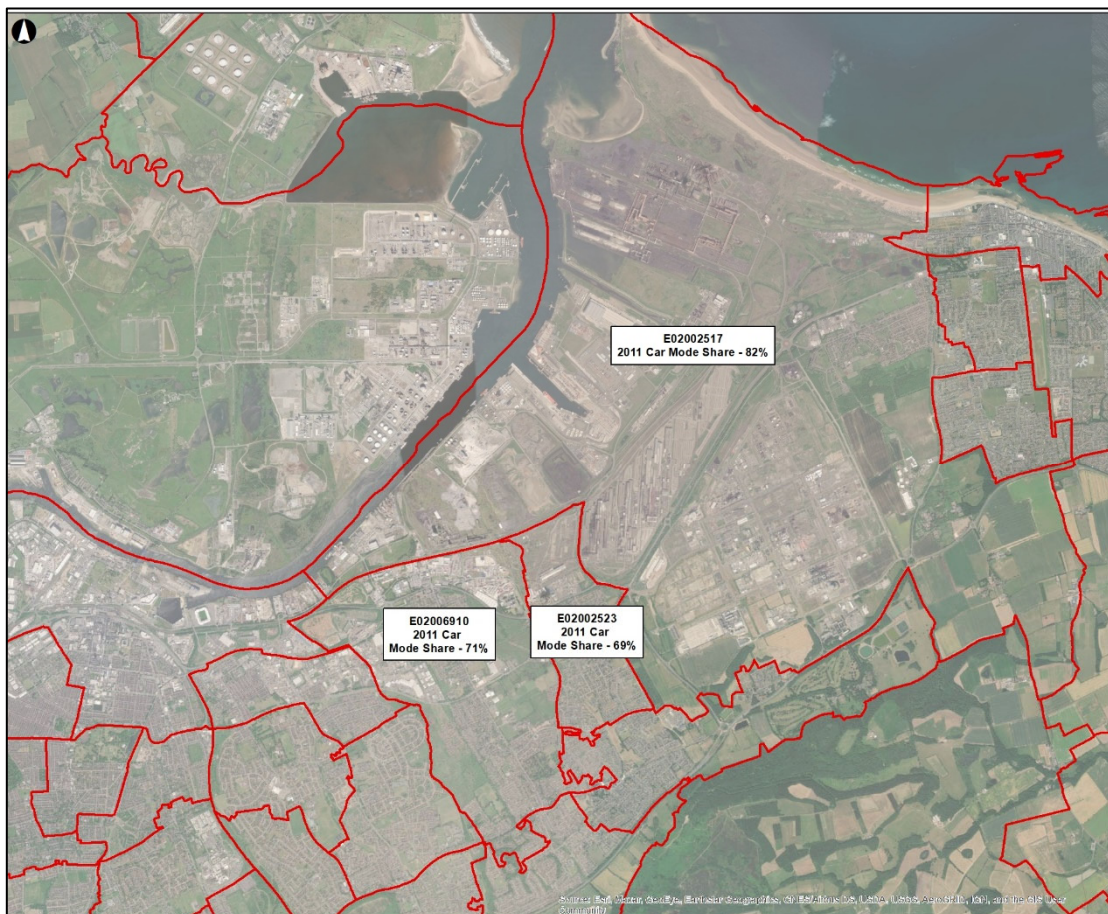
This section provides further details about the 2011 UK Census journey to work data. The data has been used to inform the distribution of development traffic on the highway network.

C1.2 Methodology

Travel to work data from the 2011 Census has been downloaded for those travelling to the area where the site is located (primarily Census Middle Layer Super Output Area (MSOA) E02002517). The travel to work area, and neighbouring areas, is shown in Figure C1. Some of the STDC site falls within the neighbouring MSOA of E02002523.

In 2011 the site was operating as a steel works and whilst noting that the proposed use could alter the trip attraction of the site, the MSOA includes the Wilton International Site and therefore in 2011 it was probable that the area had a relatively wide distribution of employee home locations.

Figure C1: Census Boundaries



Origins with 1% of total trips or more to the study area in 2011 were extracted from the Census data and the most likely main route to/from the site access identified based on directions given in Google Maps. This data is presented in Table C1. The assignment of this traffic on the network is shown in Appendix D.

Table C1: Travel to Work Origins and Assigned Routes

Destination	Origin	Origin Description*	Assigned Route	All Trips	% of Trips
E02002517	E02002518	Redcar Lane / Coast	A1053	557	7%
E02002517	E02002520	Marske	A1053	540	7%
E02002517	E02002517	Same as Site	NA	349	4%
E02002517	E02002519	South central Redcar	A1053	319	4%
E02002517	E02002515	Redcar town centre	A1053	311	4%
E02002517	E02006910	South Bank	A66	301	4%
E02002517	E02002525	Lazenby/Lackenby	A1053	289	4%
E02002517	E02002516	North central Redcar	A1053	273	3%
E02002517	E02002526	Skelton	A1053	253	3%
E02002517	E02002557	Eaglescliffe	A66	194	2%
E02002517	E02002534	East Guisborough	A1053	186	2%
E02002517	E02002523	Grangetown	A1053	177	2%
E02002517	E02002524	Brotton	A1053	176	2%
E02002517	E02002529	Eston	A1053	172	2%
E02002517	E02006811	Nunthorpe	A1053	171	2%
E02002517	E02002514	Hemlington	A1053	159	2%
E02002517	E02002533	Pinchinthorpe	A1053	150	2%
E02002517	E02006812	Ormesby	A1053	147	2%
E02002517	E02002521	Saltburn	A1053	142	2%
E02002517	E02002532	West Guisborough	A1053	130	2%
E02002517	E02002530	Lingdale/Easington	A1053	123	2%
E02002517	E02002556	Ingleby Barwick	A1053	109	1%
E02002517	E02002502	Cargo Fleet Lane	A66	98	1%
E02002517	E02002504	Linthorpe	A66	95	1%
E02002517	E02005750	Stokesley	A1053	95	1%
E02002517	E02002512	Marton	A1053	94	1%
E02002517	E02002558	Yarm	A1053	94	1%
E02002517	E02002527	Loftus/Skinningrove	A1053	90	1%
E02002517	E02002513	Stainton	A1053	89	1%
E02002517	E02002501	Grove Hill	A66	83	1%
E02002517	E02002555	Eaglescliffe	A66	81	1%
E02002517	E02005751	Hutton Rudby	A1053	78	1%

Destination	Origin	Origin Description*	Assigned Route	All Trips	% of Trips
E02002517	E02002500	Linthorpe	A66	72	1%
E02002517	E02002496	Middlesbrough	A66	69	1%
E02002517	E02002507	Acklam	A1053	68	1%
E02002517	E02002498	Middlesbrough	A66	64	1%
E02002517	E02002508	Acklam	A1053	63	1%
E02002517	E02002499	Berwick Hills	A1053	62	1%
E02002517	E02002509	Easterside	A1053	62	1%
E02002517	E02002505	Berwick Hills	A1053	60	1%
E02002517	E02002497	North Ormesby	A1053	58	1%
E02002517	E02002535	Wolviston	A66	57	1%
E02002517	E02002539	West Stockton	A66	55	1%
E02002517	E02002553	Thornaby	A1053	54	1%
E02002517	E02002503	Whinney Banks	A66	53	1%
E02002517	E02002510	Acklam	A1053	53	1%
E02002517	E02002552	Thornaby	A1053	52	1%
E02002517	E02002549	West Stockton	A66	49	1%
E02002517	E02002540	Norton	A66	46	1%
E02002517	E02002541	Norton	A66	44	1%
E02002517	E02006909	Hartlepool	A66	44	1%
E02002517	E02002544	Stockton central	A66	43	1%
E02002517	E02002548	Stockton central	A66	43	1%

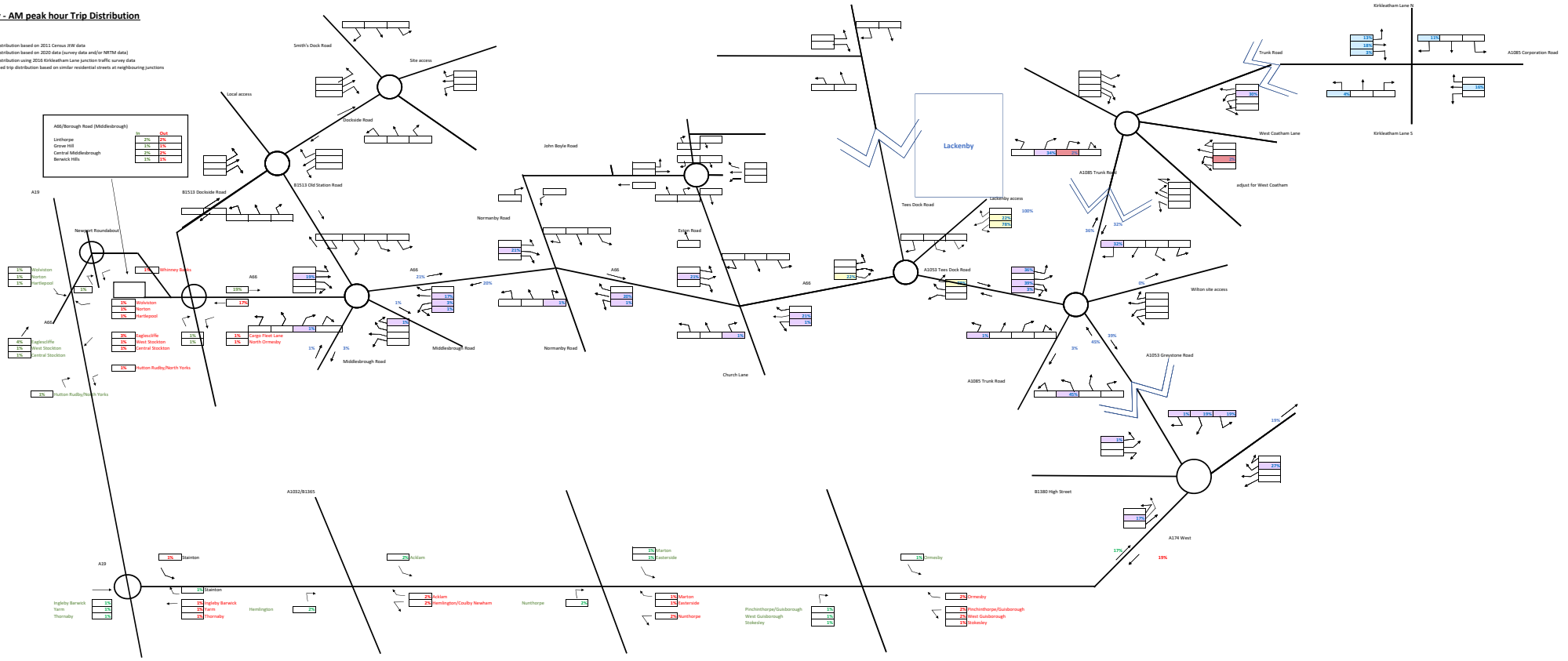
* 'Origin Description' identified based on nearest residential area / known location. Some zones have the same description as they cover the same broad area.

Appendix D

Development Vehicle Trip Distribution and Assignment

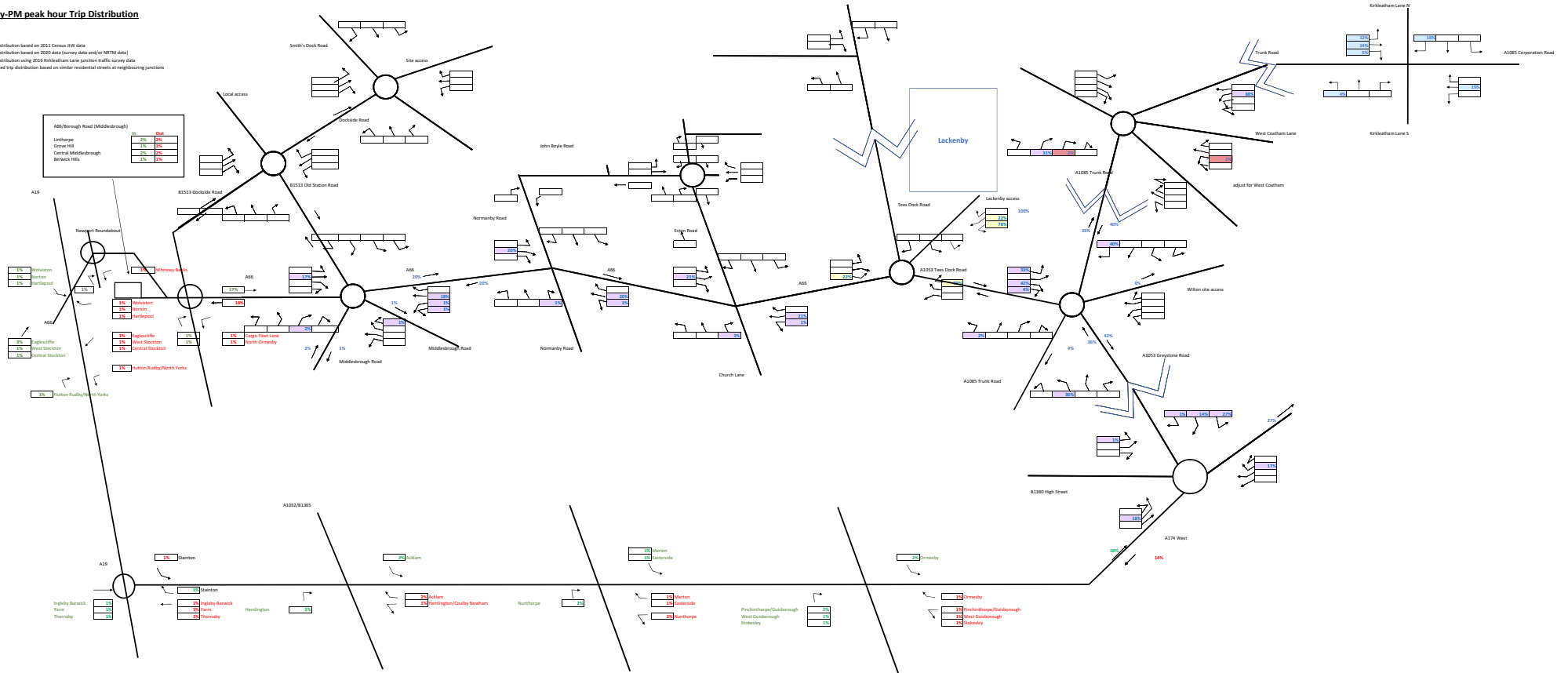
Lackenby - AM peak hour Trip Distribution

Trip distribution based on 2011 Census 200 data
 Trip distribution based on 2005 data (survey data and/or NRTM data)
 Trip distribution using 2015 Kirkstatham Lane junction traffic survey data
 Inward trip distribution based on similar residential levels at neighbouring junctions



Lackenby-PM peak hour Trip Distribution

Trip distribution based on 2011 Census 200 data
 Trip distribution based on 2005 data (survey data and/or NRTM data)
 Trip distribution using 2015 Kirkstall Lane Junction traffic survey data
 Turned trip distribution based on similar residential levels at neighbouring junctions

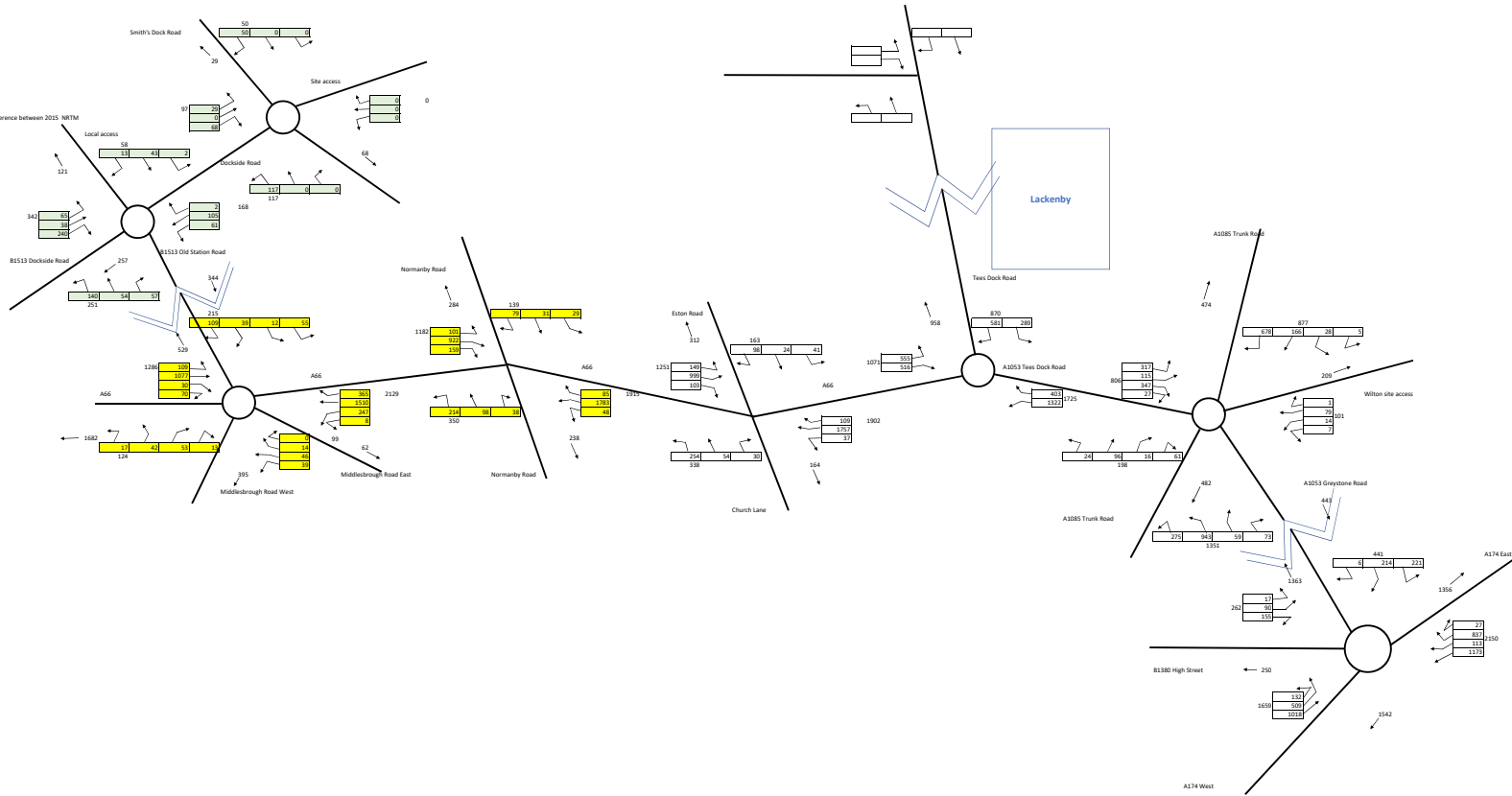


Appendix E

Traffic Flow Diagrams

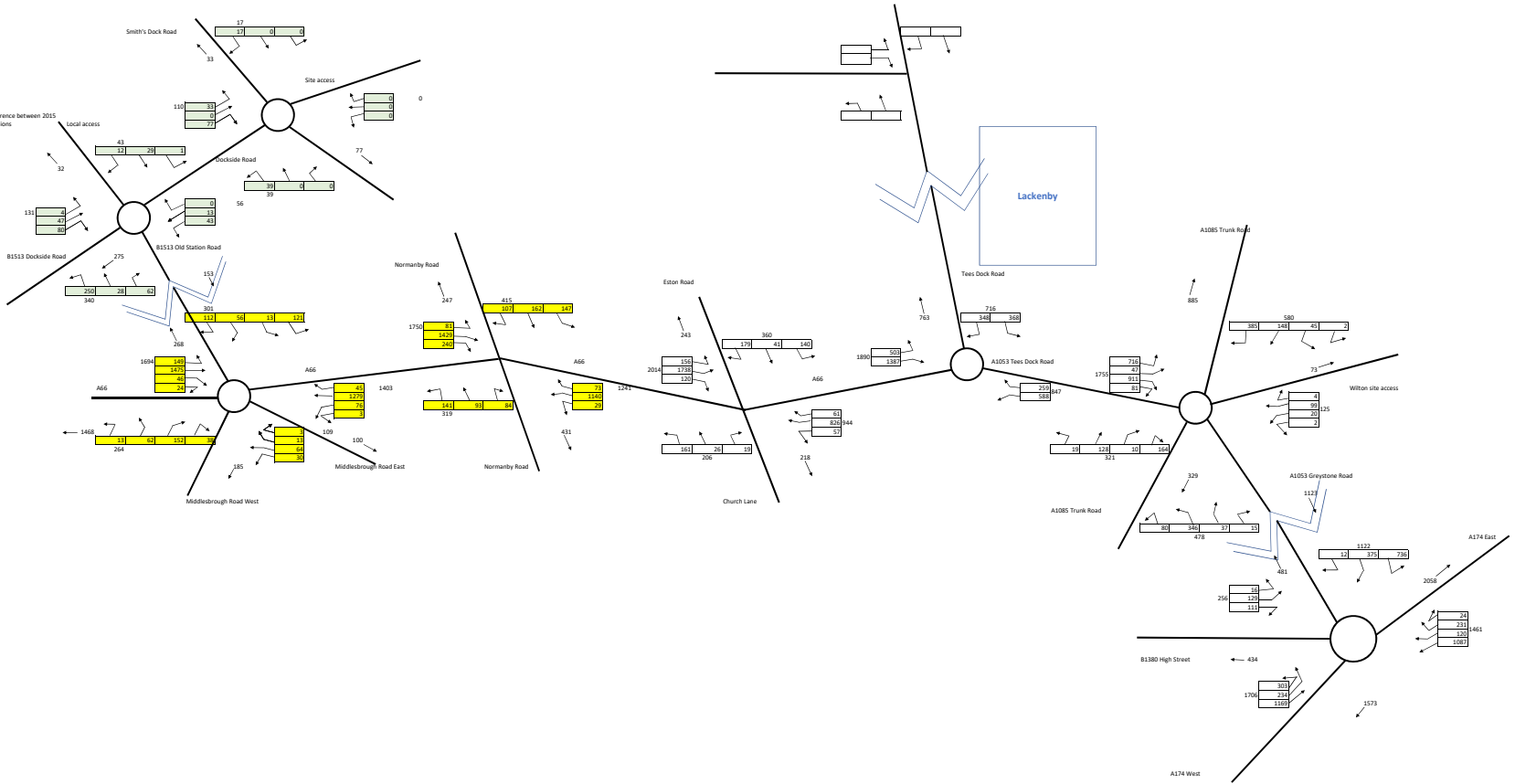
2020 Base AM Peak Hour Trips (pcu)

Key
 2021 NRTM data adjusted for 2020
 2016 survey data (from TA for the South Bank site access junction), adjusted using calculated difference between 2015 NRTM data and 2019 survey data on Old Station Rd, distributed using 2016 survey turning proportions
 2019 Middlesbrough Rd junction and Normandy Rd junction traffic surveys



2020 Base PM Peak Hour Trips (pcu)

2021 2021 NRTM data adjusted for 2020
2016 2016 survey data (from TA for the South Bank site access junction), adjusted using calculated difference between 2015
NRTM NRTM data and 2015 survey data on Old Station Rd, distributed using 2016 survey turning proportions
2019 2019 Middlesbrough Rd junction and Normandy Rd junction traffic surveys



2033 Base PM Peak Hour Trips (pcu)

2033 flows estimated using 2012 survey data from Mariner Estate TA. Traffic flows were grown to 2036 using TEMPro factors (2012-2036). TEMPro estimates estimated reduction of traffic) and to 2033 using NHTM forecasts. PCU estimated using NHTM on similar arms of neighbouring junctions.

Estimated trip generation associated with existing educational facility (TRICS trip rates from similar Land Use 04 - EDUCATION) (F - COMMUNITY EDUCATION sites).

2016 traffic survey data (from 2016 Kirkham Lane TA), grown to 2033 using NHTM forecasts for A1085 Trunk Road north of the A1053.

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B	0	0	0	0
C	0	0	0	0
D	0	0	0	0
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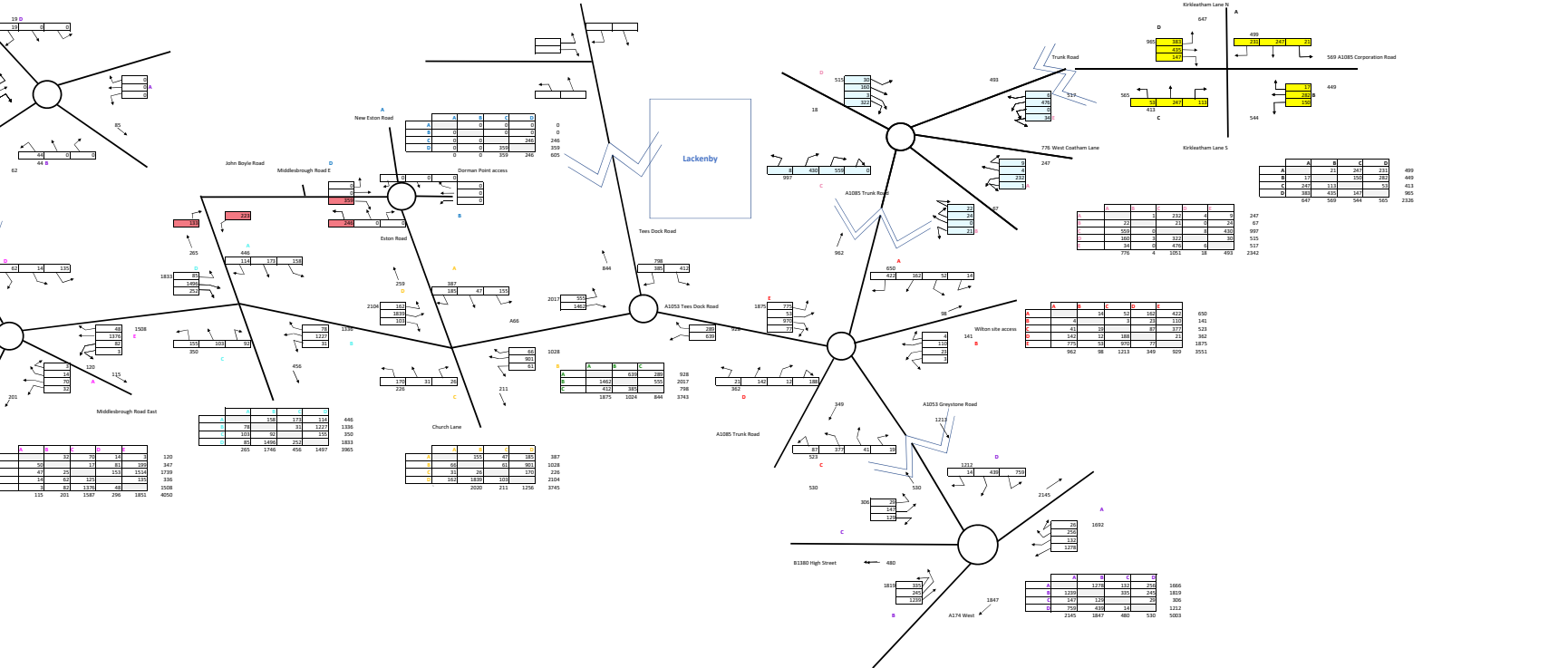
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099

440

413

863

2336

247

87

997

516

517

2342

690

141

523

863

1875

3351

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2017

798

3743

387

1028

236

1004

3745

1666

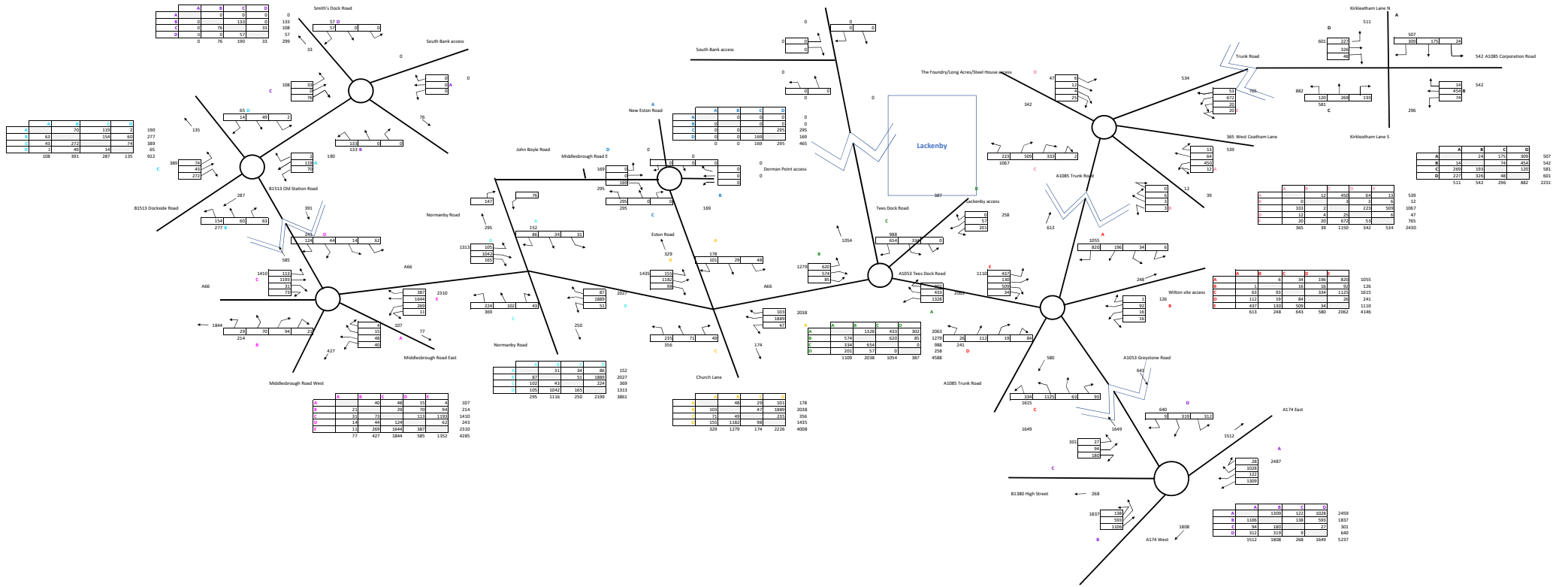
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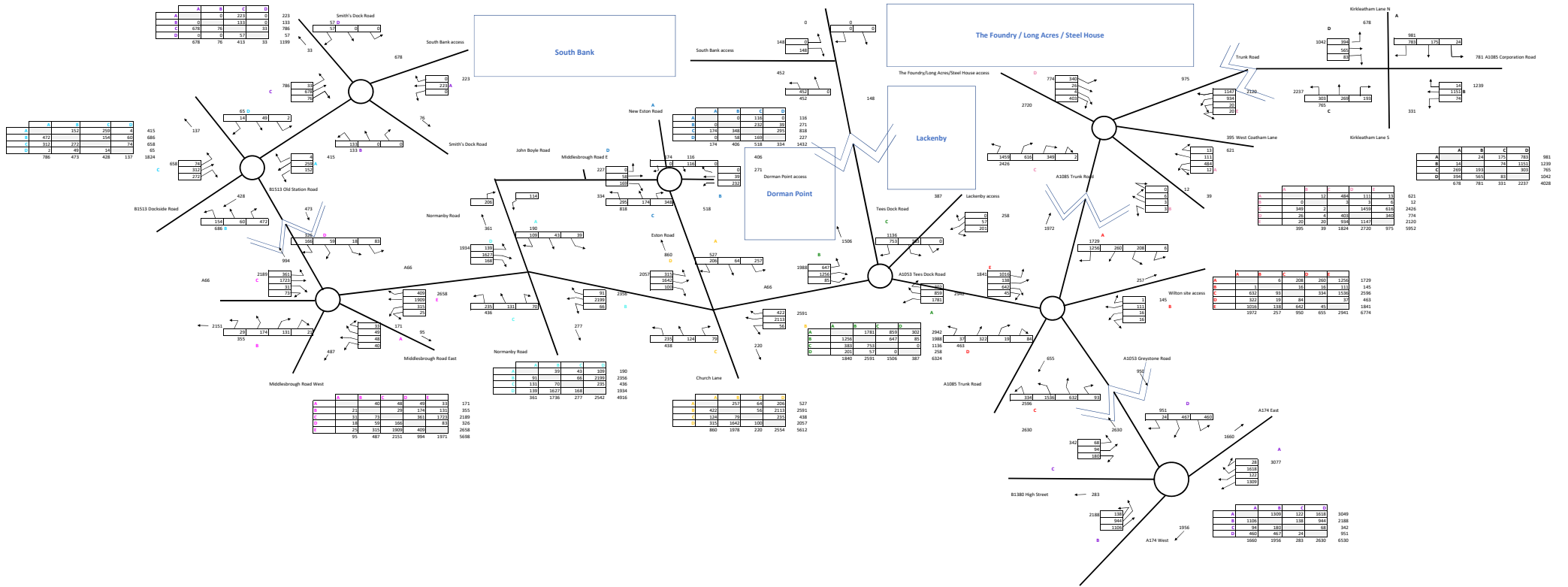
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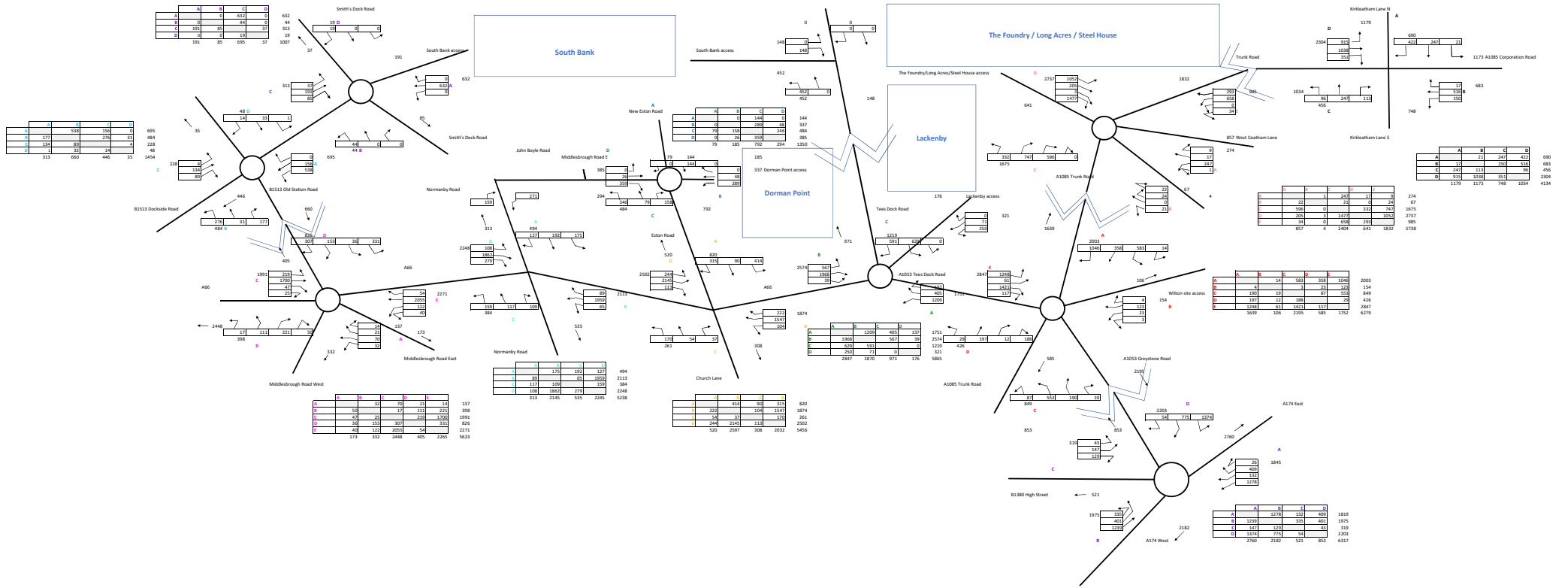
2033 Base + Lackenby - AM Peak Hour Trips (PCU)



2033 Cumulative Assessment - AM Peak Hour Trips (PCU)



2033 Cumulative Assessment - PM Peak Hour Trips (PCU)



Appendix F

Junction Model Outputs

Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.5.0.6896
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+44 (0)1344 379777 software@trl.co.uk www.trlsoftware.co.uk

The users of this computer program for the solution of an engineering problem are in no way relieved of their responsibility for the correctness of the solution

Filename: A66_Tees Dock Road Roundabout.j9
Report generation date: 08/12/2020 12:31:17

»2033 Base, AM peak
»2033 Base, PM peak

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2033 Base								
Arm 1	9.9	19.48	0.91	C	0.8	2.92	0.44	A
Arm 2	1.5	4.15	0.58	A	12.9	22.18	0.93	C
Arm 3	2.2	7.49	0.63	A	4.7	19.97	0.79	C

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	A66/Tees Dock Road roundabout
Location	
Site number	
Date	04/12/2020
Version	
Status	
Identifier	
Client	
Jobnumber	
Enumerator	
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

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
-----------------------------	-----------------------------	---------------	-----------------------------	-----------------------

		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)
D1	2033 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2033 Base	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2033 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	11.83	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Tees Dock Road WB	
2	A66 EB	
3	Tees Dock Road SB	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	l' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	7.30	9.80	12.4	38.5	60.0	40.0	
2	7.10	8.80	19.3	30.0	60.0	28.0	
3	4.70	7.84	30.0	33.0	60.0	38.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.717	2642
2	0.721	2612
3	0.627	2119

The slope and intercept shown above include any corrections and adjustments.

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)
D1	2033 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1761	100.000
2		✓	1194	100.000
3		✓	988	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	1328	433
	2	574	0	620
	3	334	654	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	7	7
	2	10	0	10
	3	32	32	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.91	19.48	9.9	C
2	0.58	4.15	1.5	A
3	0.63	7.49	2.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1326	490	2291	0.579	1320	1.5	3.944	A
2	899	325	2378	0.378	896	0.7	2.667	A
3	744	431	1848	0.402	740	0.9	4.275	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1583	587	2221	0.713	1579	2.6	5.949	A
2	1073	388	2333	0.460	1072	0.9	3.139	A
3	888	516	1795	0.495	887	1.3	5.219	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1939	718	2128	0.911	1913	9.1	16.293	C
2	1315	470	2273	0.578	1312	1.5	4.108	A
3	1088	631	1723	0.631	1084	2.2	7.398	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1939	720	2126	0.912	1936	9.9	19.478	C
2	1315	476	2269	0.579	1315	1.5	4.148	A
3	1088	632	1722	0.632	1088	2.2	7.486	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1583	590	2219	0.713	1612	2.7	6.634	A
2	1073	396	2327	0.461	1076	0.9	3.170	A
3	888	517	1794	0.495	892	1.3	5.289	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1326	493	2288	0.579	1331	1.5	4.044	A
2	899	327	2376	0.378	900	0.7	2.683	A
3	744	433	1847	0.403	745	0.9	4.319	A

2033 Base, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3	16.94	C

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)
D2	2033 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	928	100.000
2		✓	2017	100.000
3		✓	797	100.000

Origin-Destination Data

Demand (PCU/hr)

		To		
		1	2	3
From	1	0	639	289
	2	1462	0	555
	3	412	385	0

Vehicle Mix

Heavy Vehicle Percentages

		To		
		1	2	3
From	1	0	7	7
	2	10	0	10
	3	32	32	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.44	2.92	0.8	A
2	0.93	22.18	12.9	C
3	0.79	19.97	4.7	C

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	699	288	2436	0.287	697	0.4	2.213	A
2	1519	217	2456	0.618	1511	1.8	4.162	A
3	600	1096	1431	0.419	596	0.9	5.666	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	834	345	2395	0.348	834	0.6	2.467	A
2	1813	260	2425	0.748	1808	3.2	6.353	A
3	716	1310	1297	0.553	714	1.6	8.116	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1022	419	2342	0.436	1021	0.8	2.914	A
2	2221	318	2383	0.932	2187	11.5	17.797	C
3	878	1585	1124	0.781	867	4.3	17.763	C

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1022	423	2339	0.437	1022	0.8	2.924	A
2	2221	318	2383	0.932	2215	12.9	22.182	C
3	878	1606	1111	0.790	876	4.7	19.972	C

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	834	352	2390	0.349	835	0.6	2.478	A
2	1813	260	2425	0.748	1851	3.4	7.340	A
3	716	1342	1277	0.561	728	1.7	8.840	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	699	291	2433	0.287	699	0.4	2.221	A
2	1519	218	2455	0.618	1525	1.8	4.284	A
3	600	1105	1425	0.421	603	1.0	5.801	A



Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.5.0.6896
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Filename: A66_Tees Dock Road_Lackenby Access Roundabout.j9

Report generation date: 09/12/2020 11:32:52

- »2033 Base+Lackenby, AM peak
- »2033 Base+Lackenby, PM peak
- »2033 Cumulative Assessment, AM peak
- »2033 Cumulative Assessment, PM peak

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2033 Base+Lackenby								
Arm 1	107.1	149.15	1.09	F	1.1	3.50	0.51	A
Arm 2	2.3	5.90	0.68	A	32.5	51.88	1.00	F
Arm 3	3.6	12.30	0.74	B	7.8	34.14	0.87	D
Arm 4	0.3	4.11	0.22	A	0.9	9.66	0.45	A
2033 Cumulative Assessment								
Arm 1	908.3	1523.68	1.57	F	6.2	11.91	0.86	B
Arm 2	96.9	142.27	1.08	F	372.7	581.03	1.30	F
Arm 3	70.6	188.86	1.11	F	276.6	1082.60	1.40	F
Arm 4	0.6	7.74	0.35	A	1.3	13.26	0.53	B

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	A66/Tees Dock Road/Lackenby Access roundabout
Location	
Site number	
Date	09/12/2020
Version	
Status	
Identifier	
Client	

Jobnumber	
Enumerator	
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

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		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)
D3	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15
D4	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15
D5	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15
D6	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2033 Base+Lackenby, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	71.59	F

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Tees Dock Road WB	
2	A66 EB	
3	Tees Dock Road SB	
4	Lackenby access	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	7.30	9.80	12.4	38.5	60.0	40.0	
2	7.10	8.80	19.3	30.0	60.0	28.0	
3	4.70	7.84	30.0	33.0	60.0	38.0	
4	7.30	8.50	15.0	25.0	60.0	38.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.717	2642
2	0.721	2612
3	0.627	2119
4	0.683	2456

The slope and intercept shown above include any corrections and adjustments.

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)
D3	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	2063	100.000
2		✓	1279	100.000
3		✓	988	100.000
4		✓	258	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1328	433	302
	2	574	0	620	85
	3	334	654	0	0
	4	201	57	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	8	8	8
	2	10	0	10	10
	3	32	32	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.09	149.15	107.1	F
2	0.68	5.90	2.3	A
3	0.74	12.30	3.6	B
4	0.22	4.11	0.3	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1553	532	2260	0.687	1544	2.3	5.358	A
2	963	550	2216	0.435	960	0.8	3.145	A
3	744	720	1667	0.446	740	1.1	5.104	A
4	194	1170	1657	0.117	194	0.2	2.803	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1855	637	2185	0.849	1841	5.6	10.914	B
2	1150	656	2139	0.537	1148	1.3	3.989	A
3	888	861	1578	0.563	886	1.7	6.835	A
4	232	1401	1499	0.155	232	0.2	3.238	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2271	778	2084	1.090	2060	58.6	64.884	F
2	1408	734	2083	0.676	1404	2.3	5.799	A
3	1088	1025	1476	0.737	1080	3.5	11.803	B
4	284	1711	1287	0.221	284	0.3	4.086	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2271	783	2081	1.092	2078	107.1	149.153	F
2	1408	740	2079	0.677	1408	2.3	5.903	A

3	1088	1030	1473	0.739	1087	3.6	12.299	B
4	284	1719	1281	0.222	284	0.3	4.114	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1855	644	2180	0.851	2159	31.1	118.039	F
2	1150	769	2058	0.559	1153	1.4	4.394	A
3	888	910	1548	0.574	895	1.8	7.364	A
4	232	1413	1491	0.156	232	0.2	3.261	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1553	537	2257	0.688	1668	2.4	7.988	A
2	963	594	2184	0.441	965	0.9	3.253	A
3	744	741	1654	0.450	747	1.1	5.258	A
4	194	1180	1650	0.118	194	0.2	2.821	A

2033 Base+Lackenby, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	33.19	D

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)
D4	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1065	100.000
2		✓	2056	100.000
3		✓	797	100.000
4		✓	321	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	639	289	137
	2	1462	0	555	39
	3	412	385	0	0
	4	250	71	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	8	8	8
	2	10	0	10	10
	3	32	32	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.51	3.50	1.1	A
2	1.00	51.88	32.5	F
3	0.87	34.14	7.8	D
4	0.45	9.66	0.9	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	802	341	2398	0.334	800	0.5	2.430	A
2	1548	320	2382	0.650	1540	2.0	4.661	A
3	600	1227	1349	0.445	596	1.0	6.278	A
4	242	1691	1301	0.186	241	0.3	3.868	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	957	408	2350	0.407	957	0.7	2.789	A
2	1848	383	2336	0.791	1840	4.0	7.856	A
3	716	1467	1199	0.598	713	1.9	9.718	A
4	289	2022	1075	0.268	288	0.4	5.211	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1173	493	2289	0.512	1171	1.1	3.473	A
2	2264	468	2275	0.995	2186	23.5	31.103	D
3	878	1746	1023	0.858	859	6.6	26.434	D
4	353	2413	807	0.438	352	0.9	8.971	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1173	500	2284	0.513	1173	1.1	3.497	A
2	2264	469	2274	0.995	2228	32.5	51.877	F
3	878	1777	1004	0.874	873	7.8	34.137	D
4	353	2457	777	0.455	353	0.9	9.664	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	957	421	2340	0.409	959	0.8	2.816	A
2	1848	384	2336	0.791	1961	4.4	13.664	B
3	716	1555	1143	0.627	739	2.3	12.338	B
4	289	2133	999	0.289	290	0.5	5.809	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	802	346	2394	0.335	803	0.5	2.445	A
2	1548	321	2381	0.650	1557	2.1	4.859	A
3	600	1240	1341	0.448	605	1.1	6.500	A
4	242	1712	1286	0.188	242	0.3	3.934	A

2033 Cumulative Assessment, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	787.80	F

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)
D5	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	2942	100.000
2		✓	1988	100.000
3		✓	1136	100.000
4		✓	258	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1781	859	302
	2	1256	0	647	85
	3	383	753	0	0
	4	201	57	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	9	9	9
	2	11	0	11	11
	3	29	29	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.57	1523.68	908.3	F
2	1.08	142.27	96.9	F
3	1.11	188.86	70.6	F
4	0.35	7.74	0.6	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
-----	-----------------------	---------------------------	-------------------	-----	---------------------	-----------------	-----------	-------------------------------

1	2215	604	2209	1.003	2116	24.7	29.820	D
2	1497	835	2010	0.745	1484	3.1	7.429	A
3	855	1218	1354	0.631	847	2.2	9.002	A
4	194	1784	1237	0.157	193	0.2	3.929	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2645	719	2127	1.244	2124	155.0	159.560	F
2	1787	838	2008	0.890	1769	7.8	15.584	C
3	1021	1411	1233	0.828	1008	5.5	19.502	C
4	232	2125	1004	0.231	231	0.3	5.308	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	3239	802	2067	1.567	2067	448.0	529.082	F
2	2189	816	2024	1.081	2000	55.0	65.909	F
3	1251	1561	1139	1.098	1115	39.4	86.813	F
4	284	2379	831	0.342	283	0.6	7.479	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	3239	809	2062	1.571	2062	742.3	1037.210	F
2	2189	814	2026	1.081	2021	96.9	142.271	F
3	1251	1575	1131	1.106	1126	70.6	187.113	F
4	284	2403	814	0.349	284	0.6	7.739	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2645	793	2074	1.275	2074	885.1	1403.424	F
2	1787	818	2022	0.884	1999	43.9	129.115	F
3	1021	1562	1139	0.897	1119	46.3	188.856	F
4	232	2382	829	0.280	233	0.4	6.890	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2215	725	2122	1.044	2122	908.3	1523.682	F
2	1497	837	2009	0.745	1659	3.4	17.400	C
3	855	1337	1280	0.668	1029	2.7	33.351	D
4	194	2077	1037	0.187	195	0.3	4.878	A

2033 Cumulative Assessment, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	484.39	F

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)
D6	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1751	100.000
2		✓	2574	100.000
3		✓	1220	100.000
4		✓	321	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1209	405	137
	2	1968	0	567	39
	3	629	591	0	0
	4	250	71	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	9	9	9
	2	11	0	11	11
	3	29	29	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.86	11.91	6.2	B
2	1.30	581.03	372.7	F
3	1.40	1082.60	276.6	F
4	0.53	13.26	1.3	B

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1318	488	2292	0.575	1312	1.5	3.979	A
2	1938	406	2319	0.835	1917	5.3	9.478	A
3	918	1597	1117	0.823	897	5.3	19.634	C
4	242	2363	842	0.287	240	0.5	6.799	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1574	522	2268	0.694	1570	2.4	5.592	A
2	2314	486	2262	1.023	2203	32.9	40.334	E
3	1097	1841	964	1.138	946	42.9	107.010	F
4	289	2631	659	0.438	287	0.9	10.995	B

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1928	541	2254	0.855	1914	5.9	11.086	B
2	2834	592	2185	1.297	2184	195.5	194.020	F
3	1343	1852	957	1.404	956	139.8	354.425	F
4	353	2625	662	0.534	352	1.3	13.148	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1928	542	2254	0.855	1927	6.2	11.910	B
2	2834	596	2182	1.299	2182	358.5	455.536	F
3	1343	1852	957	1.404	957	236.5	722.609	F
4	353	2625	663	0.533	353	1.3	13.263	B

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1574	518	2271	0.693	1589	2.5	5.872	A
2	2314	492	2258	1.025	2257	372.7	581.031	F
3	1097	1884	937	1.171	936	276.6	994.422	F
4	289	2662	637	0.453	290	1.0	11.864	B

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1318	499	2285	0.577	1322	1.5	4.095	A
2	1938	409	2317	0.836	2310	279.6	508.647	F
3	918	1905	924	0.994	919	276.5	1082.595	F
4	242	2685	621	0.389	243	0.7	10.861	B

Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.5.0.6896
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Filename: A66_Tees Dock Road_Lackenby Access Roundabout_mitigation.j9
Report generation date: 08/12/2020 18:35:41

- »2033 Base+Lackenby, AM peak
- »2033 Base+Lackenby, PM peak
- »2033 Cumulative Assessment, AM peak
- »2033 Cumulative Assessment, PM peak

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2033 Base+Lackenby								
Arm 1	3.0	4.81	0.74	A	0.6	1.81	0.35	A
Arm 2	0.9	2.41	0.46	A	2.3	3.69	0.68	A
Arm 3	0.9	2.90	0.40	A	0.9	3.83	0.41	A
Arm 4	0.2	2.18	0.13	A	0.3	3.44	0.23	A
2033 Cumulative Assessment								
Arm 1	138.6	133.26	1.08	F	1.7	3.27	0.62	A
Arm 2	4.3	7.26	0.80	A	7.6	9.99	0.88	A
Arm 3	1.8	5.26	0.59	A	5.2	14.32	0.81	B
Arm 4	0.3	3.59	0.20	A	1.1	11.13	0.49	B

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	A66/Tees Dock Road/Lackenby Access_with mitigation
Location	
Site number	
Date	08/12/2020
Version	
Status	
Identifier	
Client	
Jobnumber	

Enumerator	
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

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		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)
D3	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15
D4	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15
D5	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15
D6	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2033 Base+Lackenby, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	3.58	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Tees Dock Road WB	
2	A66 EB	
3	Tees Dock Road SB	
4	Lackenby access	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	10.95	13.45	12.4	38.5	68.0	40.0	
2	10.75	12.40	19.3	30.0	68.0	28.0	
3	10.95	12.20	15.0	33.0	68.0	38.0	
4	10.95	12.20	15.0	25.0	68.0	38.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.838	3736
2	0.846	3735
3	0.815	3586
4	0.807	3552

The slope and intercept shown above include any corrections and adjustments.

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)
D3	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	2063	100.000
2		✓	1279	100.000
3		✓	988	100.000
4		✓	258	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1328	433	302
	2	574	0	620	85
	3	334	654	0	0
	4	201	57	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	8	8	8
	2	10	0	10	10
	3	32	32	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.74	4.81	3.0	A
2	0.46	2.41	0.9	A
3	0.40	2.90	0.9	A
4	0.13	2.18	0.2	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1553	534	3288	0.472	1549	1.0	2.231	A
2	963	552	3268	0.295	961	0.5	1.714	A
3	744	722	2998	0.248	742	0.4	2.106	A
4	194	1173	2605	0.075	194	0.1	1.701	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1855	639	3201	0.579	1853	1.5	2.880	A
2	1150	660	3176	0.362	1149	0.6	1.953	A
3	888	863	2883	0.308	888	0.6	2.381	A
4	232	1403	2420	0.096	232	0.1	1.875	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2271	782	3081	0.737	2265	3.0	4.734	A
2	1408	807	3052	0.461	1407	0.9	2.407	A
3	1088	1057	2725	0.399	1087	0.9	2.898	A
4	284	1718	2166	0.131	284	0.2	2.180	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2271	783	3080	0.737	2271	3.0	4.806	A
2	1408	809	3050	0.462	1408	0.9	2.411	A
3	1088	1058	2724	0.399	1088	0.9	2.903	A

4	284	1720	2164	0.131	284	0.2	2.182	A
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08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1855	640	3200	0.580	1861	1.5	2.915	A
2	1150	663	3174	0.362	1151	0.6	1.958	A
3	888	865	2881	0.308	889	0.6	2.386	A
4	232	1406	2417	0.096	232	0.1	1.877	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1553	536	3287	0.473	1555	1.0	2.249	A
2	963	554	3266	0.295	964	0.5	1.722	A
3	744	724	2996	0.248	744	0.4	2.112	A
4	194	1177	2602	0.075	194	0.1	1.706	A

2033 Base+Lackenby, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	3.22	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)
D4	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1065	100.000
2		✓	2056	100.000
3		✓	797	100.000
4		✓	321	100.000

Origin-Destination Data

Demand (PCU/hr)

	To				
	1	2	3	4	
From	1	0	639	289	137
	2	1462	0	555	39
	3	412	385	0	0
	4	250	71	0	0

Vehicle Mix

Heavy Vehicle Percentages

	To				
	1	2	3	4	
From	1	0	8	8	8
	2	10	0	10	10
	3	32	32	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.35	1.81	0.6	A
2	0.68	3.69	2.3	A
3	0.41	3.83	0.9	A
4	0.23	3.44	0.3	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	802	342	3449	0.232	800	0.3	1.468	A
2	1548	320	3464	0.447	1544	0.9	2.060	A
3	600	1230	2584	0.232	598	0.4	2.391	A
4	242	1697	2183	0.111	241	0.1	2.113	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	957	410	3393	0.282	957	0.4	1.595	A
2	1848	383	3411	0.542	1847	1.3	2.530	A
3	716	1471	2388	0.300	716	0.6	2.840	A
4	289	2029	1915	0.151	288	0.2	2.523	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1173	501	3316	0.354	1172	0.6	1.813	A
2	2264	469	3338	0.678	2260	2.3	3.659	A
3	878	1800	2119	0.414	876	0.9	3.819	A
4	353	2483	1549	0.228	353	0.3	3.430	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1173	502	3315	0.354	1173	0.6	1.813	A
2	2264	469	3338	0.678	2264	2.3	3.685	A
3	878	1803	2117	0.415	877	0.9	3.832	A
4	353	2487	1545	0.229	353	0.3	3.443	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	957	411	3392	0.282	958	0.4	1.597	A
2	1848	383	3410	0.542	1852	1.3	2.547	A
3	716	1476	2384	0.301	718	0.6	2.856	A
4	289	2035	1910	0.151	289	0.2	2.534	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	802	344	3448	0.233	802	0.3	1.471	A
2	1548	321	3463	0.447	1550	0.9	2.070	A
3	600	1234	2581	0.233	601	0.4	2.402	A
4	242	1703	2178	0.111	242	0.1	2.121	A

2033 Cumulative Assessment, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	65.37	F

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)
D5	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	2942	100.000
2		✓	1988	100.000
3		✓	1136	100.000
4		✓	258	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1781	859	302
	2	1256	0	647	85
	3	383	753	0	0
	4	201	57	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	9	9	9
	2	11	0	11	11
	3	29	29	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	1.08	133.26	138.6	F
2	0.80	7.26	4.3	A
3	0.59	5.26	1.8	A
4	0.20	3.59	0.3	A

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
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1	2215	608	3226	0.686	2205	2.4	3.809	A
2	1497	870	2998	0.499	1492	1.1	2.646	A
3	855	1233	2582	0.331	853	0.6	2.683	A
4	194	1795	2103	0.092	194	0.1	2.149	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2645	727	3127	0.846	2632	5.7	7.726	A
2	1787	1038	2856	0.626	1784	1.8	3.717	A
3	1021	1474	2386	0.428	1020	1.0	3.397	A
4	232	2147	1819	0.127	232	0.2	2.584	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	3239	890	2991	1.083	2961	75.1	56.085	F
2	2189	1169	2746	0.797	2179	4.2	6.940	A
3	1251	1774	2141	0.584	1247	1.8	5.179	A
4	284	2624	1434	0.198	284	0.3	3.563	A

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	3239	892	2989	1.084	2985	138.6	133.262	F
2	2189	1178	2738	0.799	2188	4.3	7.257	A
3	1251	1783	2134	0.586	1251	1.8	5.257	A
4	284	2633	1427	0.199	284	0.3	3.589	A

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2645	730	3124	0.847	3100	24.9	97.719	F
2	1787	1223	2700	0.662	1796	2.2	4.460	A
3	1021	1529	2340	0.436	1024	1.0	3.540	A
4	232	2159	1810	0.128	232	0.2	2.601	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	2215	611	3224	0.687	2305	2.4	4.699	A
2	1497	910	2965	0.505	1501	1.1	2.736	A
3	855	1249	2569	0.333	857	0.6	2.716	A
4	194	1805	2096	0.093	194	0.1	2.160	A

2033 Cumulative Assessment, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
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1	A66 / Tees Dock	Standard Roundabout		1, 2, 3, 4	8.95	A
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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)
D6	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	1751	100.000
2		✓	2574	100.000
3		✓	1220	100.000
4		✓	321	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		1	2	3	4
From	1	0	1209	405	137
	2	1968	0	567	39
	3	629	591	0	0
	4	250	71	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		1	2	3	4
From	1	0	9	9	9
	2	11	0	11	11
	3	29	29	0	0
	4	14	14	0	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.62	3.27	1.7	A

2	0.88	9.99	7.6	A
3	0.81	14.32	5.2	B
4	0.49	11.13	1.1	B

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1318	497	3320	0.397	1315	0.7	1.955	A
2	1938	407	3390	0.572	1932	1.5	2.729	A
3	918	1609	2275	0.404	915	0.9	3.406	A
4	242	2392	1622	0.149	241	0.2	2.970	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1574	594	3238	0.486	1573	1.0	2.355	A
2	2314	487	3323	0.696	2310	2.5	3.928	A
3	1097	1924	2019	0.543	1094	1.5	5.009	A
4	289	2860	1244	0.232	288	0.3	4.289	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1928	722	3131	0.616	1925	1.7	3.248	A
2	2834	596	3230	0.877	2815	7.3	9.215	A
3	1343	2345	1676	0.802	1330	4.9	12.967	B
4	353	3482	742	0.476	351	1.0	10.409	B

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1928	728	3126	0.617	1928	1.7	3.275	A
2	2834	597	3230	0.877	2833	7.6	9.991	A
3	1343	2360	1664	0.807	1342	5.2	14.316	B
4	353	3508	721	0.490	353	1.1	11.133	B

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1574	603	3231	0.487	1577	1.0	2.377	A
2	2314	488	3322	0.697	2334	2.6	4.126	A
3	1097	1943	2003	0.548	1111	1.6	5.287	A
4	289	2896	1216	0.237	291	0.4	4.456	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	1318	500	3317	0.397	1320	0.7	1.966	A
2	1938	408	3389	0.572	1942	1.5	2.771	A
3	918	1618	2268	0.405	921	0.9	3.453	A
4	242	2406	1610	0.150	242	0.2	3.002	A

Junctions 9

ARCADY 9 - Roundabout Module

Version: 9.5.0.6896
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Filename: A66_Old Station Road_Middlesbrough Road Roundabout.j9

Report generation date: 09/12/2020 11:55:53

- »2033 Base, AM peak
- »2033 Base, PM peak
- »2033 Base+Lackenby, AM peak
- »2033 Base+Lackenby, PM peak
- »2033 Cumulative Assessment, AM peak
- »2033 Cumulative Assessment, PM peak

Summary of junction performance

	AM peak				PM peak			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
2033 Base								
Arm 1	0.2	7.22	0.19	A	0.1	3.95	0.13	A
Arm 2	0.4	6.33	0.29	A	0.5	5.06	0.35	A
Arm 3	1.5	3.77	0.58	A	2.8	5.34	0.72	A
Arm 4	0.3	4.68	0.24	A	0.8	8.17	0.43	A
Arm 5	11.1	16.97	0.92	C	1.8	3.89	0.62	A
2033 Base+Lackenby								
Arm 1	0.2	7.70	0.20	A	0.2	4.11	0.13	A
Arm 2	0.4	6.64	0.30	A	0.6	5.33	0.36	A
Arm 3	1.8	4.10	0.61	A	3.0	5.61	0.73	A
Arm 4	0.4	4.93	0.25	A	0.9	8.49	0.43	A
Arm 5	14.4	21.71	0.94	C	2.0	4.18	0.64	A
2033 Cumulative Assessment								
Arm 1	0.6	11.67	0.38	B	0.4	9.24	0.28	A
Arm 2	1.4	12.71	0.58	B	2.0	16.81	0.67	C
Arm 3	38.2	56.17	1.00	F	5.6	9.41	0.84	A
Arm 4	0.9	9.21	0.45	A	84.1	303.28	1.21	F
Arm 5	142.0	152.76	1.10	F	25.9	38.81	0.98	E

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	A66/Old Station Road/Middlesbrough Road roundabout
Location	
Site number	
Date	09/12/2020
Version	
Status	
Identifier	
Client	
Jobnumber	
Enumerator	
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

Calculate Queue Percentiles	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
		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)
D1	2033 Base	AM peak	ONE HOUR	07:45	09:15	15
D2	2033 Base	PM peak	ONE HOUR	16:45	18:15	15
D5	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15
D6	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15
D7	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15
D8	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Analysis Set Details

ID	Network flow scaling factor (%)
A1	100.000

2033 Base, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	11.21	B

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description
1	Middlesbrough Road WB	
2	Middlesbrough Road NB	
3	A66 EB	
4	Old Station Road	
5	A66 WB	

Roundabout Geometry

Arm	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1	3.34	9.00	21.5	42.0	88.0	28.0	
2	4.00	9.20	17.8	28.0	88.0	40.0	
3	8.00	10.50	14.7	51.0	88.0	35.0	
4	3.70	9.00	12.5	36.0	88.0	28.0	
5	7.50	11.00	17.8	35.0	88.0	36.0	

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Arm	Final slope	Final intercept (PCU/hr)
1	0.509	2006
2	0.494	1984
3	0.639	2951
4	0.487	1854
5	0.633	2924

The slope and intercept shown above include any corrections and adjustments.

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)
D1	2033 Base	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	103	100.000
2		✓	210	100.000
3		✓	1338	100.000
4		✓	244	100.000
5		✓	2257	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	40	48	15	0
	2	21	0	29	70	90
	3	31	73	0	113	1121
	4	14	44	124	0	62
	5	8	262	1600	387	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	1
	3	0	0	0	13	13
	4	0	0	18	0	18
	5	0	0	13	13	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.19	7.22	0.2	A
2	0.29	6.33	0.4	A
3	0.58	3.77	1.5	A
4	0.24	4.68	0.3	A
5	0.92	16.97	11.1	C

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	78	1867	1056	0.073	77	0.1	3.679	A
2	158	1630	1178	0.134	157	0.2	3.540	A
3	1007	437	2671	0.377	1005	0.7	2.412	A
4	184	1003	1366	0.134	183	0.2	3.441	A
5	1699	230	2778	0.612	1692	1.7	3.665	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	93	2233	869	0.107	92	0.1	4.632	A
2	189	1949	1020	0.185	188	0.2	4.345	A

3	1203	523	2616	0.460	1202	0.9	2.847	A
4	219	1200	1270	0.173	219	0.2	3.874	A
5	2029	276	2749	0.738	2024	3.1	5.479	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	113	2712	625	0.181	113	0.2	7.017	A
2	231	2368	813	0.284	231	0.4	6.196	A
3	1473	636	2544	0.579	1471	1.5	3.746	A
4	269	1468	1140	0.236	268	0.3	4.673	A
5	2485	337	2710	0.917	2456	10.3	14.384	B

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	113	2738	612	0.185	113	0.2	7.217	A
2	231	2391	802	0.288	231	0.4	6.330	A
3	1473	641	2541	0.580	1473	1.5	3.772	A
4	269	1471	1138	0.236	269	0.3	4.683	A
5	2485	338	2710	0.917	2482	11.1	16.966	C

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	93	2270	850	0.109	93	0.1	4.755	A
2	189	1983	1004	0.188	189	0.2	4.442	A
3	1203	530	2612	0.461	1205	1.0	2.869	A
4	219	1203	1269	0.173	220	0.2	3.885	A
5	2029	277	2749	0.738	2061	3.2	6.075	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	78	1881	1049	0.074	78	0.1	3.707	A
2	158	1642	1172	0.135	158	0.2	3.568	A
3	1007	440	2669	0.377	1008	0.7	2.428	A
4	184	1007	1364	0.135	184	0.2	3.451	A
5	1699	231	2777	0.612	1705	1.8	3.757	A

2033 Base, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	4.97	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)
D2	2033 Base	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	119	100.000
2		✓	347	100.000
3		✓	1739	100.000
4		✓	336	100.000
5		✓	1509	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	32	70	14	3
	2	50	0	17	81	199
	3	47	25	0	153	1514
	4	14	62	125	0	135
	5	3	82	1376	48	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	13	13
	4	0	0	18	0	18
	5	0	0	13	13	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.13	3.95	0.1	A
2	0.35	5.06	0.5	A
3	0.72	5.34	2.8	A
4	0.43	8.17	0.8	A
5	0.62	3.89	1.8	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	90	1290	1350	0.066	89	0.1	2.856	A
2	261	1228	1377	0.190	260	0.2	3.220	A
3	1309	296	2761	0.474	1305	1.0	2.771	A
4	253	1379	1183	0.214	252	0.3	4.378	A
5	1136	242	2771	0.410	1133	0.8	2.462	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	107	1543	1221	0.088	107	0.1	3.231	A
2	312	1469	1258	0.248	312	0.3	3.802	A
3	1563	355	2724	0.574	1561	1.5	3.474	A
4	302	1650	1051	0.287	301	0.5	5.439	A
5	1357	290	2740	0.495	1355	1.1	2.913	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	131	1888	1045	0.125	131	0.1	3.937	A
2	382	1798	1095	0.349	381	0.5	5.037	A
3	1915	434	2673	0.716	1910	2.8	5.263	A
4	370	2018	872	0.424	368	0.8	8.080	A
5	1661	354	2700	0.615	1659	1.8	3.870	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	131	1891	1043	0.126	131	0.1	3.946	A
2	382	1801	1094	0.349	382	0.5	5.058	A
3	1915	435	2673	0.716	1915	2.8	5.336	A
4	370	2024	870	0.425	370	0.8	8.168	A
5	1661	356	2699	0.616	1661	1.8	3.892	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	107	1548	1218	0.088	107	0.1	3.243	A
2	312	1474	1255	0.248	313	0.3	3.820	A
3	1563	356	2723	0.574	1568	1.5	3.521	A
4	302	1658	1048	0.288	304	0.5	5.498	A
5	1357	292	2739	0.495	1359	1.1	2.931	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	90	1295	1347	0.067	90	0.1	2.863	A
2	261	1233	1375	0.190	262	0.2	3.235	A

3	1309	298	2760	0.474	1311	1.0	2.798	A
4	253	1386	1180	0.214	254	0.3	4.411	A
5	1136	244	2770	0.410	1137	0.8	2.475	A

2033 Base+Lackenby, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	13.86	B

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)
D5	2033 Base+Lackenby	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	107	100.000
2		✓	214	100.000
3		✓	1410	100.000
4		✓	244	100.000
5		✓	2311	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	40	48	15	4
	2	21	0	29	70	94
	3	31	73	0	113	1193
	4	14	44	124	0	62
	5	11	269	1644	387	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	13	13
	4	0	0	18	0	18
	5	0	0	13	13	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.20	7.70	0.2	A
2	0.30	6.64	0.4	A
3	0.61	4.10	1.8	A
4	0.25	4.93	0.4	A
5	0.94	21.71	14.4	C

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	81	1905	1036	0.078	80	0.1	3.765	A
2	161	1666	1161	0.139	160	0.2	3.597	A
3	1062	443	2667	0.398	1059	0.7	2.500	A
4	184	1063	1337	0.137	183	0.2	3.528	A
5	1740	230	2778	0.626	1732	1.8	3.804	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	96	2278	846	0.114	96	0.1	4.796	A
2	192	1992	999	0.193	192	0.2	4.459	A
3	1268	530	2612	0.485	1266	1.0	2.992	A
4	219	1272	1235	0.178	219	0.2	4.007	A
5	2078	276	2749	0.756	2072	3.4	5.856	A

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	118	2759	601	0.196	117	0.2	7.433	A
2	236	2413	791	0.298	235	0.4	6.461	A
3	1552	644	2539	0.611	1550	1.7	4.061	A
4	269	1556	1097	0.245	268	0.4	4.911	A
5	2544	337	2710	0.939	2506	12.9	17.157	C

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	118	2791	585	0.201	118	0.2	7.705	A
2	236	2441	777	0.303	236	0.4	6.644	A
3	1552	650	2535	0.612	1552	1.8	4.099	A
4	269	1559	1096	0.245	269	0.4	4.925	A
5	2544	338	2710	0.939	2538	14.4	21.711	C

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	96	2328	821	0.117	97	0.1	4.975	A
2	192	2036	977	0.197	193	0.2	4.595	A
3	1268	539	2606	0.486	1270	1.1	3.022	A
4	219	1276	1233	0.178	220	0.2	4.022	A
5	2078	277	2749	0.756	2121	3.5	6.804	A

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	81	1920	1029	0.078	81	0.1	3.797	A
2	161	1679	1154	0.140	161	0.2	3.626	A
3	1062	446	2665	0.398	1063	0.7	2.518	A
4	184	1067	1335	0.138	184	0.2	3.542	A
5	1740	231	2777	0.626	1746	1.9	3.910	A

2033 Base+Lackenby, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	5.23	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)
D6	2033 Base+Lackenby	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	121	100.000
2		✓	350	100.000
3		✓	1769	100.000
4		✓	336	100.000
5		✓	1573	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	32	70	14	5
	2	50	0	17	81	202
	3	47	25	0	153	1544
	4	14	62	125	0	135
	5	6	85	1434	48	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	13	13
	4	0	0	18	0	18
	5	0	0	13	13	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.13	4.11	0.2	A
2	0.36	5.33	0.6	A
3	0.73	5.61	3.0	A
4	0.43	8.49	0.9	A
5	0.64	4.18	2.0	A

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	91	1335	1326	0.069	91	0.1	2.913	A

2	263	1273	1355	0.194	263	0.2	3.292	A
3	1332	300	2759	0.483	1328	1.0	2.819	A
4	253	1406	1170	0.216	252	0.3	4.439	A
5	1184	242	2771	0.427	1181	0.8	2.534	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	109	1598	1193	0.091	109	0.1	3.320	A
2	315	1523	1231	0.256	314	0.3	3.924	A
3	1590	359	2721	0.584	1588	1.6	3.566	A
4	302	1682	1036	0.292	301	0.5	5.552	A
5	1414	290	2740	0.516	1413	1.2	3.038	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	133	1955	1011	0.132	133	0.2	4.099	A
2	385	1864	1063	0.363	384	0.6	5.300	A
3	1948	439	2670	0.730	1942	3.0	5.519	A
4	370	2056	854	0.433	368	0.9	8.387	A
5	1732	354	2700	0.642	1729	2.0	4.146	A

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	133	1959	1009	0.132	133	0.2	4.110	A
2	385	1867	1061	0.363	385	0.6	5.327	A
3	1948	440	2669	0.730	1948	3.0	5.607	A
4	370	2062	851	0.435	370	0.9	8.486	A
5	1732	356	2699	0.642	1732	2.0	4.175	A

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	109	1603	1190	0.091	109	0.1	3.330	A
2	315	1528	1229	0.256	316	0.3	3.946	A
3	1590	361	2720	0.585	1596	1.6	3.616	A
4	302	1690	1032	0.293	304	0.5	5.617	A
5	1414	292	2739	0.516	1417	1.2	3.063	A

18:00 - 18:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	91	1341	1323	0.069	91	0.1	2.921	A
2	263	1279	1352	0.195	264	0.2	3.311	A
3	1332	302	2758	0.483	1334	1.1	2.845	A
4	253	1412	1167	0.217	254	0.3	4.473	A
5	1184	244	2770	0.428	1186	0.8	2.553	A

2033 Cumulative Assessment, AM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	94.51	F

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)
D7	2033 Cumulative Assessment	AM peak	ONE HOUR	07:45	09:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	170	100.000
2		✓	355	100.000
3		✓	2188	100.000
4		✓	326	100.000
5		✓	2658	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	40	48	49	33
	2	21	0	29	174	131
	3	31	73	0	361	1723
	4	18	59	166	0	83
	5	25	315	1909	409	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	13	13
	4	0	0	16	0	16
	5	0	0	12	12	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.38	11.67	0.6	B
2	0.58	12.71	1.4	B
3	1.00	56.17	38.2	F
4	0.45	9.21	0.9	A
5	1.10	152.76	142.0	F

Main Results for each time segment

07:45 - 08:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	128	2194	889	0.144	127	0.2	4.721	A
2	267	1957	1017	0.263	266	0.4	4.785	A
3	1647	612	2559	0.644	1639	2.0	4.357	A
4	245	1507	1121	0.219	244	0.3	4.584	A
5	2001	276	2749	0.728	1990	2.9	5.150	A

08:00 - 08:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	153	2616	674	0.227	152	0.3	6.894	A
2	319	2334	830	0.384	318	0.6	7.013	A
3	1967	731	2484	0.792	1959	4.1	7.580	A
4	293	1801	978	0.300	292	0.5	5.867	A
5	2389	330	2715	0.880	2372	7.4	11.027	B

08:15 - 08:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	187	2947	506	0.370	186	0.6	11.225	B
2	391	2634	682	0.573	388	1.3	12.137	B
3	2409	854	2405	1.002	2320	26.4	32.162	D
4	359	2139	813	0.441	357	0.9	8.797	A
5	2927	400	2671	1.096	2648	76.9	64.794	F

08:30 - 08:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	187	2968	495	0.378	187	0.6	11.673	B
2	391	2651	674	0.580	391	1.4	12.710	B
3	2409	859	2401	1.003	2362	38.2	56.171	F
4	359	2176	795	0.451	359	0.9	9.210	A
5	2927	403	2669	1.097	2666	142.0	152.757	F

08:45 - 09:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	187	2968	495	0.378	187	0.6	11.673	B
2	391	2651	674	0.580	391	1.4	12.710	B
3	2409	859	2401	1.003	2362	38.2	56.171	F
4	359	2176	795	0.451	359	0.9	9.210	A
5	2927	403	2669	1.097	2666	142.0	152.757	F

1	153	2937	511	0.299	153	0.4	10.090	B
2	319	2612	693	0.461	321	0.9	9.737	A
3	1967	783	2450	0.803	2100	4.8	15.850	C
4	293	1921	919	0.319	295	0.5	6.454	A
5	2389	338	2710	0.882	2689	67.2	141.541	F

09:00 - 09:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	128	2462	753	0.170	129	0.2	5.779	A
2	267	2193	900	0.297	269	0.4	5.722	A
3	1647	657	2531	0.651	1658	2.1	4.690	A
4	245	1525	1112	0.221	246	0.3	4.650	A
5	2001	278	2748	0.728	2258	3.0	13.921	B

2033 Cumulative Assessment, PM peak

Data Errors and Warnings

No errors or warnings

Junction Network

Junctions

Junction	Name	Junction type	Use circulating lanes	Arm order	Junction Delay (s)	Junction LOS
1	untitled	Standard Roundabout		1, 2, 3, 4, 5	65.01	F

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)
D8	2033 Cumulative Assessment	PM peak	ONE HOUR	16:45	18:15	15

Vehicle mix source	PCU Factor for a HV (PCU)
HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
1		✓	137	100.000
2		✓	399	100.000
3		✓	1991	100.000
4		✓	827	100.000
5		✓	2271	100.000

Origin-Destination Data

Demand (PCU/hr)

		To				
		1	2	3	4	5
From	1	0	32	70	21	14
	2	50	0	17	111	221
	3	47	25	0	219	1700
	4	36	153	307	0	331
	5	40	122	2055	54	0

Vehicle Mix

Heavy Vehicle Percentages

		To				
		1	2	3	4	5
From	1	0	0	0	0	0
	2	0	0	0	0	0
	3	0	0	0	13	13
	4	0	0	16	0	16
	5	0	0	12	12	0

Results

Results Summary for whole modelled period

Arm	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS
1	0.28	9.24	0.4	A
2	0.67	16.81	2.0	C
3	0.84	9.41	5.6	A
4	1.21	303.28	84.1	F
5	0.98	38.81	25.9	E

Main Results for each time segment

16:45 - 17:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	103	2034	971	0.106	103	0.1	4.145	A
2	300	1888	1051	0.286	299	0.4	4.778	A
3	1499	353	2725	0.550	1493	1.4	3.273	A
4	623	1543	1104	0.564	617	1.4	8.188	A
5	1710	461	2632	0.650	1702	2.0	4.262	A

17:00 - 17:15

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	123	2429	770	0.160	123	0.2	5.563	A
2	359	2255	869	0.413	358	0.7	7.021	A

3	1790	422	2681	0.668	1786	2.2	4.510	A
4	743	1845	956	0.777	735	3.6	17.534	C
5	2042	550	2576	0.793	2033	4.1	7.262	A

17:15 - 17:30

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	151	2836	562	0.268	150	0.4	8.722	A
2	439	2655	672	0.654	435	1.8	14.939	B
3	2192	513	2623	0.836	2179	5.4	8.886	A
4	911	2250	759	1.199	747	44.4	130.615	F
5	2500	582	2556	0.978	2436	20.2	25.355	D

17:30 - 17:45

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	151	2879	540	0.279	151	0.4	9.239	A
2	439	2695	652	0.674	439	2.0	16.806	C
3	2192	517	2620	0.837	2191	5.6	9.411	A
4	911	2264	753	1.210	752	84.1	303.284	F
5	2500	585	2554	0.979	2477	25.9	38.810	E

17:45 - 18:00

Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	123	2629	667	0.185	124	0.2	6.630	A
2	359	2415	790	0.454	363	0.8	8.516	A
3	1790	430	2676	0.669	1803	2.3	4.708	A
4	743	1864	947	0.785	935	36.3	233.360	F
5	2042	671	2499	0.817	2124	5.2	12.808	B

18:00 - 18:15

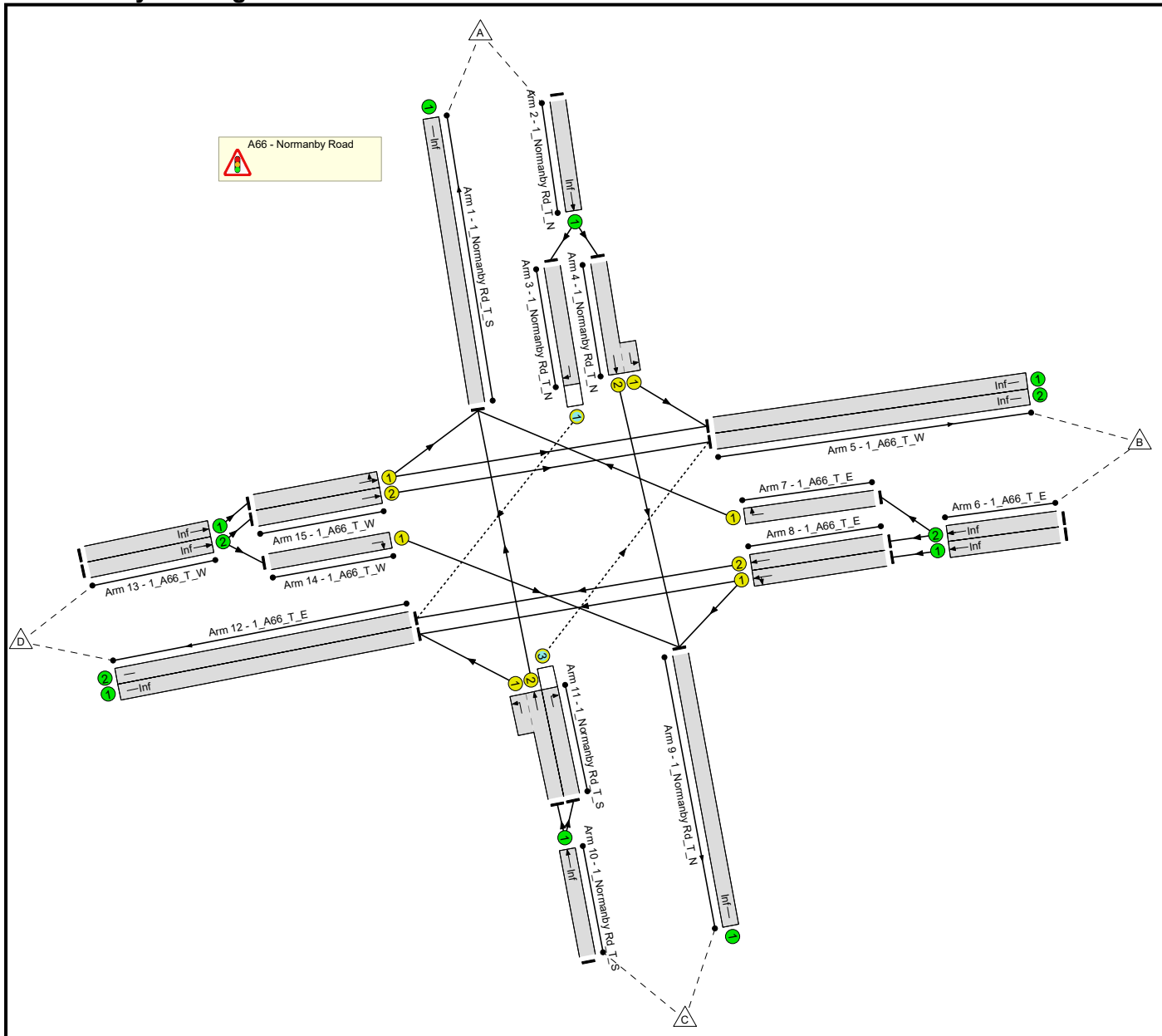
Arm	Total Demand (PCU/hr)	Circulating flow (PCU/hr)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	End queue (PCU)	Delay (s)	Unsignalised level of service
1	103	2134	920	0.112	104	0.1	4.414	A
2	300	1961	1015	0.296	302	0.4	5.063	A
3	1499	357	2723	0.551	1503	1.4	3.330	A
4	623	1553	1098	0.567	762	1.5	18.234	C
5	1710	549	2576	0.664	1722	2.2	4.742	A

Basic Results Summary
Basic Results Summary

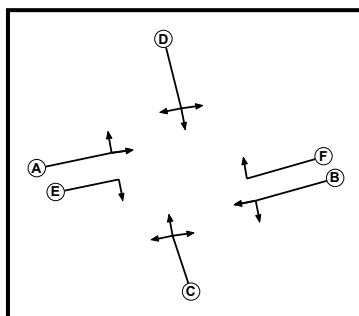
User and Project Details

Project:	Teesworks
Title:	A66 - Normanby Road

Network Layout Diagram

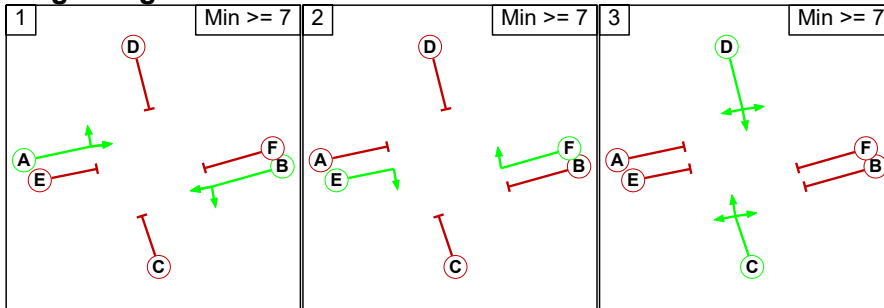


Phase Diagram



Basic Results Summary

Stage Diagram



Phase Intergreens Matrix

		Starting Phase					
		A	B	C	D	E	F
Terminating Phase	A	-	8	8	8	8	
	B	8	-	8	8	8	8
	C	7	7	-	7	7	
	D	7	7	-	-	7	7
	E	8	8	7	7	-	-
	F	8	8	7	7	-	-

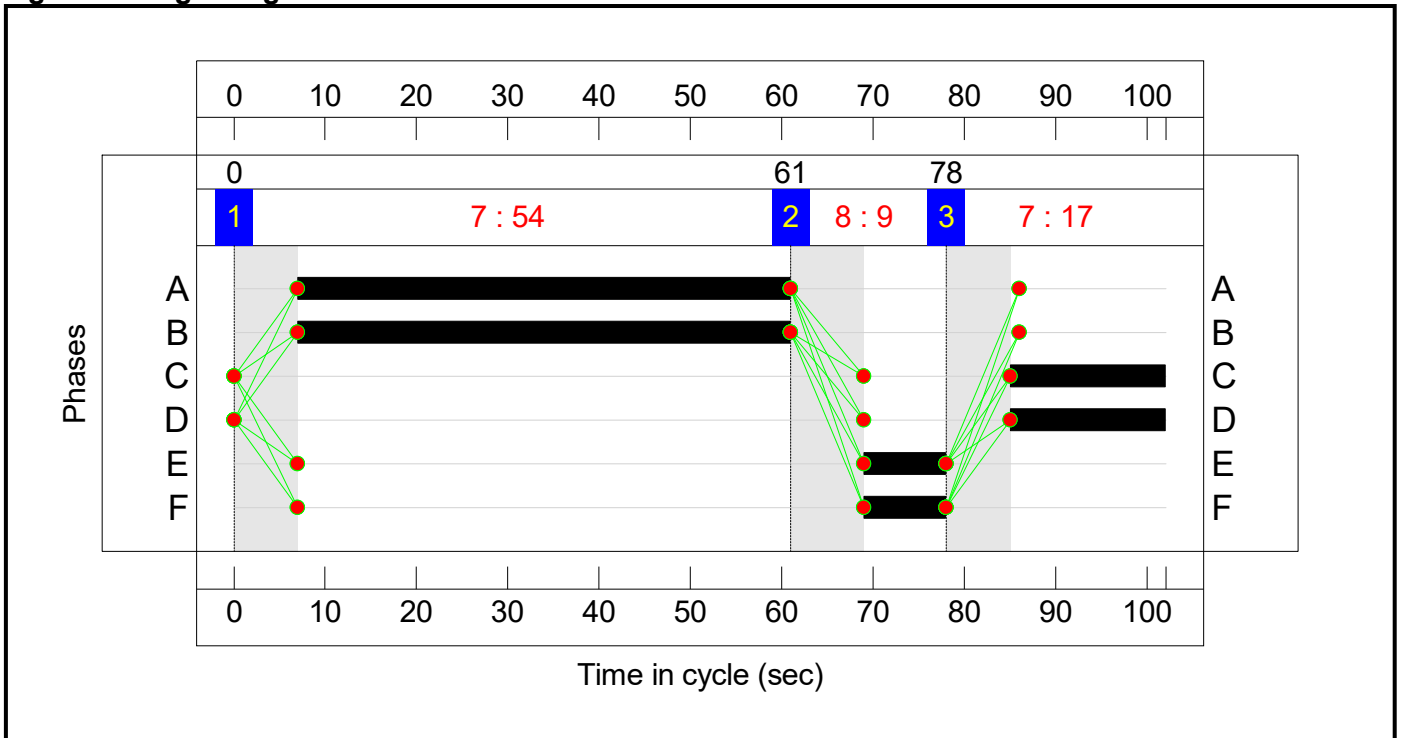
Scenario 1: '2033 AM Do Min' (FG1: '2033 AM Do Min', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination					Tot.
		A	B	C	D		
Origin	A	0	31	34	86	151	
	B	87	0	49	1836	1972	
	C	102	40	0	224	366	
	D	105	963	165	0	1233	
	Tot.	294	1034	248	2146	3722	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	89.0%	95	0	31	39.2	-	-
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	89.0%	95	0	31	39.2	-	-
3/1	1_Normanby Rd_T_N Right	O	D		1	17	-	86	1988	104	82.4%	55	0	31	3.1	130.8	4.3
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	17	-	65	2135:1752	239+218	14.2 : 14.2%	-	-	-	0.7	39.8	0.9
7/1	1_A66_T_E Right	U	F		1	9	-	87	1883	185	47.1%	-	-	-	1.5	61.8	2.8
8/1	1_A66_T_E Left Ahead	U	B		1	54	-	939	1956	1055	89.0%	-	-	-	9.2	35.4	27.3
8/2	1_A66_T_E Ahead	U	B		1	54	-	946	2105	1135	83.3%	-	-	-	7.6	29.0	24.8
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	17	-	326	2105:1945	129+283	79.1 : 79.1%	-	-	-	5.3	58.9	8.8
11/3	1_Normanby Rd_T_S Right	O	C		1	17	-	40	2080	258	15.5%	40	0	0	0.5	45.6	1.0
12/2	1_A66_T_E	U	-		-	-	-	1032	1975	1975	52.3%	-	-	-	0.8	2.7	22.2
14/1	1_A66_T_W Right	U	E		1	9	-	165	1902	186	88.5%	-	-	-	5.1	111.0	7.6
15/1	1_A66_T_W Left Ahead	U	A		1	54	-	500	1925	1038	48.2%	-	-	-	2.5	18.0	9.2
15/2	1_A66_T_W Ahead	U	A		1	54	-	568	2095	1130	50.3%	-	-	-	2.8	18.1	10.6
C1							PRC for Signalled Lanes (%):	1.1	Total Delay for Signalled Lanes (pcuHr):			38.46	Cycle Time (s): 102				
							PRC Over All Lanes (%):	1.1	Total Delay Over All Lanes(pcuHr):			39.22					

Basic Results Summary

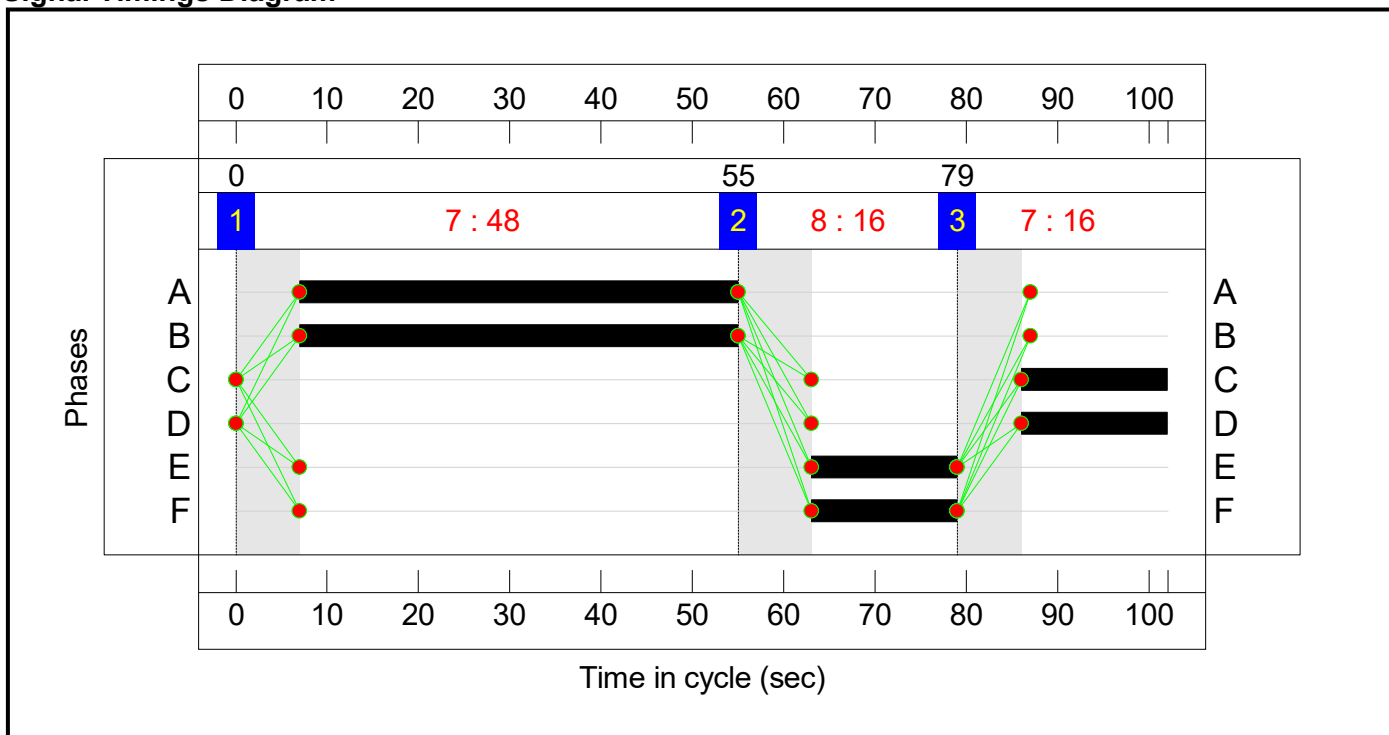
Scenario 2: '2033 PM Do Min' (FG2: '2033 PM Do Min', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	158	173	114	445
	B	78	0	31	1227	1336
	C	103	92	0	155	350
	D	85	1496	252	0	1833
	Tot.	266	1746	456	1496	3964

Signal Timings Diagram



Basic Results Summary

Network 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: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	82.4%	173	0	33	43.5	-	-
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	82.4%	173	0	33	43.5	-	-
3/1	1_Normanby Rd_T_N Right	O	D		1	16	-	114	1988	154	73.8%	107	0	7	2.8	88.4	4.4
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	16	-	331	2135:1752	229+209	75.5 : 75.5%	-	-	-	5.1	55.3	7.6
7/1	1_A66_T_E Right	U	F		1	16	-	78	1883	314	24.9%	-	-	-	1.0	44.6	2.1
8/1	1_A66_T_E Left Ahead	U	B		1	48	-	660	1957	940	70.2%	-	-	-	5.0	27.1	15.7
8/2	1_A66_T_E Ahead	U	B		1	48	-	598	2105	1011	59.1%	-	-	-	3.9	23.6	13.0
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	16	-	258	2105:1945	168+254	61.1 : 61.1%	-	-	-	3.5	48.9	4.9
11/3	1_Normanby Rd_T_S Right	O	C		1	16	-	92	2080	116	79.5%	66	0	26	2.9	115.2	4.2
12/2	1_A66_T_E	U	-		-	-	-	712	1975	1975	36.1%	-	-	-	0.3	1.7	10.9
14/1	1_A66_T_W Right	U	E		1	16	-	252	1902	317	79.5%	-	-	-	4.7	67.0	8.6
15/1	1_A66_T_W Left Ahead	U	A		1	48	-	752	1943	933	80.6%	-	-	-	6.7	32.2	20.0
15/2	1_A66_T_W Ahead	U	A		1	48	-	829	2095	1006	82.4%	-	-	-	7.5	32.7	22.3
C1							PRC for Signalled Lanes (%):	9.3	Total Delay for Signalled Lanes (pcuHr):			43.13	Cycle Time (s): 102				
							PRC Over All Lanes (%):	9.3	Total Delay Over All Lanes(pcuHr):			43.46					

Basic Results Summary

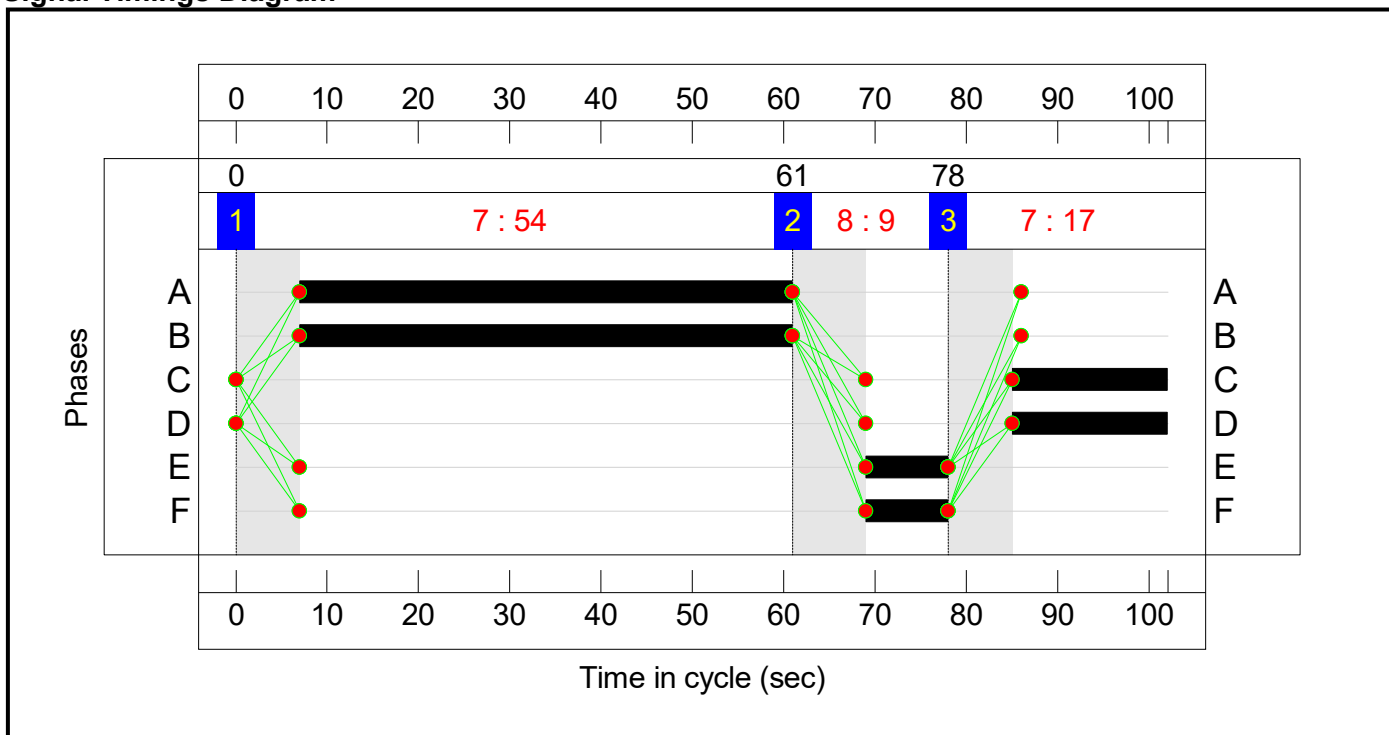
Scenario 5: '2033 AM+Lackenby' (FG5: '2033 AM+Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	31	34	86	151
	B	87	0	51	1889	2027
	C	102	43	0	224	369
	D	105	1042	165	0	1312
	Tot.	294	1116	250	2199	3859

Signal Timings Diagram



Basic Results Summary

Network 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: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	91.3%	98	0	31	42.0	-	-
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	91.3%	98	0	31	42.0	-	-
3/1	1_Normanby Rd_T_N Right	O	D		1	17	-	86	1988	104	82.4%	55	0	31	3.1	130.8	4.3
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	17	-	65	2135:1752	239+218	14.2 : 14.2%	-	-	-	0.7	39.8	0.9
7/1	1_A66_T_E Right	U	F		1	9	-	87	1883	185	47.1%	-	-	-	1.5	61.8	2.8
8/1	1_A66_T_E Left Ahead	U	B		1	54	-	963	1956	1055	91.3%	-	-	-	10.5	39.1	29.4
8/2	1_A66_T_E Ahead	U	B		1	54	-	977	2105	1135	86.1%	-	-	-	8.5	31.2	26.6
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	17	-	326	2105:1945	129+283	79.1 : 79.1%	-	-	-	5.3	58.9	8.8
11/3	1_Normanby Rd_T_S Right	O	C		1	17	-	43	2080	258	16.6%	43	0	0	0.5	45.8	1.1
12/2	1_A66_T_E	U	-		-	-	-	1063	1975	1975	53.8%	-	-	-	0.8	2.8	23.8
14/1	1_A66_T_W Right	U	E		1	9	-	165	1902	186	88.5%	-	-	-	5.1	111.0	7.6
15/1	1_A66_T_W Left Ahead	U	A		1	54	-	539	1927	1039	51.9%	-	-	-	2.8	18.6	10.3
15/2	1_A66_T_W Ahead	U	A		1	54	-	608	2095	1130	53.8%	-	-	-	3.2	18.7	11.7
C1							PRC for Signalled Lanes (%):	-1.5	Total Delay for Signalled Lanes (pcuHr):			41.18	Cycle Time (s): 102				
							PRC Over All Lanes (%):	-1.5	Total Delay Over All Lanes(pcuHr):			42.01					

Basic Results Summary

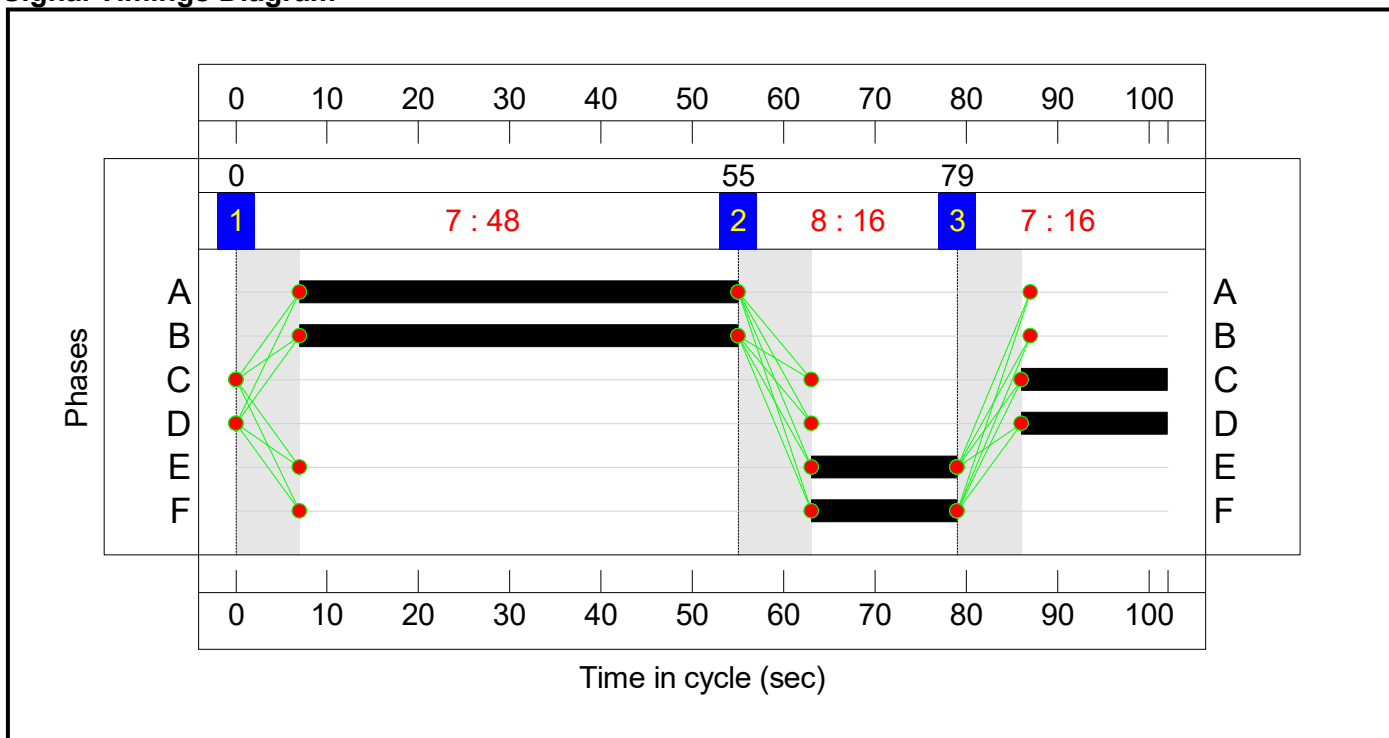
Scenario 6: '2033 PM+Lackenby' (FG6: '2033 PM+Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	158	173	114	445
	B	78	0	33	1292	1403
	C	103	94	0	155	352
	D	85	1531	252	0	1868
	Tot.	266	1783	458	1561	4068

Signal Timings Diagram



Basic Results Summary

Network 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: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	84.1%	173	0	35	45.4	-	-
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	84.1%	173	0	35	45.4	-	-
3/1	1_Normanby Rd_T_N Right	O	D		1	16	-	114	1988	154	73.8%	107	0	7	2.8	88.4	4.4
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	16	-	331	2135:1752	229+209	75.5 : 75.5%	-	-	-	5.1	55.3	7.6
7/1	1_A66_T_E Right	U	F		1	16	-	78	1883	314	24.9%	-	-	-	1.0	44.6	2.1
8/1	1_A66_T_E Left Ahead	U	B		1	48	-	691	1957	940	73.5%	-	-	-	5.5	28.4	16.9
8/2	1_A66_T_E Ahead	U	B		1	48	-	634	2105	1011	62.7%	-	-	-	4.3	24.5	14.0
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	16	-	258	2105:1945	168+254	61.1 : 61.1%	-	-	-	3.5	48.9	4.9
11/3	1_Normanby Rd_T_S Right	O	C		1	16	-	94	2080	116	81.2%	66	0	28	3.1	119.7	4.5
12/2	1_A66_T_E	U	-		-	-	-	748	1975	1975	37.9%	-	-	-	0.4	1.7	12.0
14/1	1_A66_T_W Right	U	E		1	16	-	252	1902	317	79.5%	-	-	-	4.7	67.0	8.6
15/1	1_A66_T_W Left Ahead	U	A		1	48	-	770	1944	934	82.5%	-	-	-	7.2	33.5	20.9
15/2	1_A66_T_W Ahead	U	A		1	48	-	846	2095	1006	84.1%	-	-	-	8.0	34.0	23.2
C1							PRC for Signalled Lanes (%):	7.1	Total Delay for Signalled Lanes (pcuHr):			45.08	Cycle Time (s): 102				
							PRC Over All Lanes (%):	7.1	Total Delay Over All Lanes(pcuHr):			45.44					

Basic Results Summary

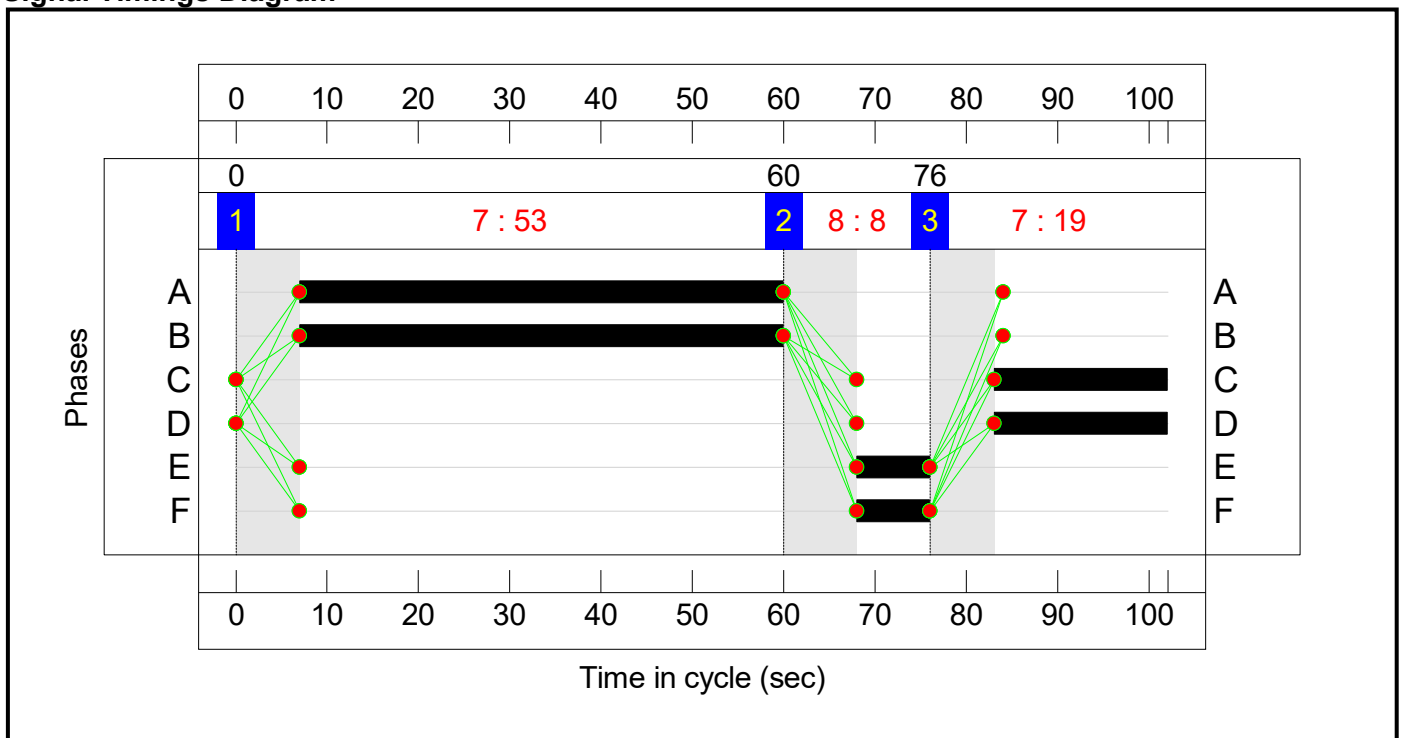
Scenario 7: '2033 AM+Cumulative' (FG7: '2033 AM+Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	39	43	109	191
	B	91	0	66	2199	2356
	C	131	70	0	235	436
	D	139	1627	168	0	1934
	Tot.	361	1736	277	2543	4917

Signal Timings Diagram



Basic Results Summary

Network 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: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	106.3%	133	0	46	133.3	-	-	
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	106.3%	133	0	46	133.3	-	-	
3/1	1_Normanby Rd_T_N Right	O	D		1	19	-	109	1988	113	96.4%	63	0	46	5.8	191.9	7.4	
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	19	-	82	2135:1752	260+236	16.5 : 16.5%	-	-	-	0.9	38.1	1.1	
7/1	1_A66_T_E Right	U	F		1	8	-	91	1883	166	54.8%	-	-	-	1.7	68.1	3.0	
8/1	1_A66_T_E Left Ahead	U	B		1	53	-	1100	1955	1035	106.3%	-	-	-	49.8	163.1	72.5	
8/2	1_A66_T_E Ahead	U	B		1	53	-	1165	2105	1114	104.5%	-	-	-	44.0	136.0	68.3	
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	19	-	366	2105:1945	167+299	78.6 : 78.6%	-	-	-	5.6	54.8	9.4	
11/3	1_Normanby Rd_T_S Right	O	C		1	19	-	70	2080	282	24.8%	70	0	0	0.9	45.0	1.8	
12/2	1_A66_T_E	U	-		-	-	-	1274	1975	1975	61.9%	-	-	-	1.3	3.7	30.7	
14/1	1_A66_T_W Right	U	E		1	8	-	168	1902	168	100.1%	-	-	-	8.7	186.5	11.3	
15/1	1_A66_T_W Left Ahead	U	A		1	53	-	839	1933	1023	82.0%	-	-	-	6.9	29.5	21.8	
15/2	1_A66_T_W Ahead	U	A		1	53	-	927	2095	1109	83.6%	-	-	-	7.7	29.9	24.6	
			C1	PRC for Signalled Lanes (%):			-18.1	Total Delay for Signalled Lanes (pcuHr):			131.98	Cycle Time (s):			102			
				PRC Over All Lanes (%):			-18.1	Total Delay Over All Lanes(pcuHr):			133.25							

Basic Results Summary

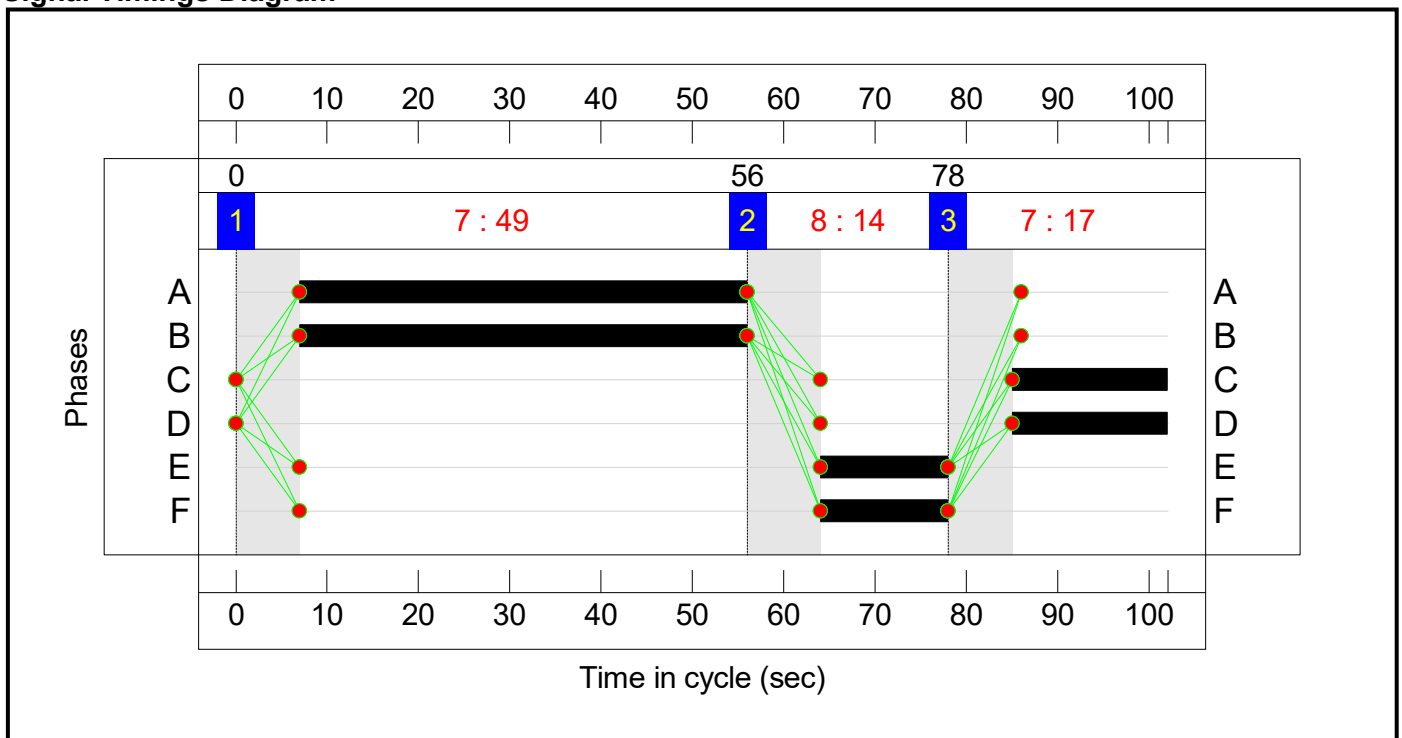
Scenario 8: '2033 PM+Cumulative' (FG8: '2033 PM+Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	175	192	127	494
	B	89	0	65	1959	2113
	C	117	109	0	159	385
	D	108	1862	279	0	2249
	Tot.	314	2146	536	2245	5241

Signal Timings Diagram



Basic Results Summary

Network Results

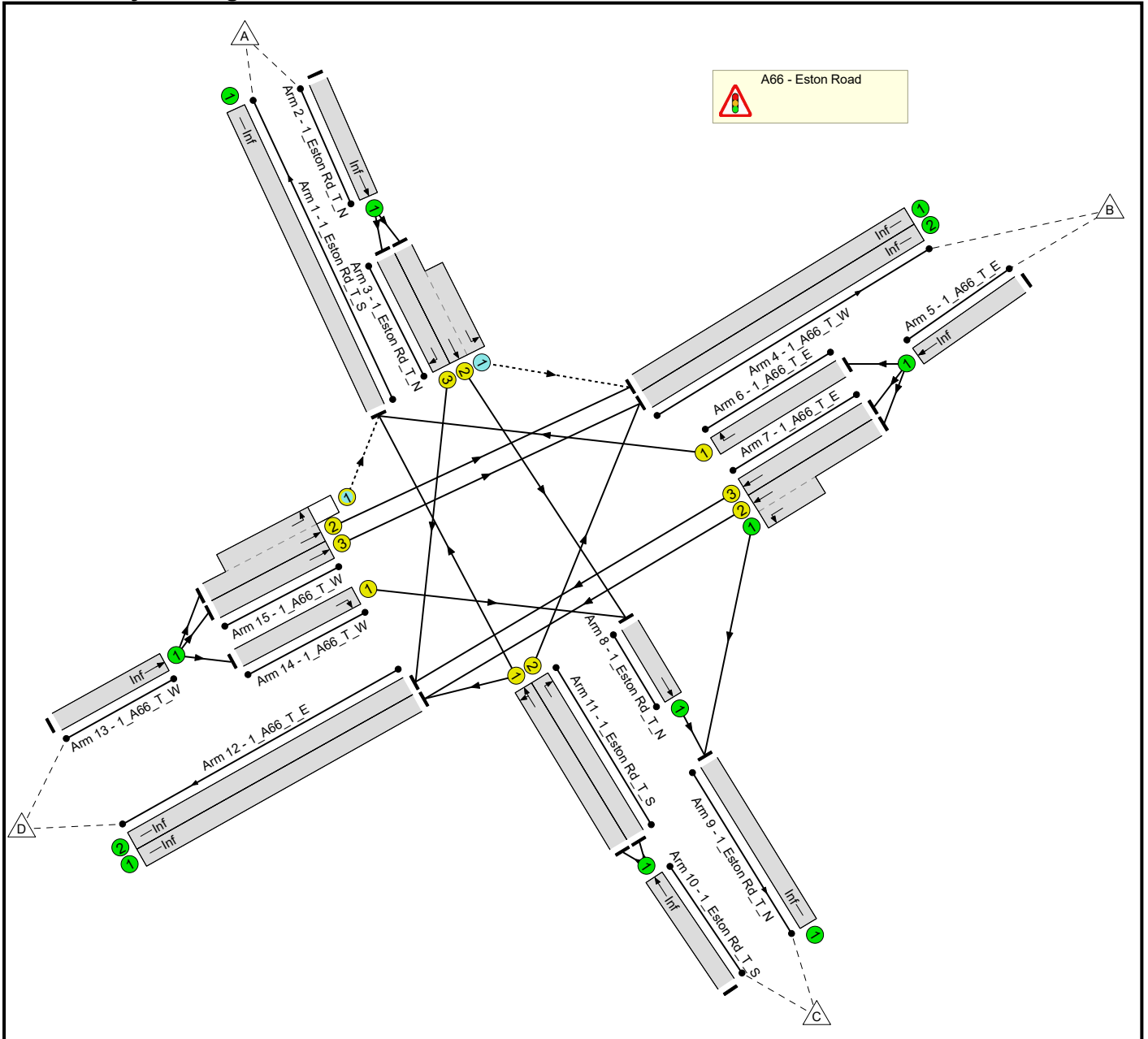
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)	
Network: A66 - Normanby Road	-	-	-		-	-	-	-	-	-	104.6%	168	0	64	138.4	-	-	
A66 - Normanby Road	-	-	-		-	-	-	-	-	-	104.6%	168	0	64	138.4	-	-	
3/1	1_Normanby Rd_T_N Right	O	D		1	17	-	127	1988	162	78.5%	114	0	13	3.3	93.6	5.1	
4/2+4/1	1_Normanby Rd_T_N Left Ahead	U	D		1	17	-	367	2135:1752	239+218	80.2 : 80.2%	-	-	-	5.9	57.7	9.1	
7/1	1_A66_T_E Right	U	F		1	14	-	89	1883	277	32.1%	-	-	-	1.2	48.5	2.5	
8/1	1_A66_T_E Left Ahead	U	B		1	49	-	998	1954	958	104.2%	-	-	-	37.9	136.6	58.2	
8/2	1_A66_T_E Ahead	U	B		1	49	-	1026	2105	1032	99.4%	-	-	-	22.0	77.1	43.4	
11/2+11/1	1_Normanby Rd_T_S Ahead Left	U	C		1	17	-	276	2105:1945	191+260	61.1 : 61.1%	-	-	-	3.6	47.4	5.0	
11/3	1_Normanby Rd_T_S Right	O	C		1	17	-	109	2080	104	104.6%	54	0	50	8.4	276.1	9.8	
12/2	1_A66_T_E	U	-		-	-	-	1153	1975	1975	58.4%	-	-	-	1.1	3.3	28.0	
14/1	1_A66_T_W Right	U	E		1	14	-	279	1902	280	99.7%	-	-	-	11.5	149.0	16.0	
15/1	1_A66_T_W Left Ahead	U	A		1	49	-	941	1943	952	98.8%	-	-	-	19.5	74.4	38.9	
15/2	1_A66_T_W Ahead	U	A		1	49	-	1029	2095	1027	100.2%	-	-	-	24.1	84.3	45.8	
C1							PRC for Signalled Lanes (%):	-16.3	Total Delay for Signalled Lanes (pcuHr):			137.33	Cycle Time (s):			102		
							PRC Over All Lanes (%):	-16.3	Total Delay Over All Lanes(pcuHr):			138.40						

Basic Results Summary
Basic Results Summary

User and Project Details

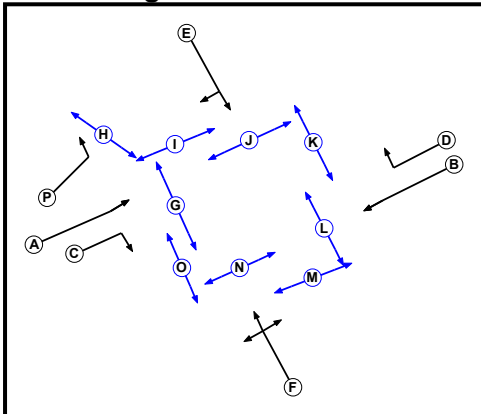
Project:	Teesworks
Title:	A66 / Eston Road

Network Layout Diagram



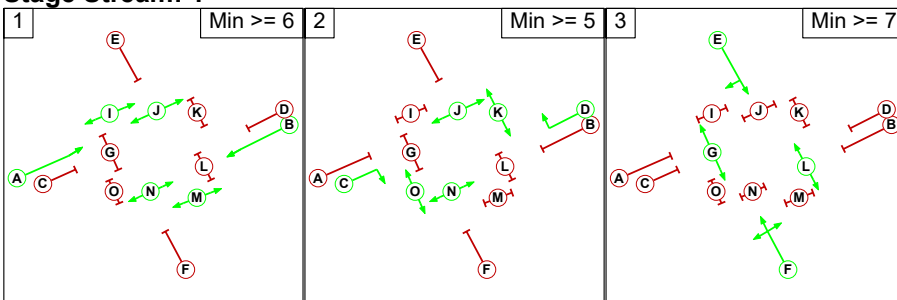
Basic Results Summary

Phase Diagram

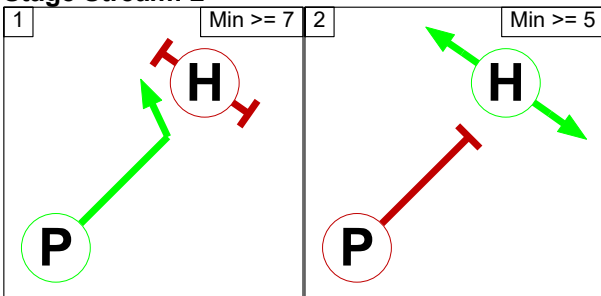


Stage Diagram

Stage Stream: 1



Stage Stream: 2



Basic Results Summary

Phase Intergreens Matrix

		Starting Phase															
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Terminating Phase	A	-	-	6	6	6	5	-	-	-	8	-	-	-	-	-	-
	B	-	-	6	-	6	6	-	-	-	-	-	5	-	-	9	-
	C	-	7	-	-	5	5	5	-	-	-	-	-	9	-	-	-
	D	7	-	-	-	5	5	-	-	10	-	-	5	-	-	-	-
	E	5	7	6	0	-	-	-	-	-	5	-	-	9	-	10	-
	F	7	5	6	6	-	-	-	-	9	-	10	-	-	5	7	-
	G	12	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-
	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
	I	-	-	-	6	-	6	-	-	-	-	-	-	-	-	-	-
	J	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-
	K	9	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-
	L	-	12	-	12	-	-	-	-	-	-	-	-	-	-	-	-
	M	-	-	6	-	6	-	-	-	-	-	-	-	-	-	-	-
	N	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-
	O	-	9	-	-	0	9	-	-	-	-	-	-	-	-	-	-
	P	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-

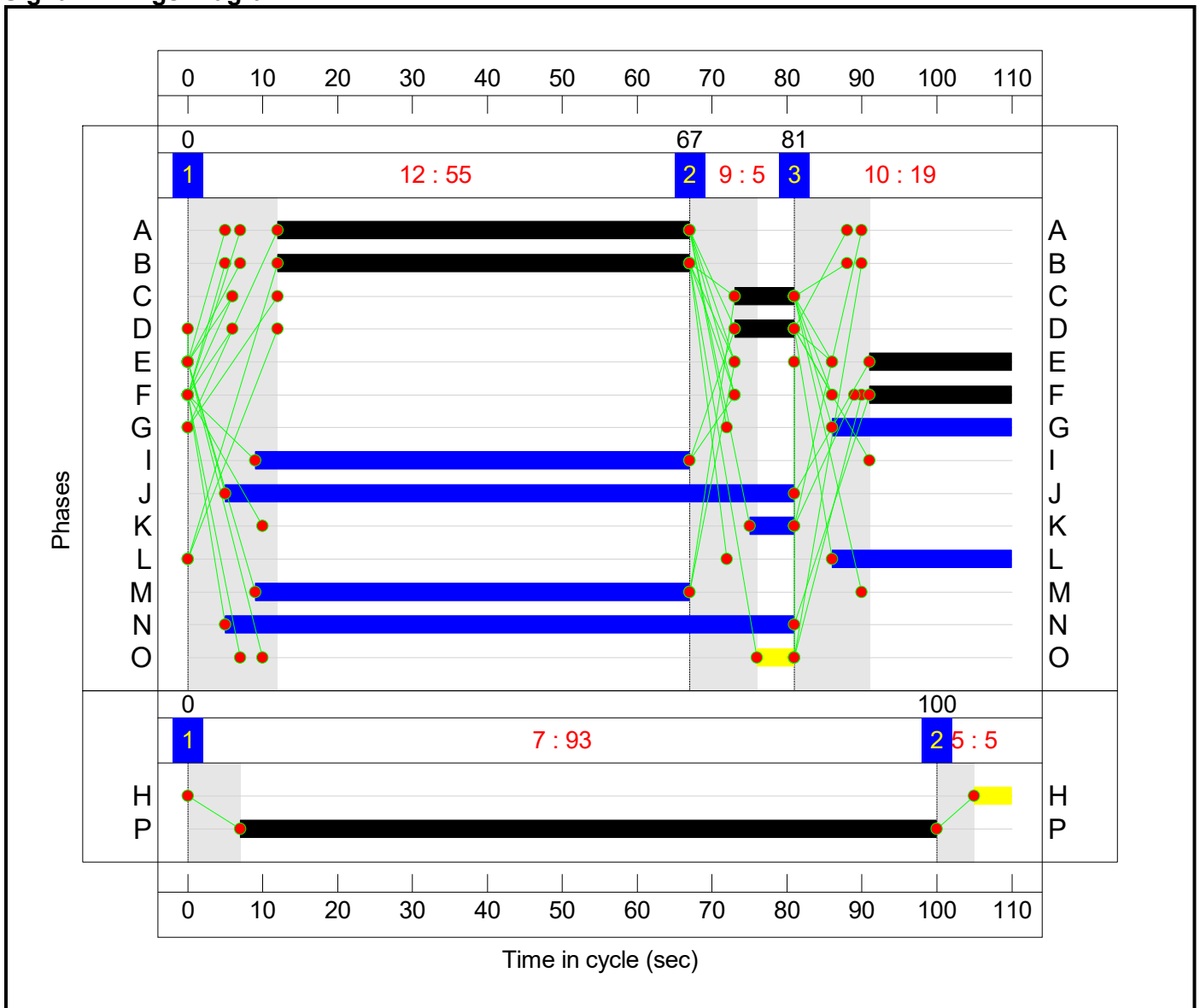
Scenario 1: '2033 AM Do Min' (FG1: '2033 AM Do Min', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination					Tot.
		A	B	C	D	Tot.	
Origin	A	0	48	29	101	178	
	B	103	0	44	1835	1982	
	C	71	46	0	235	352	
	D	155	1099	98	0	1352	
	Tot.	329	1193	171	2171	3864	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	90.9%	57	146	0	41.8	-	-
A66 - Eston Road	-	-	-		-	-	-	-	-	-	90.9%	57	146	0	41.8	-	-
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	19	-	77	1915:2014	285+472	10.2 : 10.2%	24	24	0	0.4	16.8	0.8
3/3	1_Eston Rd_T_N Right	U	E		1	19	-	101	1775	323	31.3%	-	-	-	1.3	47.2	2.9
6/1	1_A66_T_E Right	U	D		1	8	-	103	1976	162	63.7%	-	-	-	2.3	78.8	3.9
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	55	-	914	1975:2015	971+49	89.6 : 89.6%	-	-	-	10.0	39.4	29.0
7/3	1_A66_T_E Ahead	U	B		1	55	-	965	2115	1077	89.6%	-	-	-	10.6	39.4	30.6
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	127	1965	1965	6.5%	-	-	-	0.0	1.0	0.0
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	19	-	306	1851	337	90.9%	-	-	-	7.7	90.9	13.1
11/2	1_Eston Rd_T_S Right	U	F		1	19	-	46	1920	349	13.2%	-	-	-	0.6	43.7	1.3
14/1	1_A66_T_W Right	U	C		1	8	-	98	1914	157	62.6%	-	-	-	2.1	78.8	3.7
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	55:93	-	688	1975:1905	906+264	58.8 : 58.8%	32	123	0	3.5	18.2	11.5
15/3	1_A66_T_W Ahead	U	A		1	55	-	566	2115	1077	52.6%	-	-	-	3.4	21.6	12.0
							C1 Stream: 1 PRC for Signalled Lanes (%):		-1.0	Total Delay for Signalled Lanes (pcuHr):			41.80		Cycle Time (s): 110		
							C1 Stream: 2 PRC for Signalled Lanes (%):		0.0	Total Delay for Signalled Lanes (pcuHr):			0.00		Cycle Time (s): 110		
							PRC Over All Lanes (%):		-1.0	Total Delay Over All Lanes(pcuHr):			41.84				

Basic Results Summary

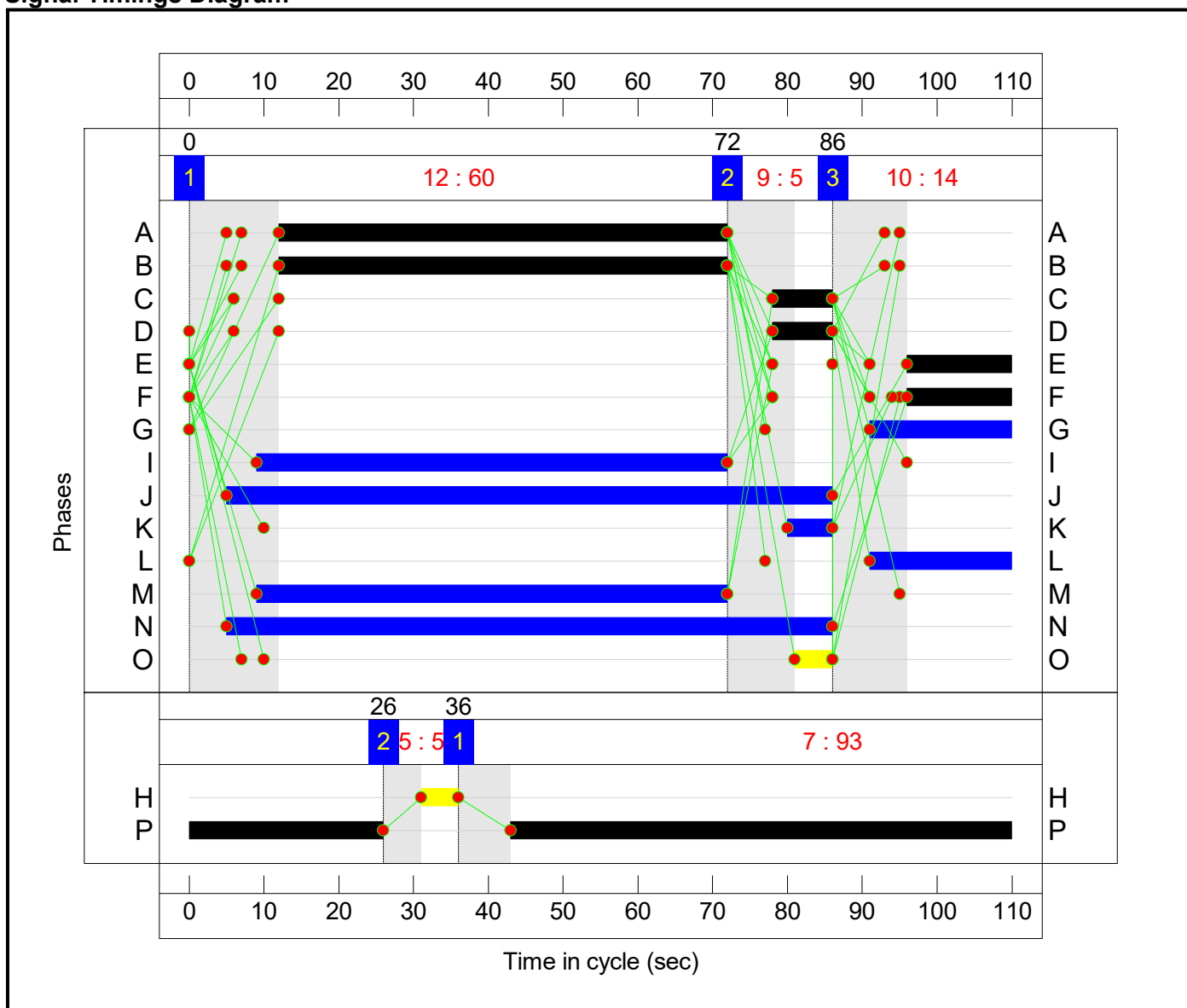
Scenario 2: '2033 PM Do Min' (FG2: '2033 PM Do Min', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	155	47	185	387	
B	66	0	61	901	1028	
C	31	26	0	170	227	
D	162	1839	103	0	2104	
Tot.	259	2020	211	1256	3746	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	85.9%	127	187	3	32.8	-	-	
A66 - Eston Road	-	-	-		-	-	-	-	-	-	85.9%	127	187	3	32.8	-	-	
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	14	-	202	1915:2014	159+523	29.6 : 29.6%	86	69	0	0.8	13.5	1.5	
3/3	1_Eston Rd_T_N Right	U	E		1	14	-	185	1775	242	76.4%	-	-	-	3.9	75.7	7.0	
6/1	1_A66_T_E Right	U	D		1	8	-	66	1976	162	40.8%	-	-	-	1.2	66.7	2.2	
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	60	-	484	1975:2015	985+142	42.9 : 42.9%	-	-	-	2.0	15.1	8.0	
7/3	1_A66_T_E Ahead	U	B		1	60	-	478	2115	1173	40.8%	-	-	-	2.2	16.7	8.7	
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	150	1965	1965	7.6%	-	-	-	0.0	1.0	0.0	
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	14	-	201	1836	250	80.3%	-	-	-	4.5	79.9	7.8	
11/2	1_Eston Rd_T_S Right	U	F		1	14	-	26	1920	262	9.9%	-	-	-	0.4	49.3	0.7	
14/1	1_A66_T_W Right	U	C		1	8	-	103	1914	157	65.8%	-	-	-	2.3	81.5	4.0	
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	60:93	-	1034	1975:1905	1015+189	85.9 : 85.9%	41	118	3	7.8	27.1	25.5	
15/3	1_A66_T_W Ahead	U	A		1	60	-	967	2115	1173	82.4%	-	-	-	7.7	28.7	26.5	
							C1 Stream: 1 PRC for Signalled Lanes (%):	4.7	Total Delay for Signalled Lanes (pcuHr):			32.75	Cycle Time (s):		110			
							C1 Stream: 2 PRC for Signalled Lanes (%):	0.0	Total Delay for Signalled Lanes (pcuHr):			0.00	Cycle Time (s):		110			
							PRC Over All Lanes (%):	4.7	Total Delay Over All Lanes(pcuHr):			32.79						

Basic Results Summary

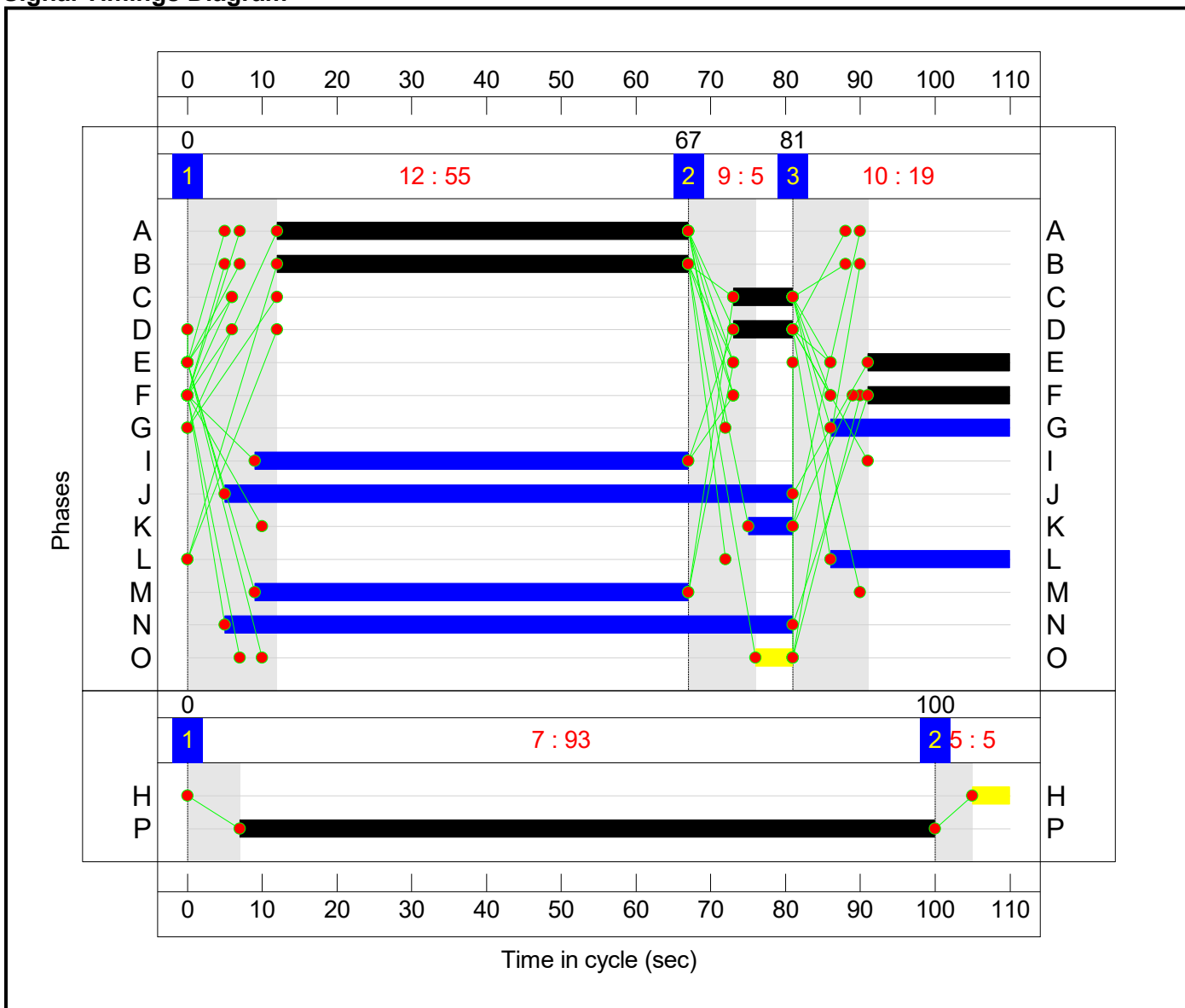
Scenario 5: '2033 AM+Lackenby' (FG5: '2033 AM+Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	48	29	101	178	
B	103	0	47	1889	2039	
C	71	49	0	235	355	
D	155	1182	98	0	1435	
Tot.	329	1279	174	2225	4007	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	92.3%	57	146	0	46.0	-	-	
A66 - Eston Road	-	-	-		-	-	-	-	-	-	92.3%	57	146	0	46.0	-	-	
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	19	-	77	1915:2014	285+472	10.2 : 10.2%	24	24	0	0.4	16.8	0.8	
3/3	1_Eston Rd_T_N Right	U	E		1	19	-	101	1775	323	31.3%	-	-	-	1.3	47.2	2.9	
6/1	1_A66_T_E Right	U	D		1	8	-	103	1976	162	63.7%	-	-	-	2.3	78.8	3.9	
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	55	-	942	1975:2015	969+51	92.3 : 92.3%	-	-	-	11.6	44.5	31.7	
7/3	1_A66_T_E Ahead	U	B		1	55	-	994	2115	1077	92.3%	-	-	-	12.2	44.3	33.2	
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	127	1965	1965	6.5%	-	-	-	0.0	1.0	0.0	
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	19	-	306	1851	337	90.9%	-	-	-	7.7	90.9	13.1	
11/2	1_Eston Rd_T_S Right	U	F		1	19	-	49	1920	349	14.0%	-	-	-	0.6	43.8	1.3	
14/1	1_A66_T_W Right	U	C		1	8	-	98	1914	157	62.6%	-	-	-	2.1	78.8	3.7	
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	55:93	-	727	1975:1905	912+247	62.7 : 62.7%	32	123	0	3.9	19.2	12.9	
15/3	1_A66_T_W Ahead	U	A		1	55	-	610	2115	1077	56.7%	-	-	-	3.8	22.5	13.4	
							C1 Stream: 1 PRC for Signalled Lanes (%):	-2.6				Total Delay for Signalled Lanes (pcuHr):	45.95			Cycle Time (s):	110	
							C1 Stream: 2 PRC for Signalled Lanes (%):	0.0				Total Delay for Signalled Lanes (pcuHr):	0.00			Cycle Time (s):	110	
							PRC Over All Lanes (%):	-2.6				Total Delay Over All Lanes(pcuHr):	45.98					

Basic Results Summary

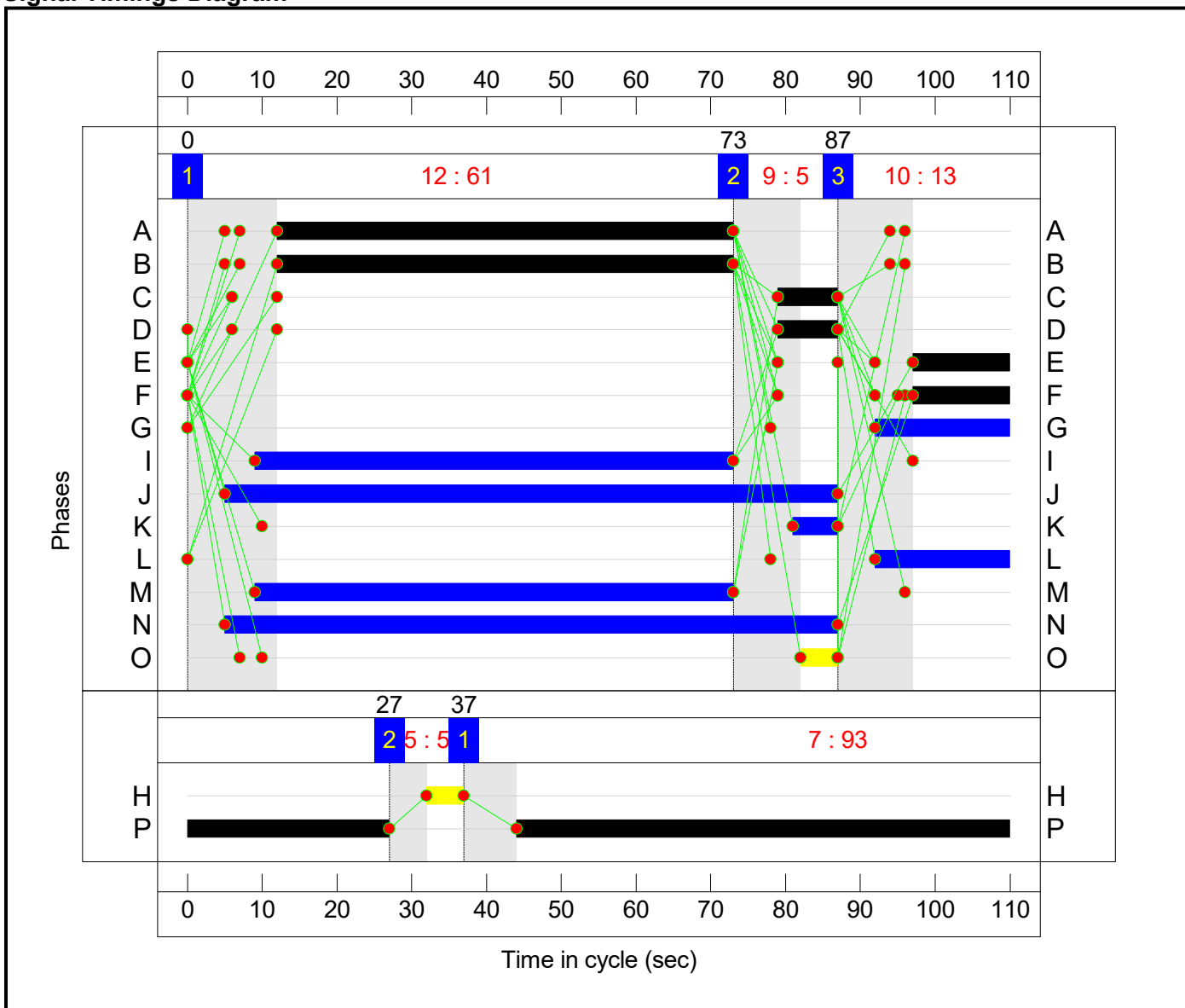
Scenario 6: '2033 PM+Lackenby' (FG6: '2033 PM+Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	155	47	185	387	
B	66	0	65	967	1098	
C	31	28	0	170	229	
D	162	1876	103	0	2141	
Tot.	259	2059	215	1322	3855	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	86.2%	127	187	3	34.6	-	-	
A66 - Eston Road	-	-	-		-	-	-	-	-	-	86.2%	127	187	3	34.6	-	-	
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	13	-	202	1915:2014	157+519	29.8 : 29.8%	87	68	0	0.8	13.8	1.5	
3/3	1_Eston Rd_T_N Right	U	E		1	13	-	185	1775	226	81.9%	-	-	-	4.5	86.8	7.6	
6/1	1_A66_T_E Right	U	D		1	8	-	66	1976	162	40.8%	-	-	-	1.2	66.7	2.2	
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	61	-	519	1975:2015	1002+143	45.3 : 45.3%	-	-	-	2.2	15.0	8.6	
7/3	1_A66_T_E Ahead	U	B		1	61	-	513	2115	1192	43.0%	-	-	-	2.3	16.5	9.4	
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	150	1965	1965	7.6%	-	-	-	0.0	1.0	0.0	
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	13	-	201	1836	234	86.0%	-	-	-	5.3	94.5	8.6	
11/2	1_Eston Rd_T_S Right	U	F		1	13	-	28	1920	244	11.5%	-	-	-	0.4	50.9	0.8	
14/1	1_A66_T_W Right	U	C		1	8	-	103	1914	157	65.8%	-	-	-	2.3	81.5	4.0	
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	61:93	-	1051	1975:1905	1031+188	86.2 : 86.2%	40	119	3	7.8	26.8	26.2	
15/3	1_A66_T_W Ahead	U	A		1	61	-	987	2115	1192	82.8%	-	-	-	7.7	28.2	27.0	
C1 Stream: 1 PRC for Signalled Lanes (%):							4.4	Total Delay for Signalled Lanes (pcuHr):				34.52	Cycle Time (s):		110			
C1 Stream: 2 PRC for Signalled Lanes (%):							0.0	Total Delay for Signalled Lanes (pcuHr):				0.00	Cycle Time (s):		110			
PRC Over All Lanes (%):							4.4	Total Delay Over All Lanes(pcuHr):				34.56						

Basic Results Summary

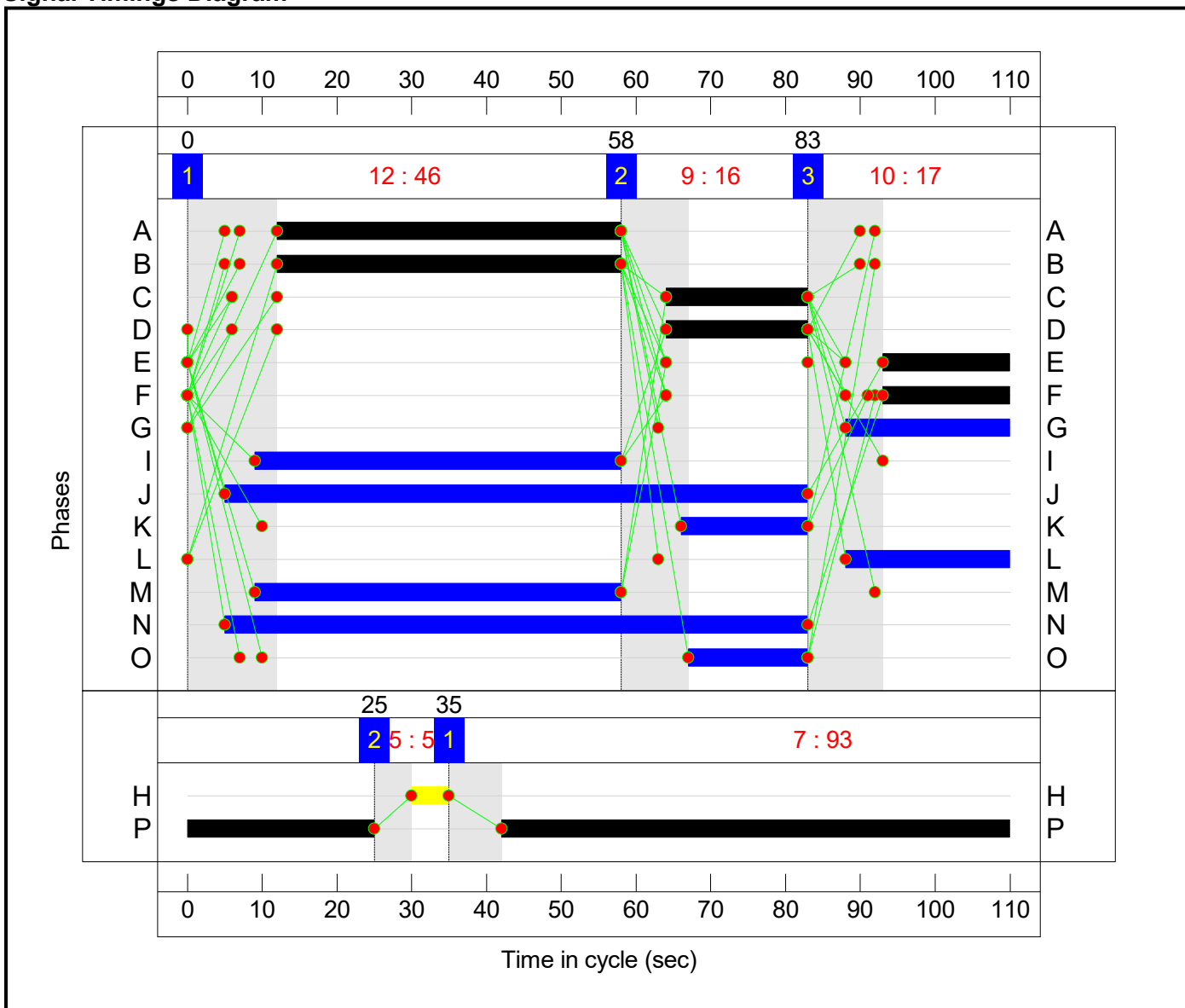
Scenario 7: '2033 AM Cumulative' (FG7: '2033 AM Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	257	64	206	527	
B	422	0	56	2113	2591	
C	124	79	0	235	438	
D	315	1642	100	0	2057	
Tot.	861	1978	220	2554	5613	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	123.1%	167	403	2	379.1	-	-
A66 - Eston Road	-	-	-		-	-	-	-	-	-	123.1%	167	403	2	379.1	-	-
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	17	-	321	1915:2014	136+547	47.0 : 47.0%	110	147	0	1.1	12.9	2.1
3/3	1_Eston Rd_T_N Right	U	E		1	17	-	206	1775	290	70.9%	-	-	-	3.7	64.3	7.1
6/1	1_A66_T_E Right	U	D		1	19	-	422	1976	359	117.5%	-	-	-	42.2	360.2	49.2
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	46	-	1057	1975:2015	814+46	123.0 : 123.0%	-	-	-	120.5	410.6	180.4
7/3	1_A66_T_E Ahead	U	B		1	46	-	1112	2115	904	123.1%	-	-	-	127.1	411.4	147.1
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	164	1965	1965	8.3%	-	-	-	0.0	1.0	0.0
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	17	-	359	1873	306	117.1%	-	-	-	37.2	373.1	43.2
11/2	1_Eston Rd_T_S Right	U	F		1	17	-	79	1920	314	25.1%	-	-	-	1.0	47.8	2.3
14/1	1_A66_T_W Right	U	C		1	19	-	100	1914	348	28.7%	-	-	-	1.3	46.1	2.8
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	46:93	-	1090	1975:1905	762+310	101.7 : 101.7%	57	255	2	29.3	96.7	50.2
15/3	1_A66_T_W Ahead	U	A		1	46	-	867	2115	904	95.9%	-	-	-	15.5	64.5	33.7
C1 Stream: 1 PRC for Signalled Lanes (%):							-36.7	Total Delay for Signalled Lanes (pcuHr):				379.03	Cycle Time (s): 110				
C1 Stream: 2 PRC for Signalled Lanes (%):							0.0	Total Delay for Signalled Lanes (pcuHr):				0.00	Cycle Time (s): 110				
PRC Over All Lanes (%):							-36.7	Total Delay Over All Lanes(pcuHr):				379.08					

Basic Results Summary

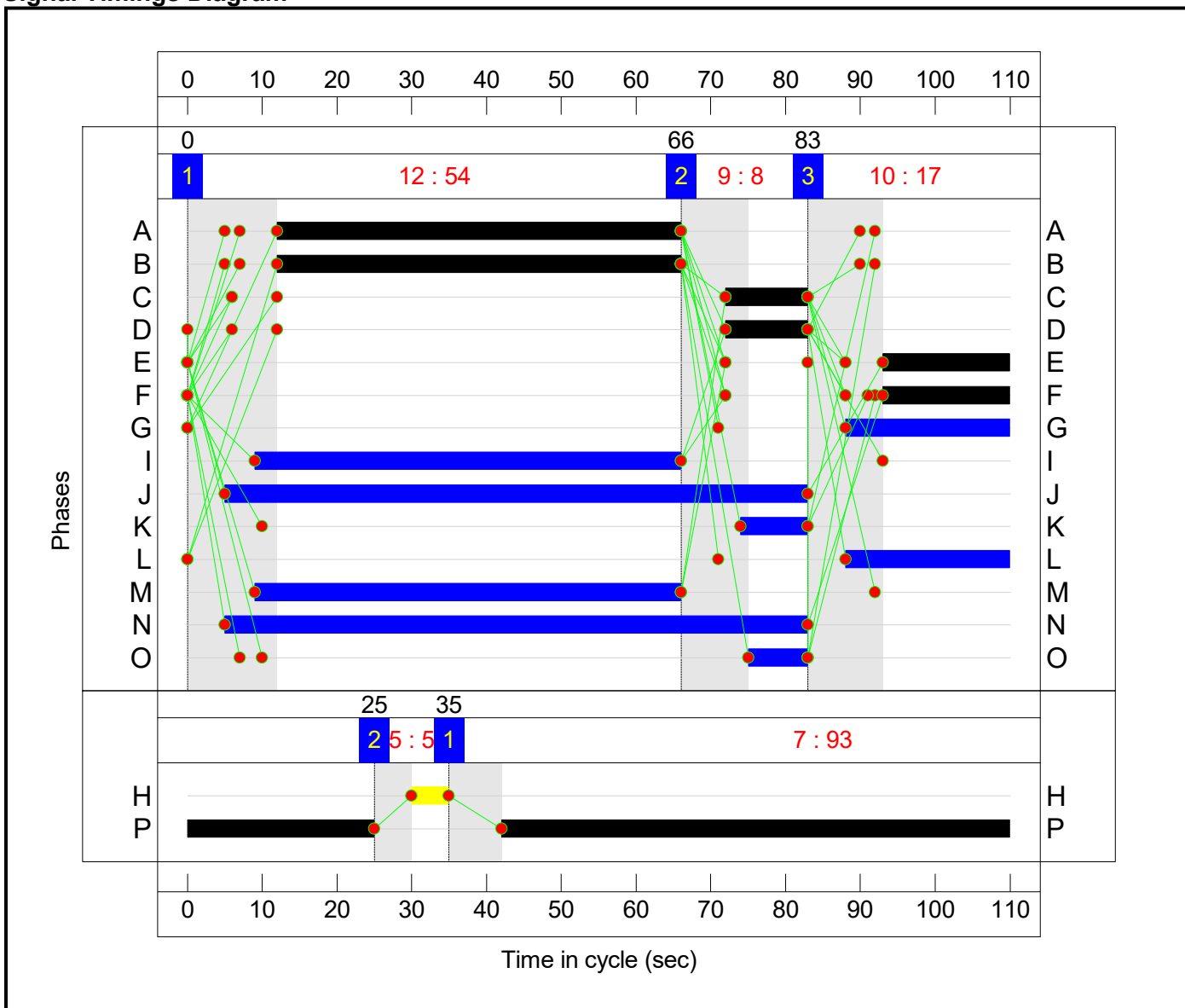
Scenario 8: '2033 PM Cumulative' (FG8: '2033 PM Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	414	90	315	819	
B	222	0	104	1547	1873	
C	54	37	0	170	261	
D	244	2145	113	0	2502	
Tot.	520	2596	307	2032	5455	

Signal Timings Diagram



Basic Results Summary

Network 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: A66 / Eston Road	-	-	-		-	-	-	-	-	-	110.8%	220	437	0	198.4	-	-
A66 - Eston Road	-	-	-		-	-	-	-	-	-	110.8%	220	437	0	198.4	-	-
3/2+3/1	1_Eston Rd_T_N Left Ahead	U+O	E -		1	17	-	504	1915:2014	112+516	80.3 : 80.3%	158	256	0	3.6	25.4	10.3
3/3	1_Eston Rd_T_N Right	U	E		1	17	-	315	1775	290	108.5%	-	-	-	22.5	257.1	27.8
6/1	1_A66_T_E Right	U	D		1	11	-	222	1976	216	103.0%	-	-	-	12.5	202.8	16.2
7/2+7/1	1_A66_T_E Left Ahead	U	B -		1	54	-	817	1975:2015	890+130	80.1 : 80.1%	-	-	-	6.7	29.6	21.7
7/3	1_A66_T_E Ahead	U	B		1	54	-	834	2115	1058	78.9%	-	-	-	7.1	30.6	22.7
8/1	1_Eston Rd_T_N Ahead	U	-		-	-	-	203	1965	1965	10.3%	-	-	-	0.1	1.0	0.1
11/1	1_Eston Rd_T_S Ahead Left	U	F		1	17	-	224	1853	303	73.9%	-	-	-	4.1	65.7	7.8
11/2	1_Eston Rd_T_S Right	U	F		1	17	-	37	1920	314	11.8%	-	-	-	0.5	45.8	1.0
14/1	1_A66_T_W Right	U	C		1	11	-	113	1914	209	54.1%	-	-	-	2.0	65.0	3.8
15/2+15/1	1_A66_T_W Left Ahead	U+O	A P		1	54:93	-	1248	1975:1905	907+220	110.8 : 110.8%	62	181	0	78.8	227.2	117.6
15/3	1_A66_T_W Ahead	U	A		1	54	-	1141	2115	1058	107.9%	-	-	-	60.6	191.2	85.1
C1 Stream: 1 PRC for Signalled Lanes (%):							-23.1	Total Delay for Signalled Lanes (pcuHr):				198.31	Cycle Time (s): 110				
C1 Stream: 2 PRC for Signalled Lanes (%):							0.0	Total Delay for Signalled Lanes (pcuHr):				0.00	Cycle Time (s): 110				
PRC Over All Lanes (%):							-23.1	Total Delay Over All Lanes(pcuHr):				198.36					

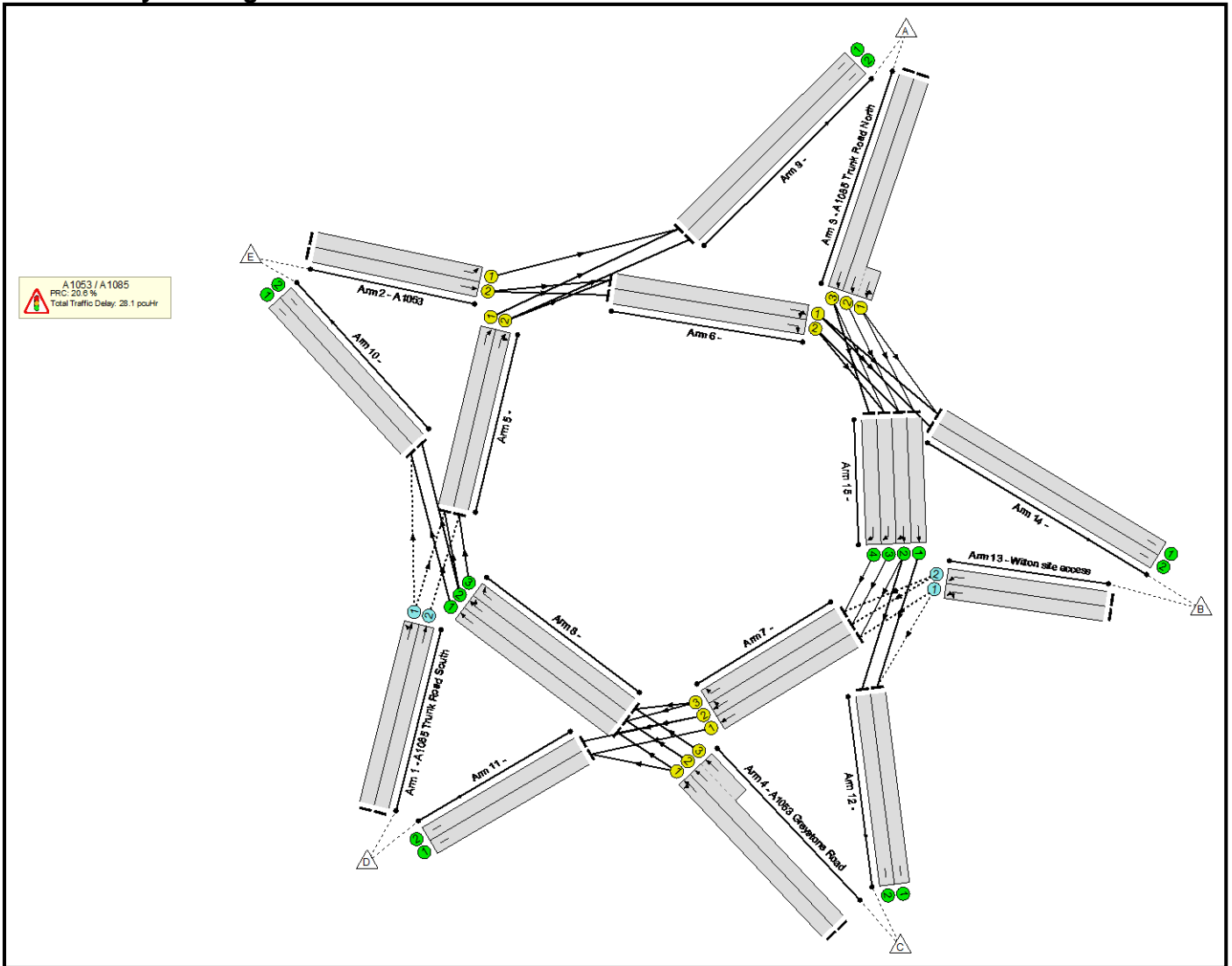
Basic Results Summary
Basic Results Summary

User and Project Details

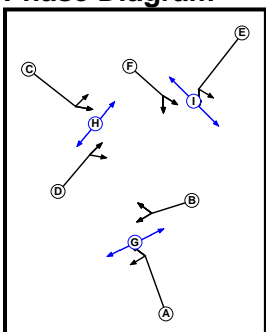
Project:	Teesworks
Title:	A1053 / A1085 Trunk Road Roundabout

Scenario 1: '2033 AM Base' (FG1: '2033 AM Base', Plan 1: 'Network Control Plan 1')

Network Layout Diagram

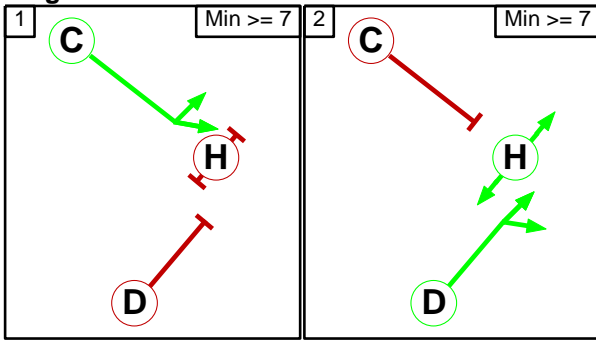


Phase Diagram

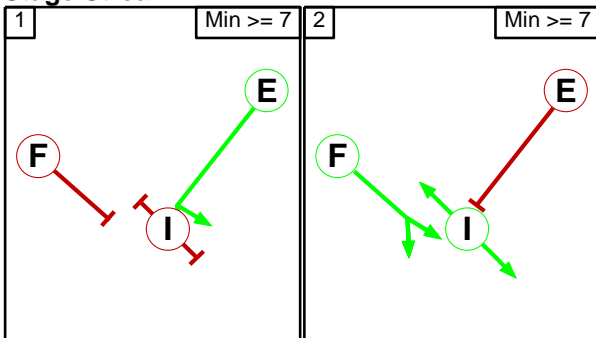


Basic Results Summary

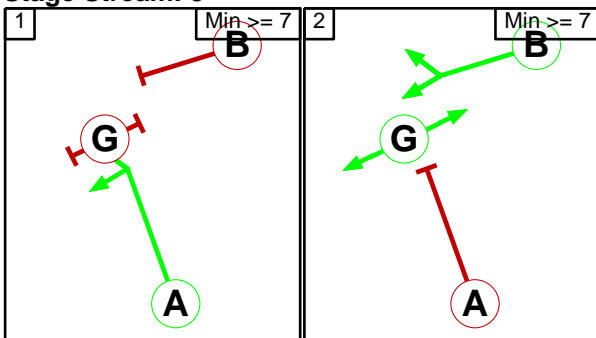
Stage Diagram
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

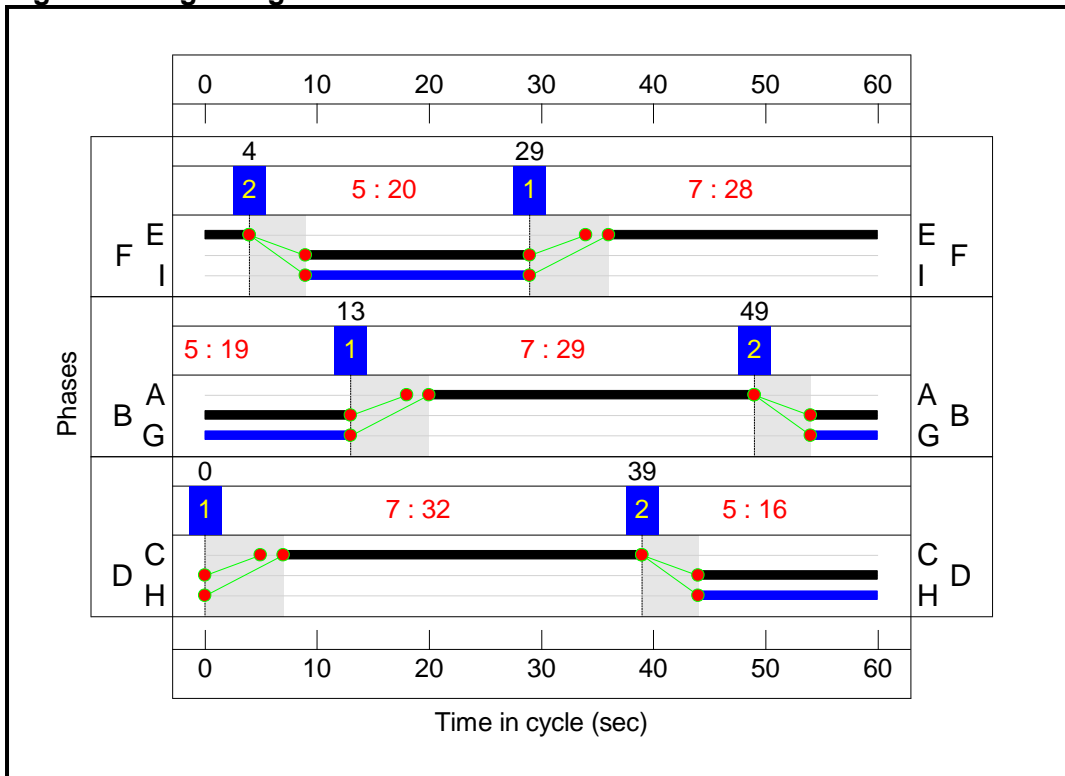


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	
	C	-	-	-	5	-	-	-	5	
	D	-	-	5	-	-	-	-	-	
	E	-	-	-	-	-	5	-	5	
	F	-	-	-	-	5	-	-	-	
	G	7	-	-	-	-	-	-	-	
	H	-	-	7	-	-	-	-	-	
I	-	-	-	-	7	-	-	-		

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
Origin		A	B	C	D	E	Tot.
	A	0	6	34	196	696	932
	B	1	0	16	16	92	125
	C	63	93	0	334	952	1442
	D	112	19	84	0	21	236
	E	344	130	408	26	0	908
	Tot.	520	248	542	572	1761	3643

Basic Results Summary

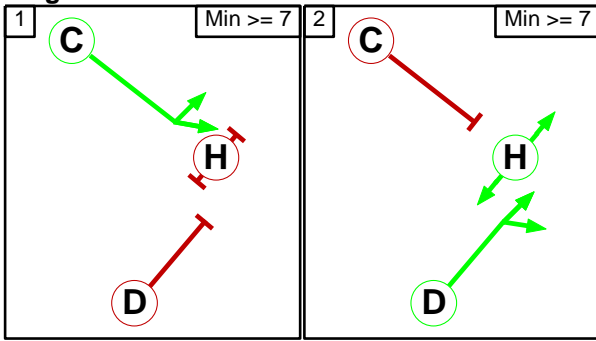
Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	74.6%	-	-	361	0	0	28.1	-
A1053 / A1085	-	-	-		-	-	-	-	74.6%	-	-	361	0	0	28.1	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	58	1972	28.7%	0.7	202	58	0	0	0.3	20.6
1/2	A1085 Trunk Road South Ahead	O	-		-	-	178	2015	37.1%	1.2	480	178	0	0	0.5	9.5
2/1	A1053 Left	U	C		32	-	344	1947	32.1%	3.3	1071	-	-	-	0.9	9.9
2/2	A1053 Ahead	U	C		32	-	564	2000	51.3%	6.3	1100	-	-	-	1.9	11.8
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		28	-	236	1955:1600	25.1 : 25.1%	2.0	780+159	-	-	-	0.7	11.4
3/3	A1085 Trunk Road North Ahead	U	E		28	-	696	1940	74.2%	10.7	938	-	-	-	3.8	19.9
4/1	A1053 Greystone Road Ahead Left	U	A		29	-	680	1854	73.4%	10.2	927	-	-	-	3.6	19.1
4/2+4/3	A1053 Greystone Road Ahead	U	A		29	-	762	1940:1950	74.6 : 74.6%	10.5	897+125	-	-	-	3.8	18.2
5/1	Ahead	U	D		16	-	101	1800	19.8%	1.2	510	-	-	-	0.4	12.9
5/2	Right Ahead	U	D		16	-	271	1800	53.1%	3.8	510	-	-	-	1.6	20.9
6/1	Ahead Right	U	F		20	-	381	1800	60.5%	5.9	630	-	-	-	2.2	20.9
6/2	Right	U	F		20	-	379	1800	60.2%	2.5	630	-	-	-	1.7	16.2
7/1	Ahead	U	B		19	-	238	1800	39.7%	3.4	600	-	-	-	0.9	14.2
7/2	Right Ahead	U	B		19	-	430	1800	71.7%	7.0	600	-	-	-	2.1	17.2
7/3	Right	U	B		19	-	359	1700	63.4%	5.4	567	-	-	-	1.4	14.2
8/1	Ahead	U	-		-	-	776	1800	43.1%	0.4	1800	-	-	-	0.4	1.8
8/2	Right Ahead	U	-		-	-	1028	1800	57.1%	6.7	1800	-	-	-	0.7	2.4

Basic Results Summary

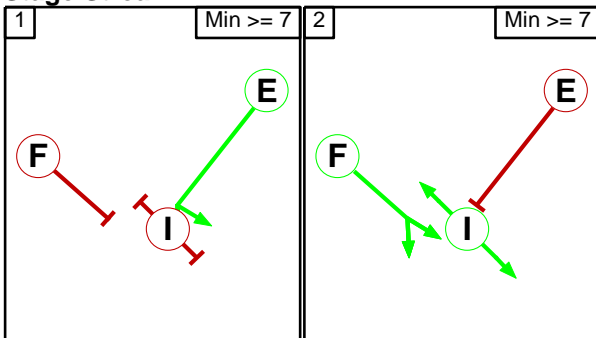
8/3	Right	U	-	-	-	93	1800	5.2%	0.0	1800	-	-	-	0.0	1.1	
13/1	Wilton site access Ahead Left	O	-	-	-	32	1925	9.7%	0.2	331	32	0	0	0.1	11.8	
13/2	Wilton site access Ahead	O	-	-	-	93	2015	31.5%	1.0	296	93	0	0	0.4	16.3	
15/1	Ahead	U	-	-	-	173	1600	10.8%	0.1	1600	-	-	-	0.1	1.3	
15/2	Right Ahead	U	-	-	-	575	1600	35.9%	0.3	1600	-	-	-	0.3	1.8	
15/3	Right	U	-	-	-	367	1600	22.9%	0.1	1600	-	-	-	0.1	1.5	
15/4	Right	U	-	-	-	329	1600	20.6%	0.1	1600	-	-	-	0.1	1.4	
						C1 Stream: 1 PRC for Signalled Lanes (%):	69.4	Total Delay for Signalled Lanes (pcuHr):			4.73	Cycle Time (s):				60
						C1 Stream: 2 PRC for Signalled Lanes (%):	21.3	Total Delay for Signalled Lanes (pcuHr):			8.51	Cycle Time (s):				60
						C1 Stream: 3 PRC for Signalled Lanes (%):	20.6	Total Delay for Signalled Lanes (pcuHr):			11.85	Cycle Time (s):				60
						PRC Over All Lanes (%):	20.6	Total Delay Over All Lanes (pcuHr):			28.12					

Basic Results Summary

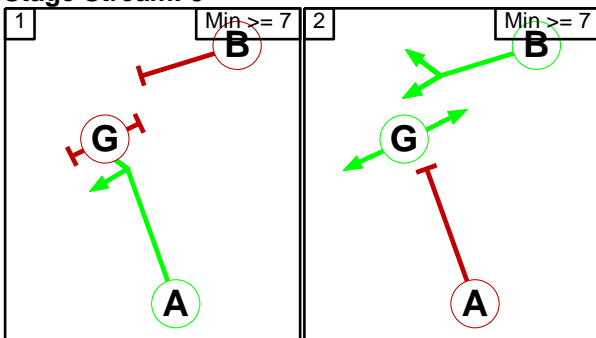
Stage Diagram
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

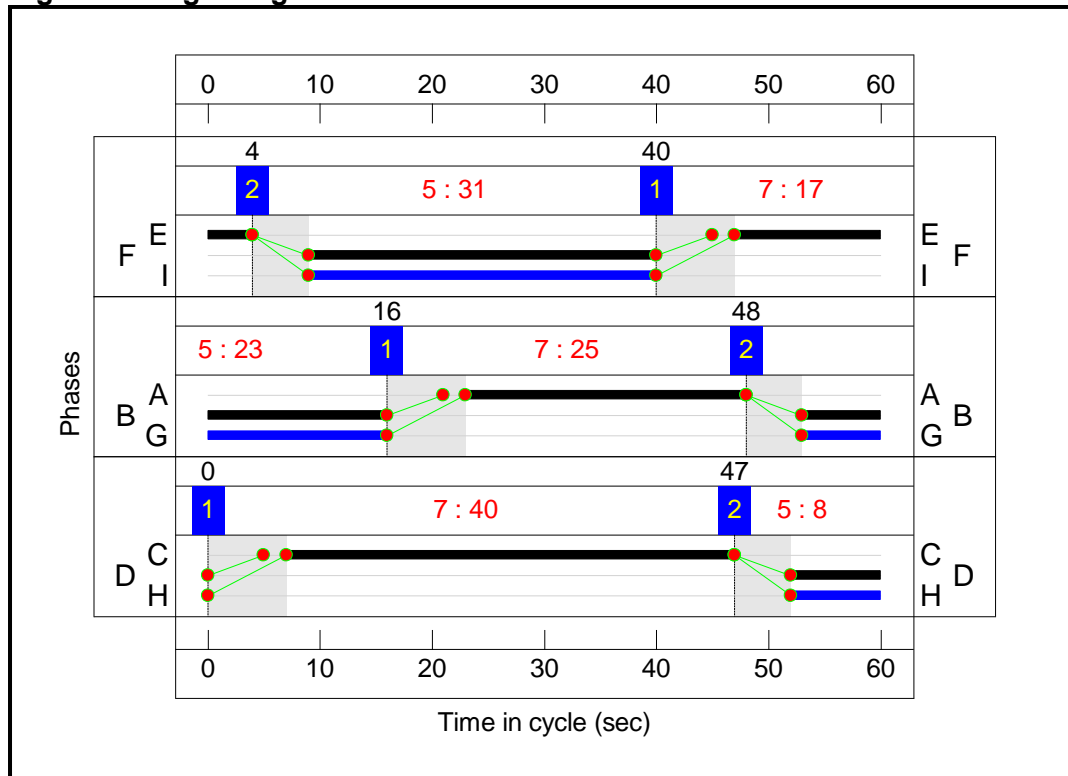


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	-
	C	-	-	-	5	-	-	-	5	-
	D	-	-	5	-	-	-	-	-	-
	E	-	-	-	-	-	5	-	-	5
	F	-	-	-	-	5	-	-	-	-
	G	7	-	-	-	-	-	-	-	-
	H	-	-	7	-	-	-	-	-	-
I	-	-	-	-	7	-	-	-	-	

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	14	52	162	422	650
	B	4	0	3	23	110	140
	C	41	19	0	87	377	524
	D	142	12	188	0	21	363
	E	775	53	970	77	0	1875
	Tot.	962	98	1213	349	930	3552

Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	81.1%	-	-	503	0	0	27.7	-
A1053 / A1085	-	-	-		-	-	-	-	81.1%	-	-	503	0	0	27.7	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	163	2000	29.9%	1.2	544	163	0	0	0.4	7.8
1/2	A1085 Trunk Road South Ahead	O	-		-	-	200	2015	25.8%	0.7	776	200	0	0	0.2	3.7
2/1	A1053 Left	U	C		40	-	775	1947	58.3%	7.4	1330	-	-	-	1.8	8.2
2/2	A1053 Ahead	U	C		40	-	1100	2000	80.5%	14.9	1367	-	-	-	4.1	13.3
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		17	-	228	1955:1600	36.8 : 36.8%	2.3	443+177	-	-	-	1.3	20.4
3/3	A1085 Trunk Road North Ahead	U	E		17	-	422	1940	72.5%	7.5	582	-	-	-	3.5	29.9
4/1	A1053 Greystone Road Ahead Left	U	A		25	-	237	1860	29.4%	2.7	806	-	-	-	0.9	14.2
4/2+4/3	A1053 Greystone Road Ahead	U	A		25	-	287	1940:1950	32.9 : 32.9%	3.1	813+58	-	-	-	1.1	14.2
5/1	Ahead	U	D		8	-	187	1800	69.3%	4.0	270	-	-	-	2.1	41.3
5/2	Right Ahead	U	D		8	-	219	1800	81.1%	5.5	270	-	-	-	3.4	56.2
6/1	Ahead Right	U	F		31	-	652	1800	67.9%	8.6	960	-	-	-	2.6	14.5
6/2	Right	U	F		31	-	667	1800	69.5%	4.3	960	-	-	-	2.1	11.6
7/1	Ahead	U	B		23	-	243	1800	33.8%	1.5	720	-	-	-	0.6	9.1
7/2	Right Ahead	U	B		23	-	387	1800	53.8%	1.7	720	-	-	-	0.8	7.5
7/3	Right	U	B		23	-	168	1700	24.7%	0.3	680	-	-	-	0.2	4.2
8/1	Ahead	U	-		-	-	518	1800	28.8%	0.2	1800	-	-	-	0.2	1.4
8/2	Right Ahead	U	-		-	-	436	1800	24.2%	0.2	1800	-	-	-	0.2	1.3

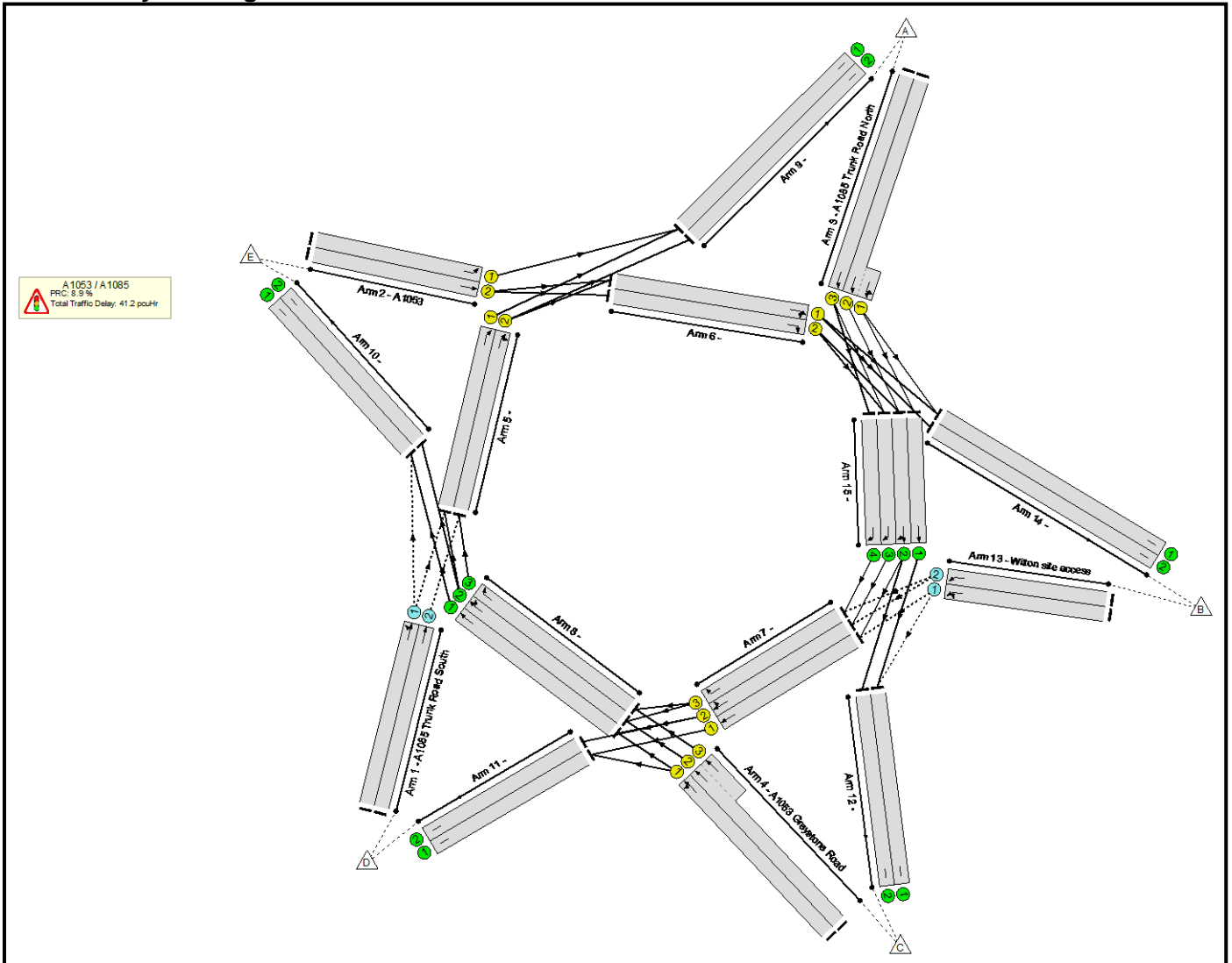
Basic Results Summary

8/3	Right	U	-	-	-	19	1800	1.1%	0.0	1800	-	-	-	0.0	1.0	
13/1	Wilton site access Ahead Left	O	-	-	-	26	1993	12.4%	0.3	210	26	0	0	0.1	19.9	
13/2	Wilton site access Ahead	O	-	-	-	114	2015	55.2%	1.7	206	114	0	0	1.0	30.8	
15/1	Ahead	U	-	-	-	619	1600	38.7%	0.3	1600	-	-	-	0.3	1.8	
15/2	Right Ahead	U	-	-	-	811	1600	50.7%	0.5	1600	-	-	-	0.5	2.3	
15/3	Right	U	-	-	-	291	1600	18.2%	0.1	1600	-	-	-	0.1	1.4	
15/4	Right	U	-	-	-	150	1600	9.4%	0.1	1600	-	-	-	0.1	1.2	
						C1 Stream: 1 PRC for Signalled Lanes (%):	11.0	Total Delay for Signalled Lanes (pcuHr):			11.41	Cycle Time (s):				60
						C1 Stream: 2 PRC for Signalled Lanes (%):	24.1	Total Delay for Signalled Lanes (pcuHr):			9.57	Cycle Time (s):				60
						C1 Stream: 3 PRC for Signalled Lanes (%):	67.4	Total Delay for Signalled Lanes (pcuHr):			3.68	Cycle Time (s):				60
						PRC Over All Lanes (%):	11.0	Total Delay Over All Lanes(pcuHr):			27.69					

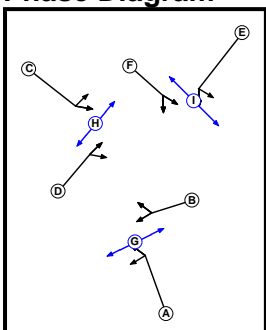
Basic Results Summary

Scenario 5: '2033 AM Base+Lackenby' (FG5: '2033 AM Base+Lackenby', Plan 1: 'Network Control Plan 1')

Network Layout Diagram



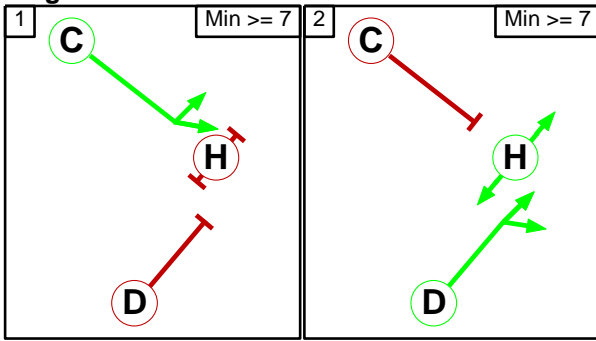
Phase Diagram



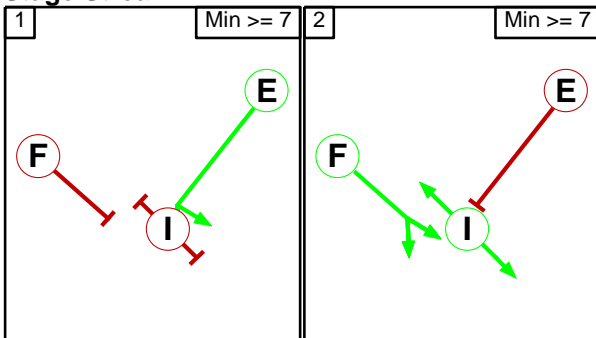
Basic Results Summary

Stage Diagram

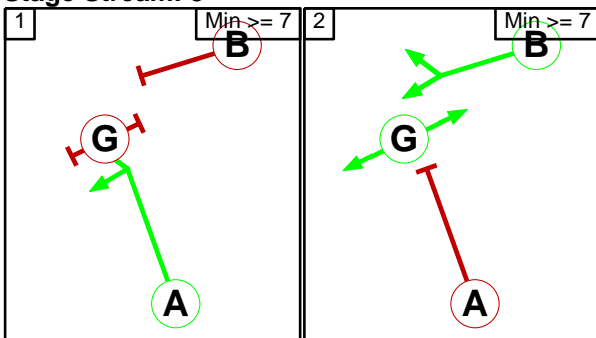
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

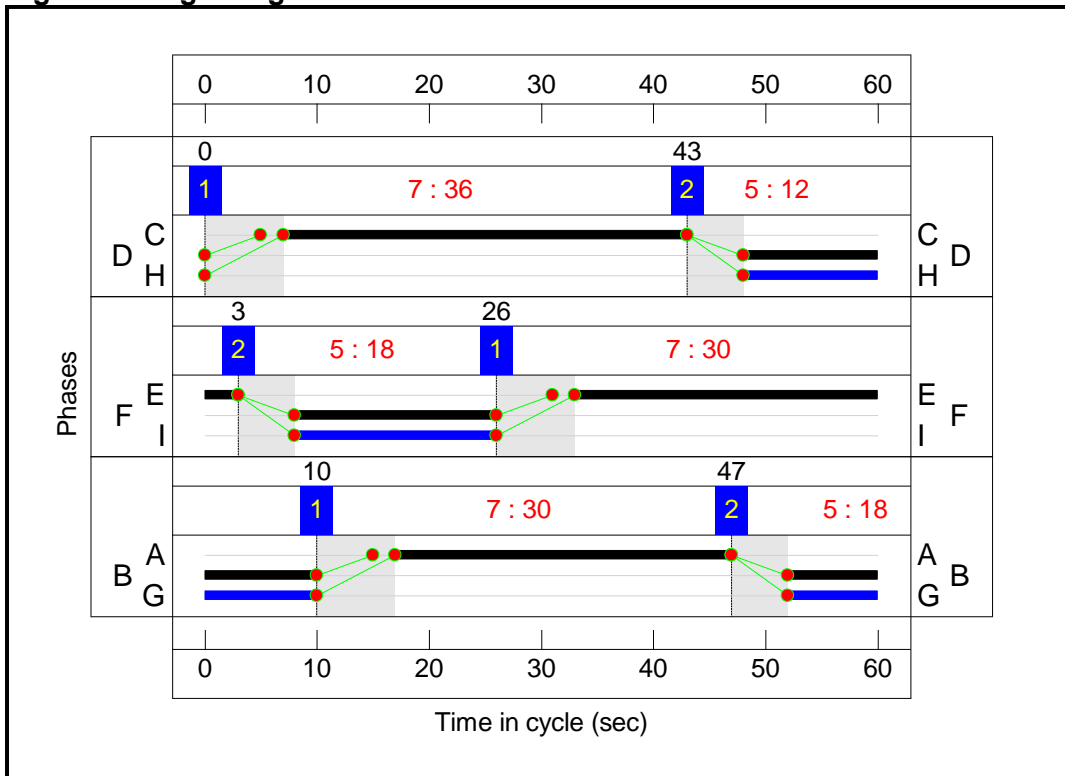


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	-
	C	-	-	-	5	-	-	-	5	-
	D	-	-	5	-	-	-	-	-	-
	E	-	-	-	-	-	5	-	-	5
	F	-	-	-	-	5	-	-	-	-
	G	7	-	-	-	-	-	-	-	-
	H	-	-	7	-	-	-	-	-	-
I	-	-	-	-	7	-	-	-	-	

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
Origin		A	B	C	D	E	Tot.
	A	0	6	34	196	820	1056
	B	1	0	16	16	92	125
	C	63	93	0	334	1125	1615
	D	112	19	84	0	26	241
	E	437	130	509	34	0	1110
	Tot.	613	248	643	580	2063	4147

Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	82.6%	-	-	366	0	0	41.2	-
A1053 / A1085	-	-	-		-	-	-	-	82.6%	-	-	366	0	0	41.2	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	115	1988	81.1%	3.7	142	115	0	0	2.5	78.0
1/2	A1085 Trunk Road South Ahead	O	-		-	-	126	2015	35.2%	1.1	358	126	0	0	0.5	13.8
2/1	A1053 Left	U	C		36	-	437	1947	36.4%	3.8	1201	-	-	-	1.0	8.0
2/2	A1053 Ahead	U	C		36	-	673	2000	54.6%	7.0	1233	-	-	-	1.8	9.9
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		30	-	236	1955:1600	23.6 : 23.6%	2.0	864+135	-	-	-	0.7	10.1
3/3	A1085 Trunk Road North Ahead	U	E		30	-	820	1940	81.8%	13.6	1002	-	-	-	5.0	21.8
4/1	A1053 Greystone Road Ahead Left	U	A		30	-	790	1857	82.3%	13.2	959	-	-	-	4.9	22.5
4/2+4/3	A1053 Greystone Road Ahead	U	A		30	-	825	1940:1950	78.6 : 78.6%	11.9	932+118	-	-	-	4.4	19.1
5/1	Ahead	U	D		12	-	153	1800	39.2%	2.4	390	-	-	-	1.1	25.2
5/2	Right Ahead	U	D		12	-	219	1800	56.2%	3.3	390	-	-	-	1.6	25.6
6/1	Ahead Right	U	F		18	-	461	1800	80.9%	8.7	570	-	-	-	3.9	30.5
6/2	Right	U	F		18	-	408	1800	71.6%	4.3	570	-	-	-	2.7	24.1
7/1	Ahead	U	B		18	-	246	1800	43.2%	3.7	570	-	-	-	1.2	17.2
7/2	Right Ahead	U	B		18	-	471	1800	82.6%	9.4	570	-	-	-	3.5	26.9
7/3	Right	U	B		18	-	442	1700	82.1%	8.9	538	-	-	-	3.4	27.3
8/1	Ahead	U	-		-	-	927	1800	51.5%	2.5	1800	-	-	-	0.5	2.1
8/2	Right Ahead	U	-		-	-	1174	1800	65.2%	8.0	1800	-	-	-	1.0	2.9

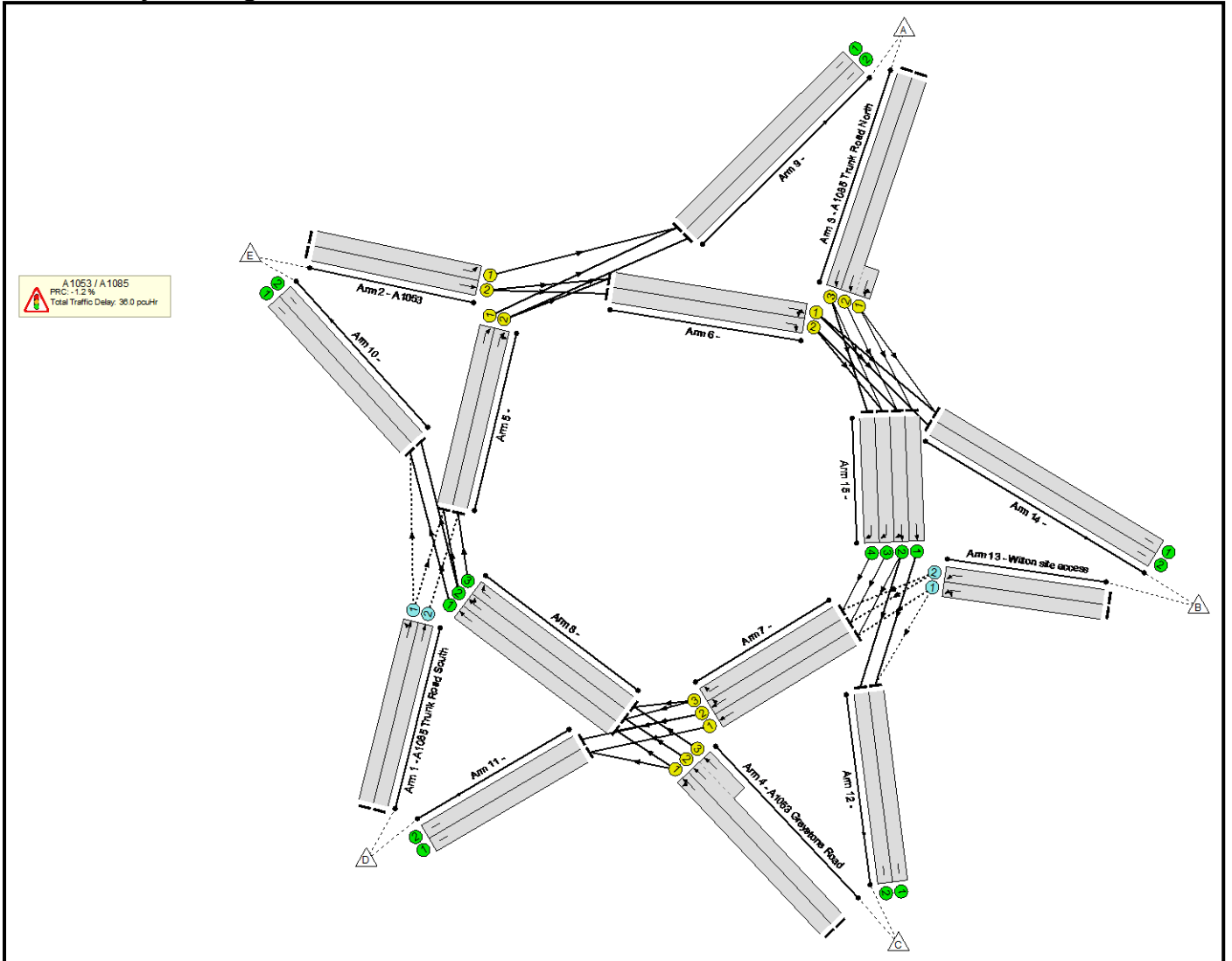
Basic Results Summary

8/3	Right	U	-	-	-	93	1800	5.2%	0.0	1800	-	-	-	0.0	1.1	
13/1	Wilton site access Ahead Left	O	-	-	-	32	1925	14.5%	0.3	221	32	0	0	0.2	18.2	
13/2	Wilton site access Ahead	O	-	-	-	93	2015	47.5%	1.3	196	93	0	0	0.7	28.2	
15/1	Ahead	U	-	-	-	245	1600	15.3%	0.1	1600	-	-	-	0.1	1.3	
15/2	Right Ahead	U	-	-	-	612	1600	38.3%	0.8	1600	-	-	-	0.3	1.8	
15/3	Right	U	-	-	-	423	1600	26.4%	0.2	1600	-	-	-	0.2	1.5	
15/4	Right	U	-	-	-	397	1600	24.8%	0.2	1600	-	-	-	0.2	1.5	
						C1 Stream: 1 PRC for Signalled Lanes (%):	60.3	Total Delay for Signalled Lanes (pcuHr):			5.45	Cycle Time (s):				60
						C1 Stream: 2 PRC for Signalled Lanes (%):	10.0	Total Delay for Signalled Lanes (pcuHr):			12.27	Cycle Time (s):				60
						C1 Stream: 3 PRC for Signalled Lanes (%):	8.9	Total Delay for Signalled Lanes (pcuHr):			17.36	Cycle Time (s):				60
						PRC Over All Lanes (%):	8.9	Total Delay Over All Lanes(pcuHr):			41.21					

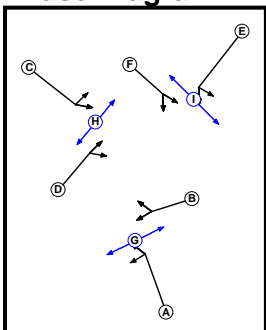
Basic Results Summary

Scenario 6: '2033 PM Base+lackenby' (FG6: '2033 PM Base+Lackenby', Plan 1: 'Network Control Plan 1')

Network Layout Diagram

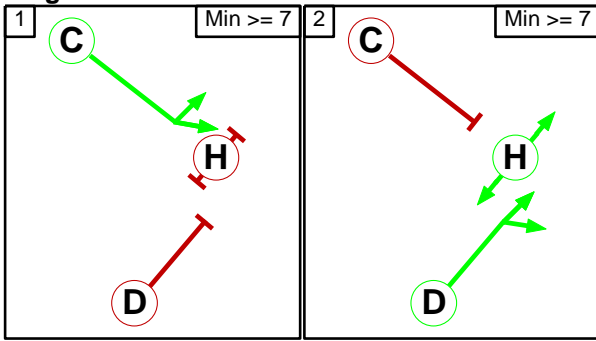


Phase Diagram

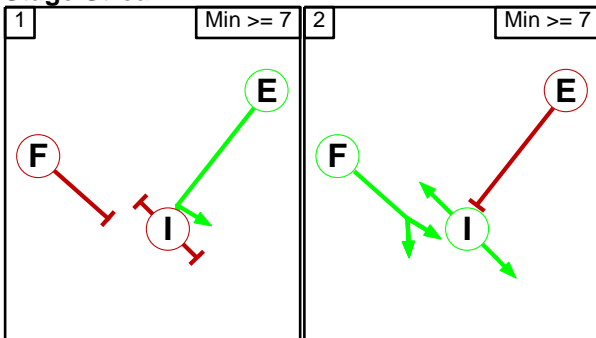


Basic Results Summary

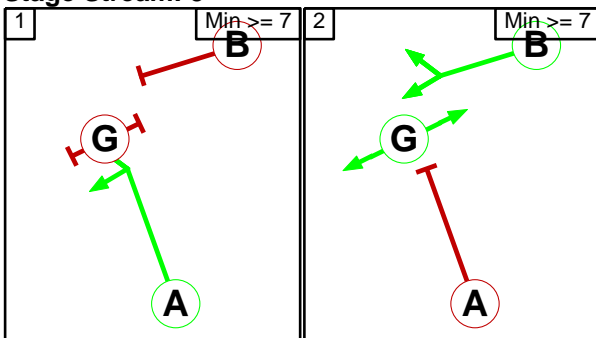
Stage Diagram
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

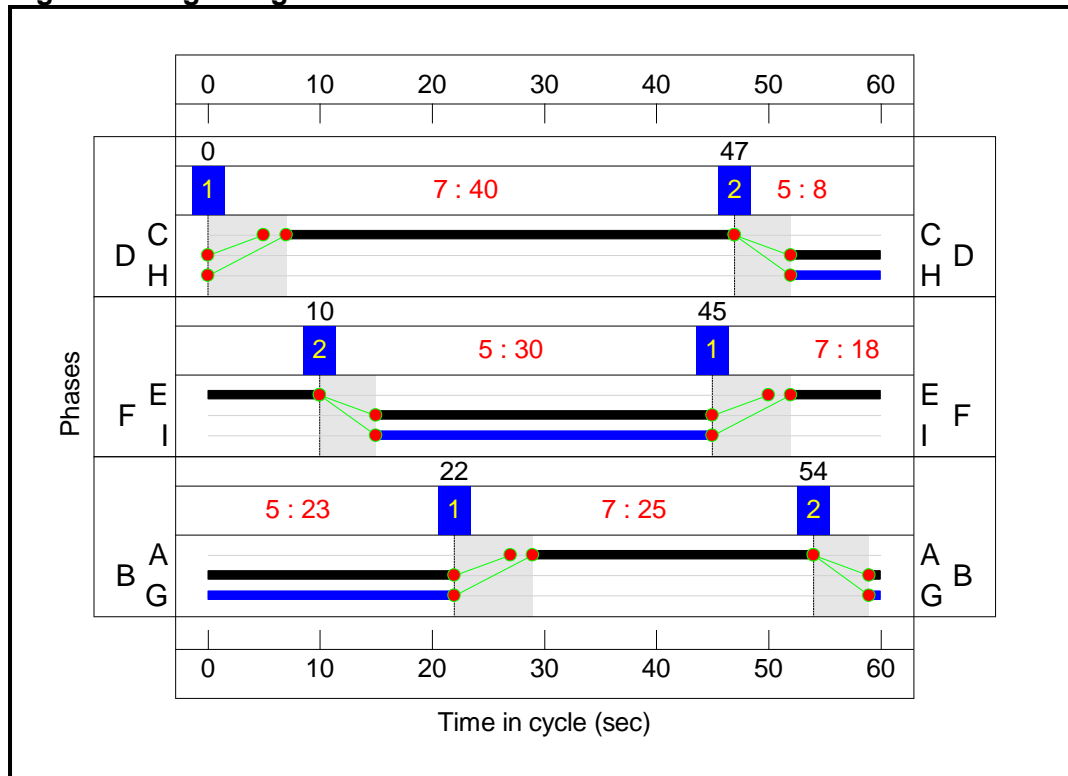


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	
	C	-	-	-	5	-	-	-	5	
	D	-	-	5	-	-	-	-	-	
	E	-	-	-	-	-	5	-	5	
	F	-	-	-	-	5	-	-	-	
	G	7	-	-	-	-	-	-	-	
	H	-	-	7	-	-	-	-	-	
I	-	-	-	-	7	-	-	-		

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
Origin		A	B	C	D	E	Tot.
	A	0	14	52	162	492	720
	B	4	0	3	23	110	140
	C	41	19	0	87	440	587
	D	142	12	188	0	24	366
	E	880	53	1104	88	0	2125
	Tot.	1067	98	1347	360	1066	3938

Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	91.1%	-	-	506	0	0	36.0	-
A1053 / A1085	-	-	-		-	-	-	-	91.1%	-	-	506	0	0	36.0	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	166	1998	35.5%	1.4	467	166	0	0	0.5	10.9
1/2	A1085 Trunk Road South Ahead	O	-		-	-	200	2015	26.2%	0.5	765	200	0	0	0.2	3.4
2/1	A1053 Left	U	C		40	-	880	1947	66.1%	9.3	1330	-	-	-	2.3	9.5
2/2	A1053 Ahead	U	C		40	-	1245	2000	91.1%	22.0	1367	-	-	-	7.5	21.7
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		18	-	228	1955:1600	35.8 : 35.8%	2.5	491+145	-	-	-	1.2	19.6
3/3	A1085 Trunk Road North Ahead	U	E		18	-	492	1940	80.1%	9.3	614	-	-	-	4.5	33.0
4/1	A1053 Greystone Road Ahead Left	U	A		25	-	281	1863	34.8%	3.4	807	-	-	-	1.2	14.8
4/2+4/3	A1053 Greystone Road Ahead	U	A		25	-	306	1940:1950	35.2 : 35.2%	3.4	816+54	-	-	-	1.2	14.4
5/1	Ahead	U	D		8	-	187	1800	69.3%	4.0	270	-	-	-	2.0	39.4
5/2	Right Ahead	U	D		8	-	219	1800	81.1%	5.5	270	-	-	-	3.4	56.4
6/1	Ahead Right	U	F		30	-	755	1800	81.2%	12.2	930	-	-	-	4.3	20.7
6/2	Right	U	F		30	-	709	1800	76.2%	7.2	930	-	-	-	2.5	12.9
7/1	Ahead	U	B		23	-	273	1800	37.9%	2.3	720	-	-	-	0.9	11.2
7/2	Right Ahead	U	B		23	-	312	1800	43.3%	0.7	720	-	-	-	0.5	5.6
7/3	Right	U	B		23	-	294	1700	43.2%	0.7	680	-	-	-	0.5	5.9
8/1	Ahead	U	-		-	-	506	1800	28.1%	0.2	1800	-	-	-	0.2	1.4
8/2	Right Ahead	U	-		-	-	581	1800	32.3%	0.2	1800	-	-	-	0.2	1.5

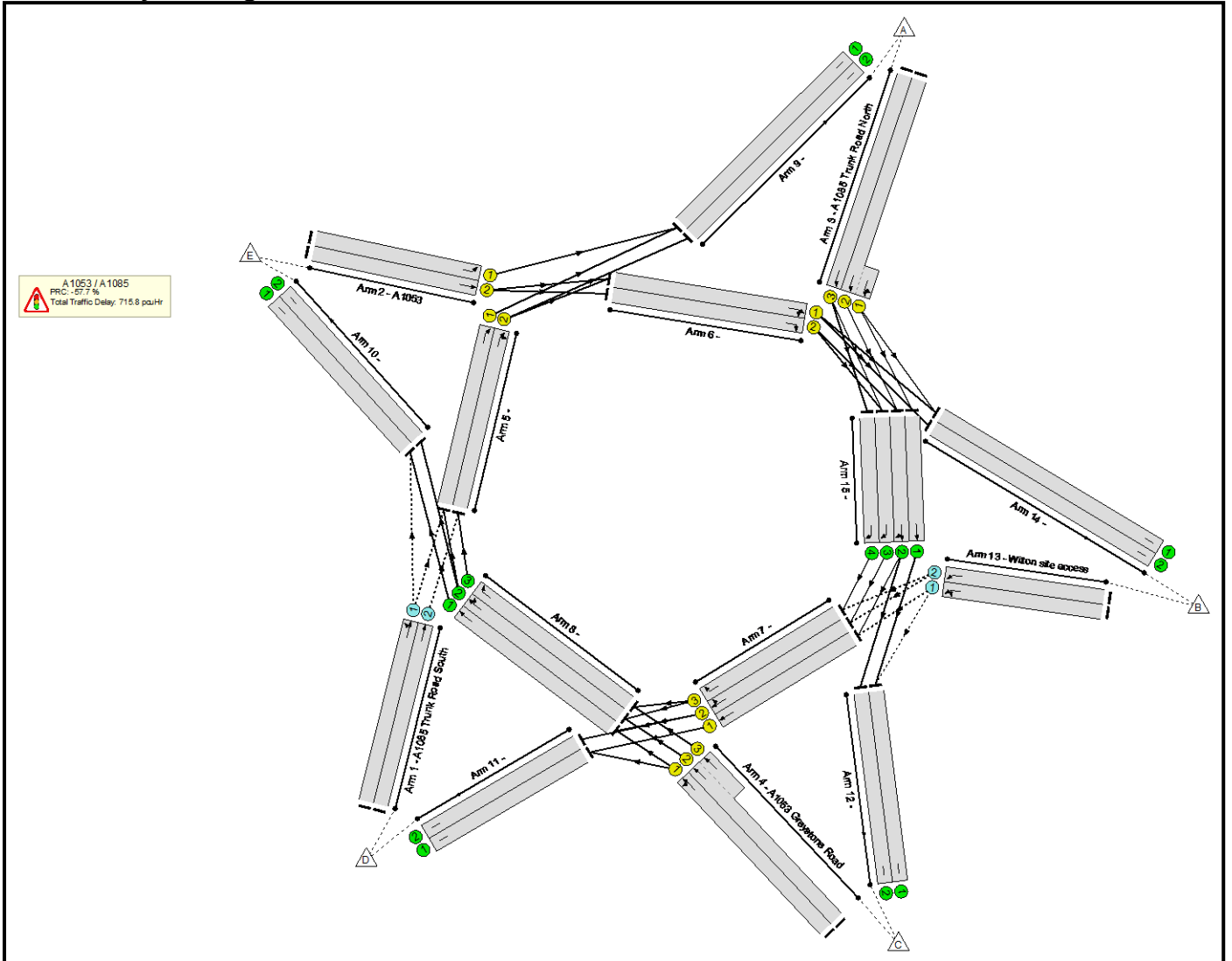
Basic Results Summary

8/3	Right	U	-	-	-	19	1800	1.1%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-	-	-	26	1993	14.8%	0.3	176	26	0	0	0.2	22.5
13/2	Wilton site access Ahead	O	-	-	-	114	2015	66.0%	2.1	173	114	0	0	1.3	41.9
15/1	Ahead	U	-	-	-	709	1600	44.3%	3.1	1600	-	-	-	0.4	2.0
15/2	Right Ahead	U	-	-	-	885	1600	55.3%	5.5	1600	-	-	-	0.6	2.6
15/3	Right	U	-	-	-	255	1600	15.9%	0.1	1600	-	-	-	0.1	1.3
15/4	Right	U	-	-	-	237	1600	14.8%	0.1	1600	-	-	-	0.1	1.3
						C1 Stream: 1 PRC for Signalled Lanes (%):	-1.2	Total Delay for Signalled Lanes (pcuHr):			15.29	Cycle Time (s): 60			
						C1 Stream: 2 PRC for Signalled Lanes (%):	10.9	Total Delay for Signalled Lanes (pcuHr):			12.63	Cycle Time (s): 60			
						C1 Stream: 3 PRC for Signalled Lanes (%):	107.7	Total Delay for Signalled Lanes (pcuHr):			4.20	Cycle Time (s): 60			
						PRC Over All Lanes (%):	-1.2	Total Delay Over All Lanes(pcuHr):			35.96				

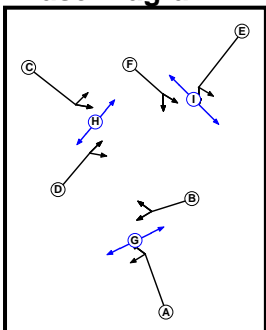
Basic Results Summary

Scenario 7: '2033 AM Cumulative' (FG7: '2033 AM Cumulative', Plan 1: 'Network Control Plan 1')

Network Layout Diagram

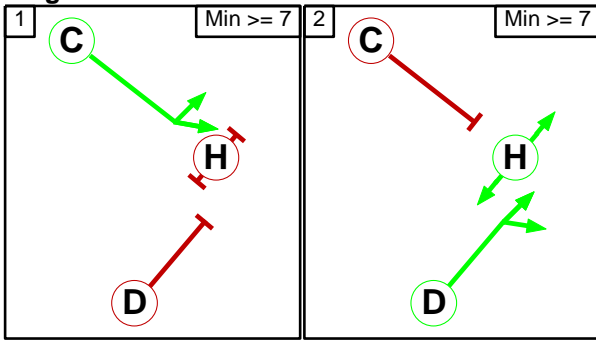


Phase Diagram

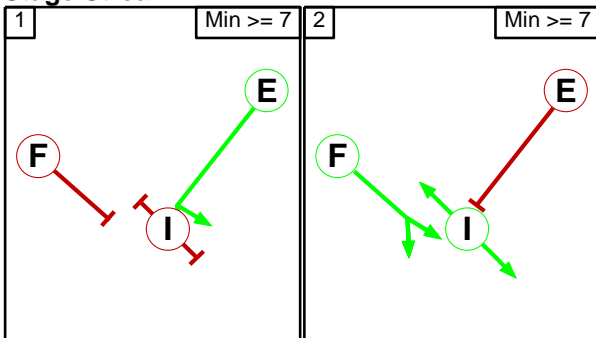


Basic Results Summary

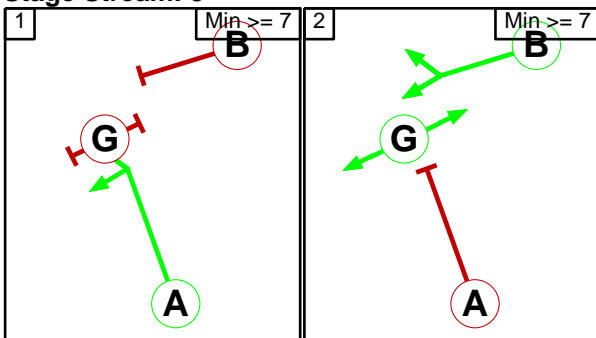
Stage Diagram
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

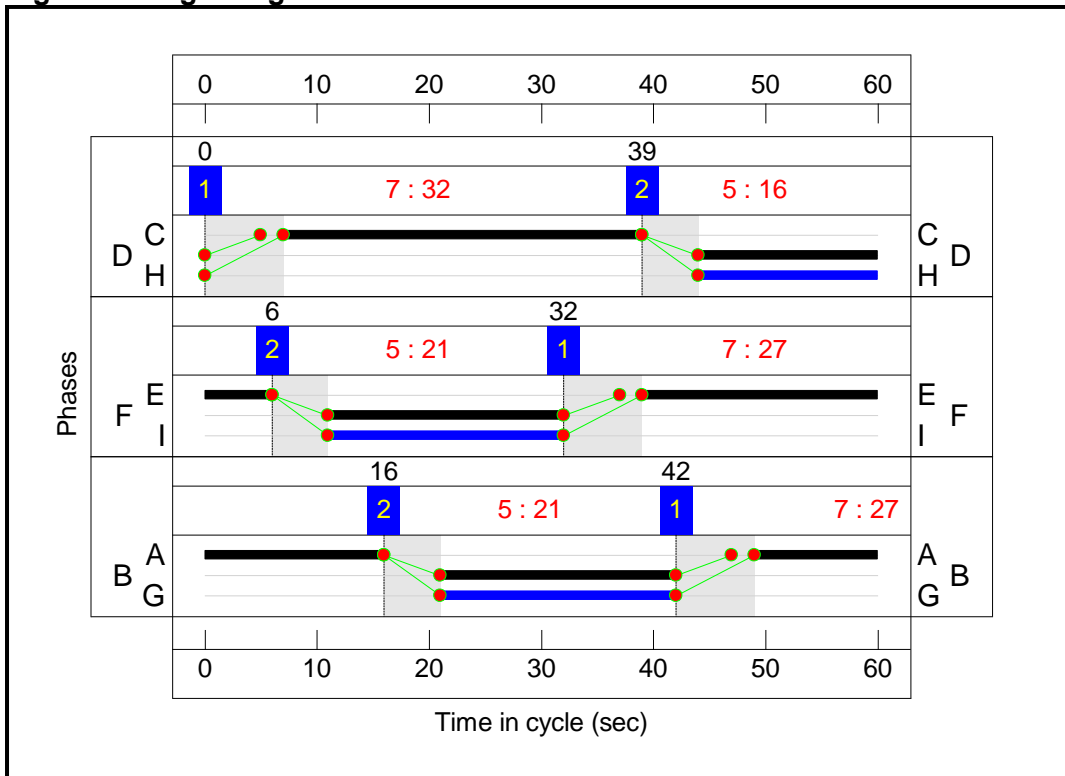


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	-
	C	-	-	-	5	-	-	-	5	-
	D	-	-	5	-	-	-	-	-	-
	E	-	-	-	-	-	5	-	-	5
	F	-	-	-	-	5	-	-	-	-
	G	7	-	-	-	-	-	-	-	-
	H	-	-	7	-	-	-	-	-	-
I	-	-	-	-	7	-	-	-	-	

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
		A	B	C	D	E	Tot.
Origin	A	0	6	208	260	1256	1730
	B	1	0	16	16	111	144
	C	632	93	0	334	1536	2595
	D	322	19	84	0	37	462
	E	1016	138	642	45	0	1841
	Tot.	1971	256	950	655	2940	6772

Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	141.9%	-	-	497	0	0	715.8	-
A1053 / A1085	-	-	-		-	-	-	-	141.9%	-	-	497	0	0	715.8	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	92	1968	59.0%	2.1	156	92	0	0	1.3	51.2
1/2	A1085 Trunk Road South Ahead	O	-		-	-	370	2015	141.9%	74.8	261	261	0	0	62.4	607.3
2/1	A1053 Left	U	C		32	-	1016	1947	94.9%	23.1	1071	-	-	-	10.9	38.6
2/2	A1053 Ahead	U	C		32	-	825	2000	75.0%	11.8	1100	-	-	-	3.9	16.8
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		27	-	474	1955:1600	49.0 : 49.0%	3.3	557+410	-	-	-	1.8	13.5
3/3	A1085 Trunk Road North Ahead	U	E		27	-	1256	1940	138.7%	206.6	905	-	-	-	194.9	558.7
4/1	A1053 Greystone Road Ahead Left	U	A		27	-	1235	1865	141.9%	210.7	870	-	-	-	201.2	586.5
4/2+4/3	A1053 Greystone Road Ahead	U	A		27	-	1360	1940:1950	136.3 : 136.3%	211.8	782+216	-	-	-	200.3	530.3
5/1	Ahead	U	D		16	-	486	1800	72.8%	6.9	510	-	-	-	4.2	40.5
5/2	Right Ahead	U	D		16	-	665	1800	93.6%	11.0	510	-	-	-	8.4	63.0
6/1	Ahead Right	U	F		21	-	584	1800	80.1%	8.6	660	-	-	-	3.6	24.8
6/2	Right	U	F		21	-	437	1800	66.2%	3.5	660	-	-	-	2.0	16.2
7/1	Ahead	U	B		21	-	321	1800	48.6%	5.4	660	-	-	-	2.6	28.6
7/2	Right Ahead	U	B		21	-	705	1800	79.4%	10.6	660	-	-	-	5.8	39.7
7/3	Right	U	B		21	-	663	1700	79.1%	10.1	623	-	-	-	5.5	40.3
8/1	Ahead	U	-		-	-	1606	1800	64.4%	6.9	1800	-	-	-	0.9	2.8
8/2	Right Ahead	U	-		-	-	1728	1800	70.8%	5.3	1800	-	-	-	1.2	3.4

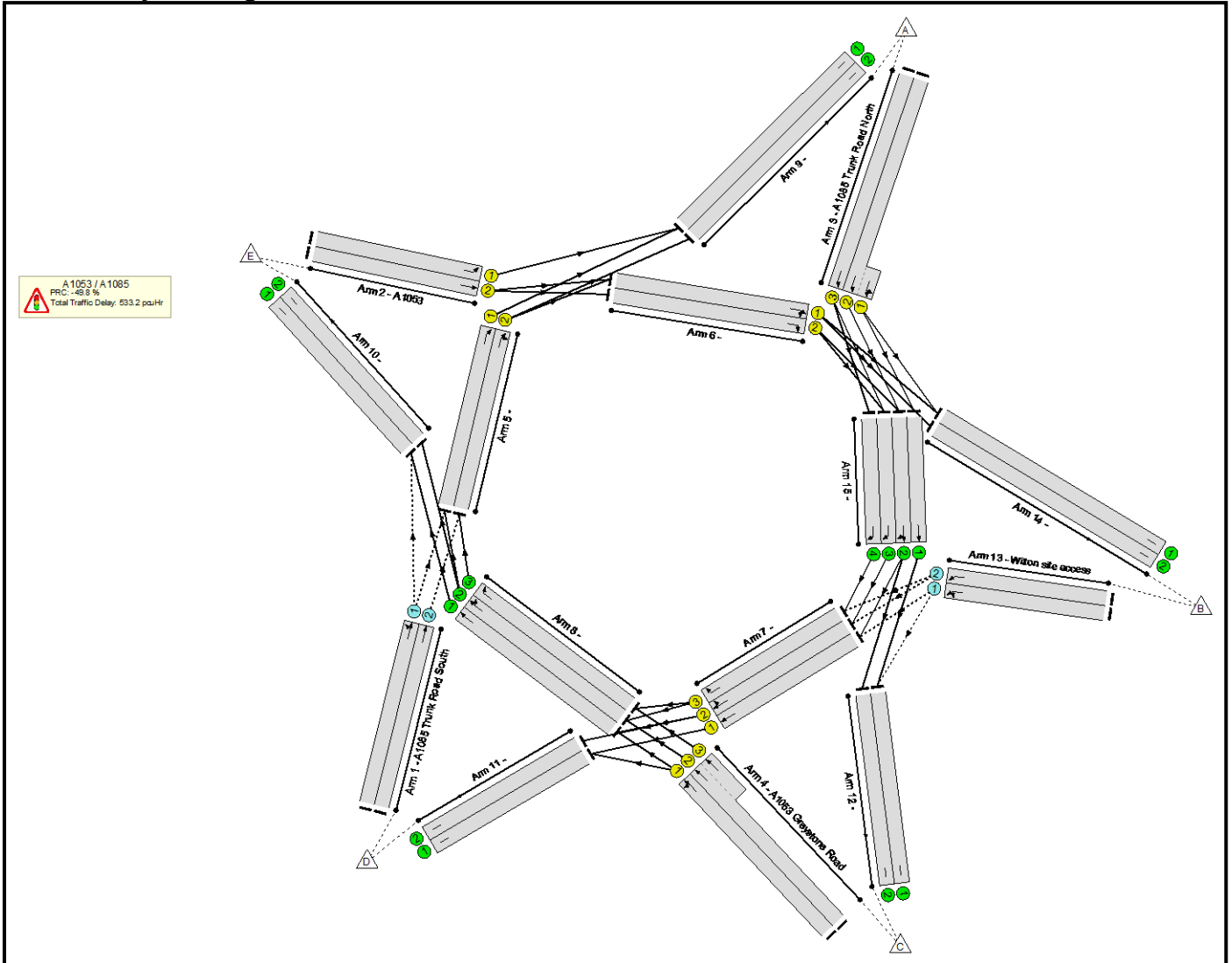
Basic Results Summary

8/3	Right	U	-	-	-	295	1800	12.0%	0.1	1800	-	-	-	0.1	1.1
13/1	Wilton site access Ahead Left	O	-	-	-	32	1925	23.8%	0.4	134	32	0	0	0.3	29.1
13/2	Wilton site access Ahead	O	-	-	-	112	2015	89.8%	4.8	125	112	0	0	3.6	116.8
15/1	Ahead	U	-	-	-	529	1600	31.5%	0.2	1600	-	-	-	0.2	1.6
15/2	Right Ahead	U	-	-	-	710	1600	44.4%	0.9	1600	-	-	-	0.4	2.0
15/3	Right	U	-	-	-	648	1600	29.2%	0.2	1600	-	-	-	0.2	1.6
15/4	Right	U	-	-	-	608	1600	27.4%	0.2	1600	-	-	-	0.2	1.5
C1 Stream: 1 PRC for Signalled Lanes (%):						-5.4	Total Delay for Signalled Lanes (pcuHr):			27.28	Cycle Time (s): 60				
C1 Stream: 2 PRC for Signalled Lanes (%):						-54.1	Total Delay for Signalled Lanes (pcuHr):			202.31	Cycle Time (s): 60				
C1 Stream: 3 PRC for Signalled Lanes (%):						-57.7	Total Delay for Signalled Lanes (pcuHr):			415.39	Cycle Time (s): 60				
PRC Over All Lanes (%):						-57.7	Total Delay Over All Lanes(pcuHr):			715.81					

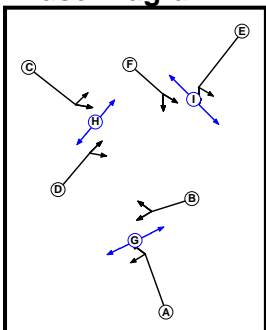
Basic Results Summary

Scenario 8: '2033 PM Cumulative' (FG8: '2033 PM Cumulative', Plan 1: 'Network Control Plan 1')

Network Layout Diagram

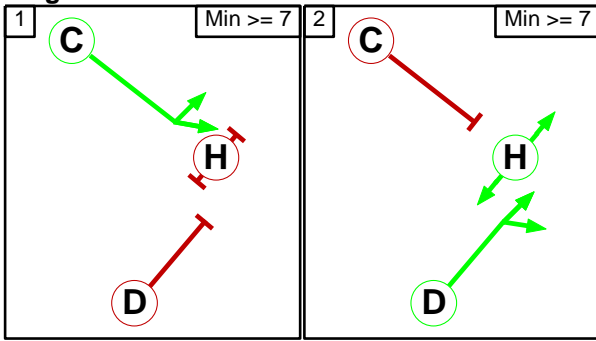


Phase Diagram

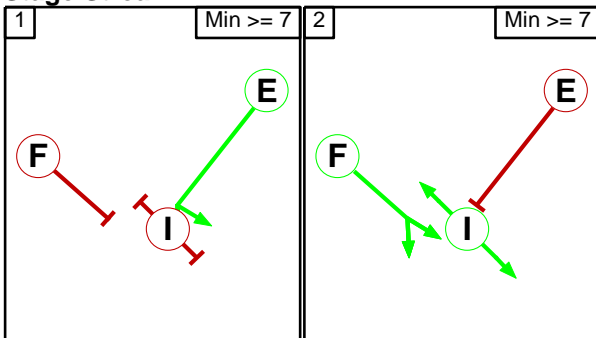


Basic Results Summary

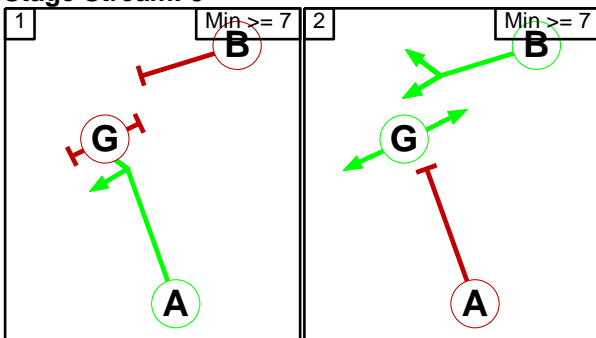
Stage Diagram
Stage Stream: 1



Stage Stream: 2



Stage Stream: 3

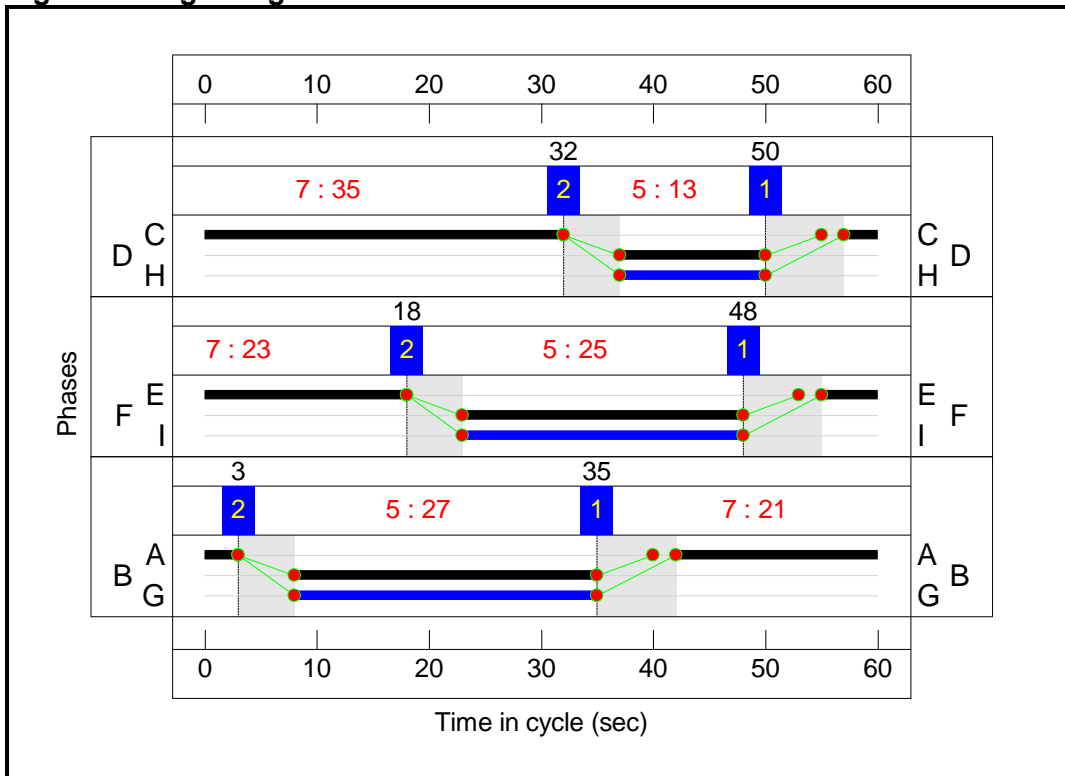


Basic Results Summary

Phase Intergreens Matrix

Terminating Phase	Starting Phase									
		A	B	C	D	E	F	G	H	I
	A	-	5	-	-	-	-	5	-	-
	B	5	-	-	-	-	-	-	-	-
	C	-	-	-	5	-	-	-	5	-
	D	-	-	5	-	-	-	-	-	-
	E	-	-	-	-	-	5	-	-	5
	F	-	-	-	-	5	-	-	-	-
	G	7	-	-	-	-	-	-	-	-
	H	-	-	7	-	-	-	-	-	-
I	-	-	-	-	7	-	-	-	-	

Signal Timings Diagram



Basic Results Summary

Traffic Flows, Actual

Actual Flow :

		Destination					
Origin		A	B	C	D	E	Tot.
	A	0	14	583	358	1046	2001
	B	4	0	3	23	123	153
	C	190	19	0	87	553	849
	D	197	12	188	0	29	426
	E	1248	61	1421	117	0	2847
	Tot.	1639	106	2195	585	1751	6276

Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network	-	-	-		-	-	-	-	134.8%	-	-	550	0	0	533.2	-
A1053 / A1085	-	-	-		-	-	-	-	134.8%	-	-	550	0	0	533.2	-
1/1	A1085 Trunk Road South Ahead Left	O	-		-	-	193	1997	60.4%	2.3	320	193	0	0	1.2	22.1
1/2	A1085 Trunk Road South Ahead	O	-		-	-	233	2015	43.5%	1.9	535	233	0	0	0.7	10.5
2/1	A1053 Left	U	C		35	-	1248	1947	106.8%	68.7	1168	-	-	-	53.1	153.0
2/2	A1053 Ahead	U	C		35	-	1599	2000	133.3%	234.8	1200	-	-	-	218.3	491.4
3/2+3/1	A1085 Trunk Road North Left Ahead	U	E		23	-	955	1955:1600	109.5 : 109.5%	61.8	450+422	-	-	-	53.4	201.3
3/3	A1085 Trunk Road North Ahead	U	E		23	-	1046	1940	134.8%	158.8	776	-	-	-	150.5	518.0
4/1	A1053 Greystone Road Ahead Left	U	A		21	-	392	1868	57.2%	5.9	685	-	-	-	2.3	21.3
4/2+4/3	A1053 Greystone Road Ahead	U	A		21	-	457	1940:1950	59.0 : 59.0%	5.8	656+119	-	-	-	2.6	20.3
5/1	Ahead	U	D		13	-	306	1800	72.7%	5.9	420	-	-	-	3.5	41.5
5/2	Right Ahead	U	D		13	-	304	1800	72.3%	5.8	420	-	-	-	3.2	38.4
6/1	Ahead Right	U	F		25	-	954	1800	98.8%	23.9	780	-	-	-	15.0	70.2
6/2	Right	U	F		25	-	864	1800	83.1%	13.2	780	-	-	-	4.6	25.3
7/1	Ahead	U	B		27	-	498	1800	52.1%	4.8	840	-	-	-	1.2	10.2
7/2	Right Ahead	U	B		27	-	598	1800	53.0%	3.2	840	-	-	-	0.7	5.7
7/3	Right	U	B		27	-	575	1700	54.0%	3.6	793	-	-	-	0.8	6.4
8/1	Ahead	U	-		-	-	903	1800	41.7%	0.4	1800	-	-	-	0.4	1.7
8/2	Right Ahead	U	-		-	-	961	1800	45.3%	2.9	1800	-	-	-	0.4	1.8

Basic Results Summary

8/3	Right	U	-	-	-	71	1800	3.9%	0.0	1800	-	-	-	0.0	1.0
13/1	Wilton site access Ahead Left	O	-	-	-	26	1993	26.4%	0.4	98	26	0	0	0.3	37.1
13/2	Wilton site access Ahead	O	-	-	-	127	2015	130.2%	22.8	98	98	0	0	18.5	523.1
15/1	Ahead	U	-	-	-	1310	1600	68.9%	9.1	1600	-	-	-	1.1	3.7
15/2	Right Ahead	U	-	-	-	1357	1600	68.7%	10.0	1600	-	-	-	1.2	4.0
15/3	Right	U	-	-	-	544	1600	25.2%	0.2	1600	-	-	-	0.2	1.5
15/4	Right	U	-	-	-	502	1600	23.3%	0.2	1600	-	-	-	0.2	1.5
C1 Stream: 1 PRC for Signalled Lanes (%):						-48.1	Total Delay for Signalled Lanes (pcuHr):			278.09	Cycle Time (s):			60	
C1 Stream: 2 PRC for Signalled Lanes (%):						-49.8	Total Delay for Signalled Lanes (pcuHr):			223.50	Cycle Time (s):			60	
C1 Stream: 3 PRC for Signalled Lanes (%):						52.6	Total Delay for Signalled Lanes (pcuHr):			7.61	Cycle Time (s):			60	
PRC Over All Lanes (%):						-49.8	Total Delay Over All Lanes(pcuHr):			533.25					

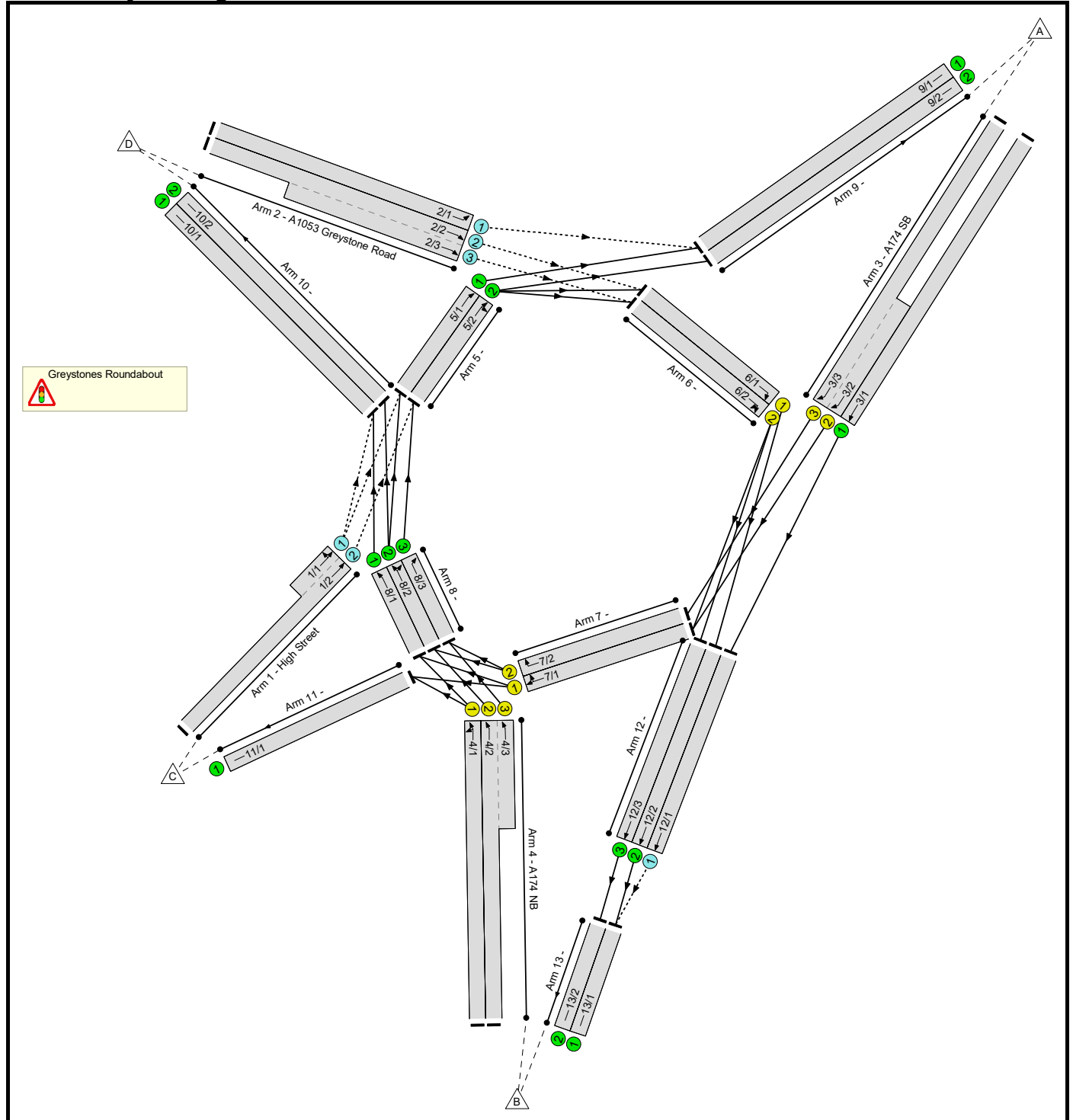
Full Input Data And Results

Full Input Data And Results

User and Project Details

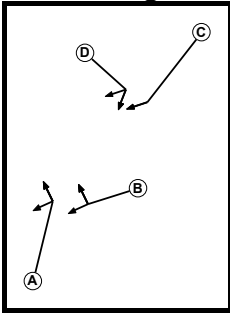
Project:	Greystones Roundabout
Title:	Existing Layout
Location:	

Network Layout Diagram



Full Input Data And Results

Phase Diagram



Phase Input Data

Phase Name	Phase Type	Stage Stream	Assoc. Phase	Street Min	Cont Min
A	Traffic	2		7	7
B	Traffic	2		7	7
C	Traffic	1		7	7
D	Traffic	1		7	7

Phase Intergreens Matrix

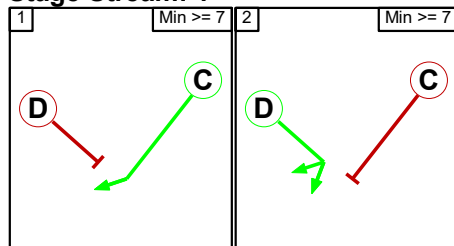
		Starting Phase			
		A	B	C	D
Terminating Phase	A	-	5	-	-
	B	5	-	-	-
	C	-	-	-	5
	D	-	-	5	-

Phases in Stage

Stream	Stage No.	Phases in Stage
1	1	C
1	2	D
2	1	A
2	2	B

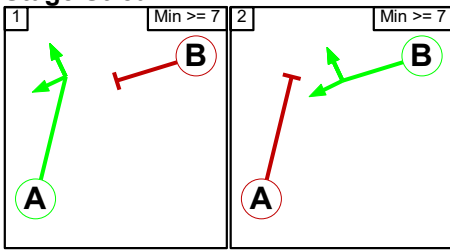
Stage Diagram

Stage Stream: 1



Full Input Data And Results

Stage Stream: 2



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					

Prohibited Stage Change

Stage Stream: 1

		To Stage	
		1	2
From Stage	1		5
	2	5	

Stage Stream: 2

		To Stage	
		1	2
From Stage	1		5
	2	5	

Full Input Data And Results

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
7: '2033 AM Base'	08:00	09:00	01:00	

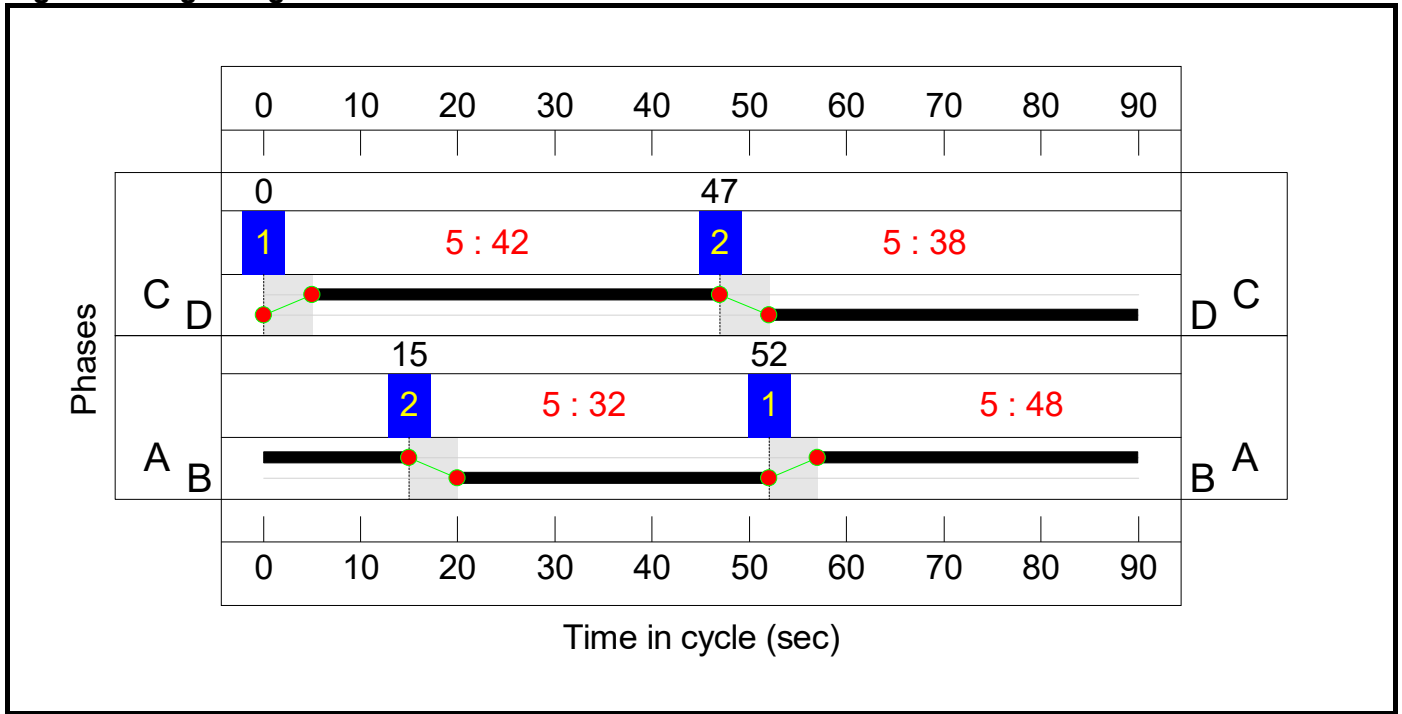
Scenario 7: '2033 AM Base' (FG7: '2033 AM Base', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	1309	122	923	2354
	B	1106	0	138	529	1773
	C	94	180	0	23	297
	D	262	270	6	0	538
	Tot.	1462	1759	266	1475	4962

Signal Timings Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	94.5%	-	-	2717	0	0	40.2	-
1/2+1/1	High Street Ahead Left	O	-		-	-	297	2015:1956	74.8 : 74.8%	4.8	366+31	594	0	0	2.2	27.2
2/1	A1053 Greystone Road Left	O	-		-	-	262	1975	53.6%	5.3	489	262	0	0	1.9	26.3
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	276	1961:1902	46.4 : 46.4%	4.4	106+489	552	0	0	1.7	22.4
3/1	A174 SB Ahead	U	-		-	-	1309	1980	66.1%	1.0	1980	-	-	-	1.0	2.7
3/3+3/2	A174 SB Ahead	U	C		46	-	1045	1985:1985	70.8 : 70.8%	10.1	711+766	-	-	-	5.3	18.1
4/1	A174 NB Ahead Left	U	A		48	-	667	1876	65.3%	12.6	1021	-	-	-	3.6	19.5
4/2+4/3	A174 NB Ahead	U	A		48	-	1106	1903:1923	81.0 : 81.0%	12.7	750+615	-	-	-	6.2	20.1
5/1	Ahead	U	-		-	-	608	1800	33.8%	0.3	1800	-	-	-	0.3	1.5
5/2	Right Ahead	U	-		-	-	772	1800	42.9%	0.4	1800	-	-	-	0.4	1.7
6/1	Right	U	D		34	-	49	1800	7.0%	1.0	700	-	-	-	0.2	16.4
6/2	Right Right2	U	D		34	-	407	1800	58.1%	9.8	700	-	-	-	2.6	22.8
7/1	Right Ahead	U	B		32	-	548	2015	74.2%	13.4	739	-	-	-	3.2	20.8
7/2	Right	U	B		32	-	503	2015	68.1%	11.7	739	-	-	-	2.5	18.2
8/1	Ahead	U	-		-	-	949	1800	52.7%	0.6	1800	-	-	-	0.6	2.1
8/2	Right Ahead	U	-		-	-	1111	1800	61.7%	10.0	1800	-	-	-	0.9	2.9
8/3	Right	U	-		-	-	498	1800	27.7%	5.9	1800	-	-	-	0.2	1.5
12/1	Ahead	O	-		-	-	1309	1940	94.5%	20.3	1386	1309	0	0	7.4	20.3
12/2	Ahead	U	-		-	-	49	1940	2.5%	0.0	1940	-	-	-	0.0	1.0
12/3	Ahead	U	-		-	-	401	1940	20.7%	0.1	1940	-	-	-	0.1	1.2

Basic Results Summary

C1	Stream: 1 PRC for Signalled Lanes (%)	27.2	Total Delay for Signalled Lanes (pcuHr)	8.06	Cycle Time (s)	90
C1	Stream: 2 PRC for Signalled Lanes (%)	11.1	Total Delay for Signalled Lanes (pcuHr)	15.50	Cycle Time (s)	90
	PRC Over All Lanes (%)	-5.0	Total Delay Over All Lanes(pcuHr)	40.24		

Full Input Data And Results

Traffic Flow Groups

Flow Group	Start Time	End Time	Duration	Formula
8: '2033 PM Base'	17:00	18:00	01:00	

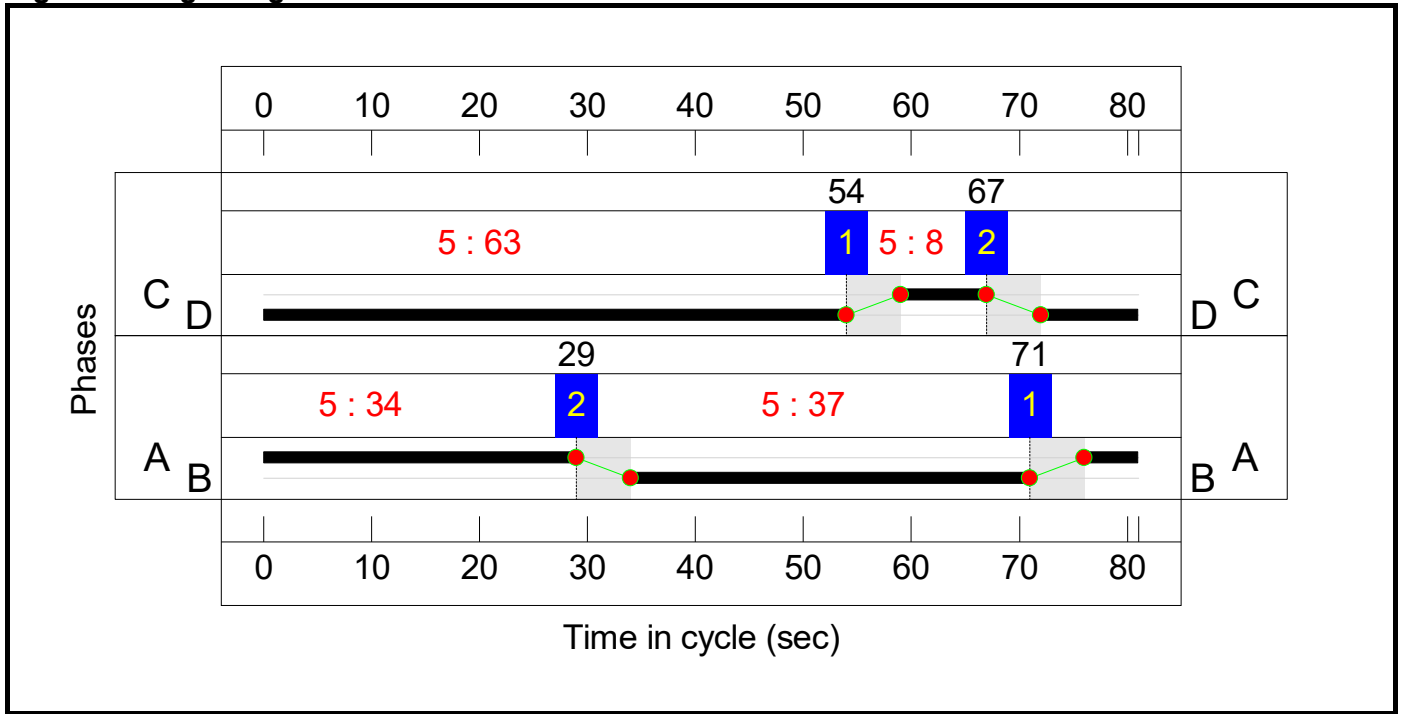
Scenario 8: '2033 PM Base' (FG8: '2033 PM Base', Plan 1: 'Network Control Plan 1')

Traffic Flows, Desired

Desired Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	1278	132	256	1666
	B	1239	0	335	245	1819
	C	147	129	0	29	305
	D	759	439	14	0	1212
	Tot.	2145	1846	481	530	5002

Signal Timings Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	125.3%	-	-	3400	0	0	255.7	-
1/2+1/1	High Street Ahead Left	O	-		-	-	305	2015:1956	32.6 : 32.6%	2.8	848+89	610	0	0	0.5	5.9
2/1	A1053 Greystone Road Left	O	-		-	-	759	1975	125.3%	106.0	606	606	0	0	91.7	134.9
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	453	1961:1902	64.4 : 64.4%	7.7	98+606	906	0	0	2.7	21.1
3/1	A174 SB Ahead	U	-		-	-	1278	1980	64.5%	0.9	1980	-	-	-	0.9	2.6
3/3+3/2	A174 SB Ahead	U	C		32	-	388	1985:1985	33.1 : 33.1%	3.7	569+605	-	-	-	2.4	22.3
4/1	A174 NB Ahead Left	U	A		35	-	580	1860	78.0%	14.3	744	-	-	-	5.5	34.3
4/2+4/3	A174 NB Ahead	U	A		35	-	1239	1903:1923	103.9 : 103.9%	75.9	626+375	-	-	-	142.0	112.7
5/1	Ahead	U	-		-	-	775	1800	34.8%	0.3	1800	-	-	-	0.3	1.5
5/2	Right Ahead	U	-		-	-	740	1800	36.1%	3.8	1800	-	-	-	0.3	1.6
6/1	Right	U	D		48	-	63	1800	6.4%	0.2	980	-	-	-	0.0	2.7
6/2	Right Right2	U	D		48	-	519	1800	53.0%	4.2	980	-	-	-	0.9	6.2
7/1	Right Ahead	U	B		45	-	214	2015	20.8%	4.6	1030	-	-	-	0.8	13.0
7/2	Right	U	B		45	-	188	2015	18.3%	4.2	1030	-	-	-	0.7	12.8
8/1	Ahead	U	-		-	-	313	1800	17.4%	0.1	1800	-	-	-	0.1	1.2
8/2	Right Ahead	U	-		-	-	963	1800	45.2%	8.4	1800	-	-	-	0.4	1.9
8/3	Right	U	-		-	-	464	1800	20.8%	4.2	1800	-	-	-	0.1	1.3
12/1	Ahead	O	-		-	-	1278	1940	93.3%	16.4	1370	1278	0	0	6.2	17.5
12/2	Ahead	U	-		-	-	63	1940	3.2%	0.0	1940	-	-	-	0.0	1.0
12/3	Ahead	U	-		-	-	505	1940	26.0%	0.2	1940	-	-	-	0.2	1.3

Basic Results Summary

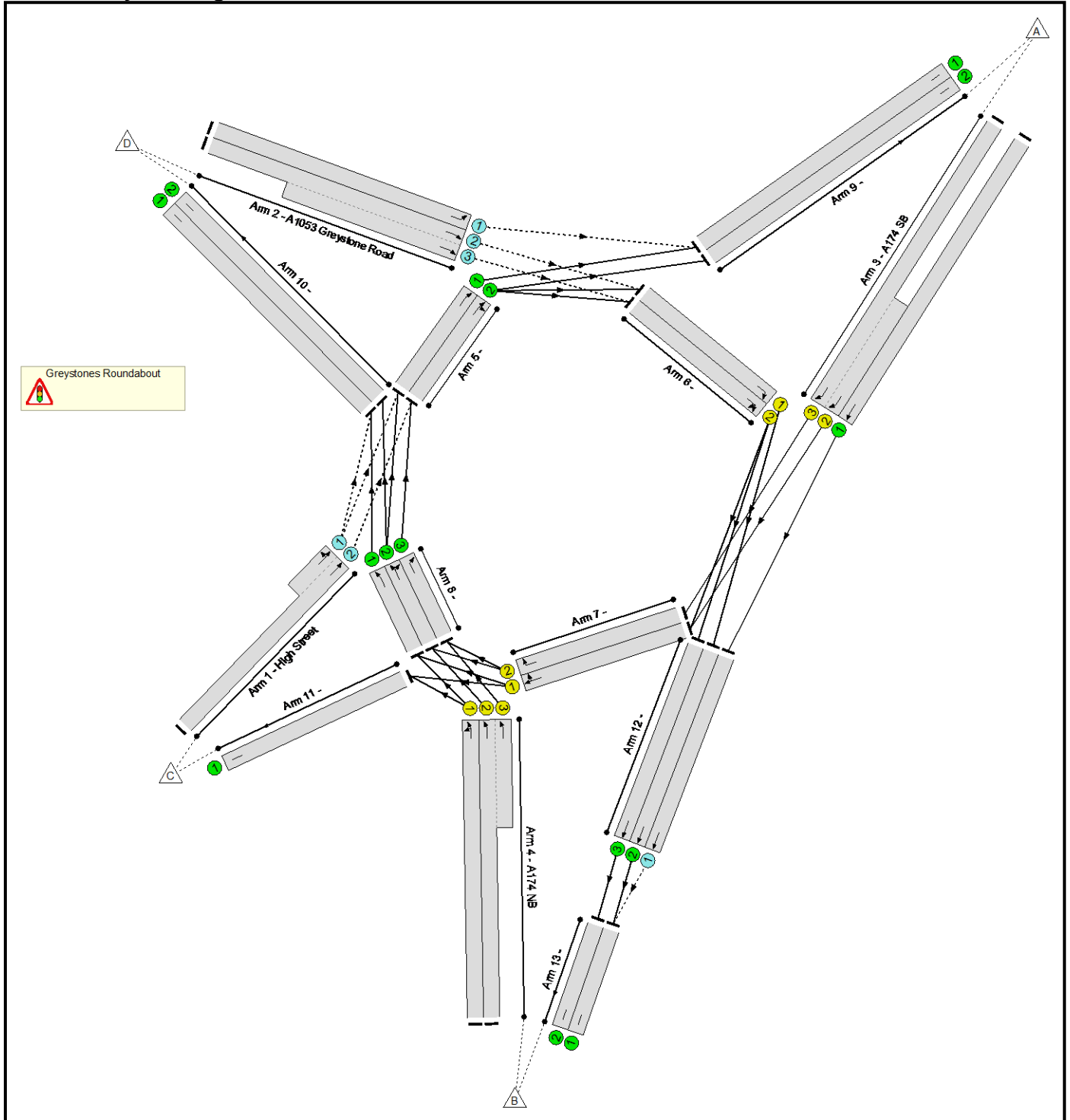
C1	Stream: 1 PRC for Signalled Lanes (%)	69.9	Total Delay for Signalled Lanes (pcuHr)	3.35	Cycle Time (s)	90
C1	Stream: 2 PRC for Signalled Lanes (%)	-19.6	Total Delay for Signalled Lanes (pcuHr)	99.01	Cycle Time (s)	90
	PRC Over All Lanes (%)	-19.6	Total Delay Over All Lanes(pcuHr)	99.75		

Basic Results Summary
Basic Results Summary

User and Project Details

Project:	Teesworks
Title:	Greystones Roundabout - As Existing

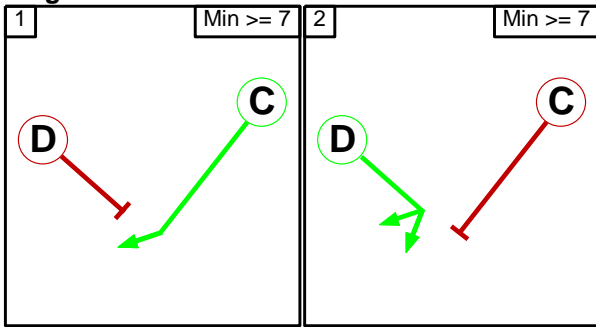
Network Layout Diagram



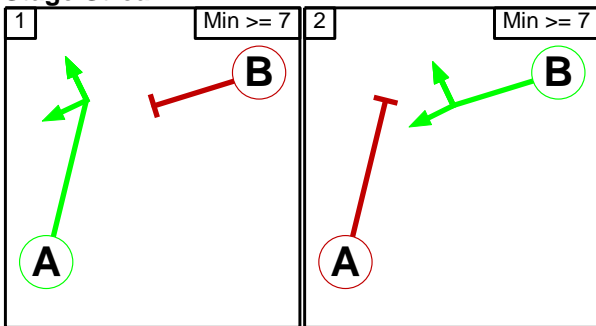
Basic Results Summary

Stage Diagram

Stage Stream: 1



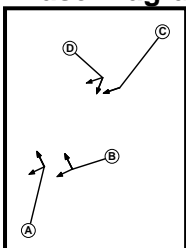
Stage Stream: 2



Phase Intergrens Matrix

		Starting Phase			
		A	B	C	D
Terminating Phase	A	-	5	-	-
	B	5	-	-	-
	C	-	-	-	5
	D	-	-	5	-

Phase Diagram



Basic Results Summary

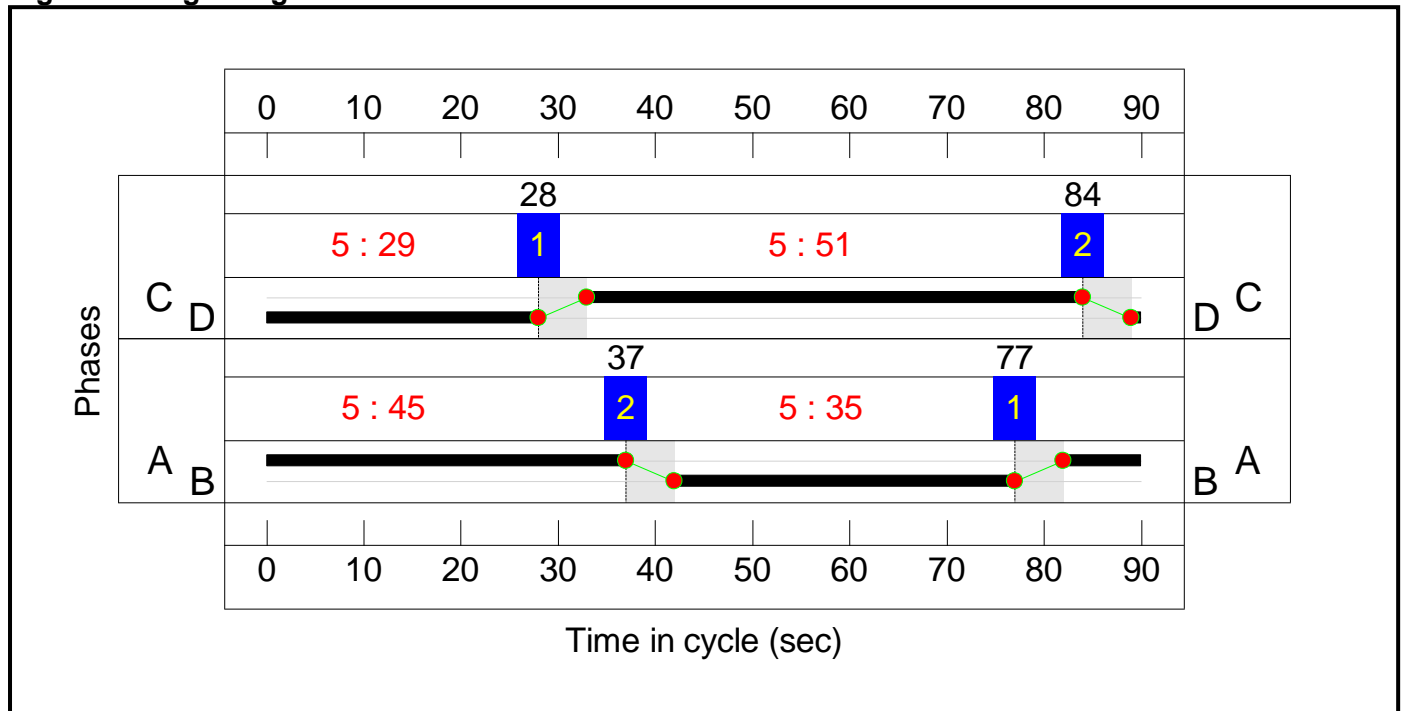
Scenario 5: '2033 AM Base+Lackenby' (FG5: '2033 AM Base + Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

Origin	Destination					Tot.
	A	B	C	D	Tot.	
A	0	1309	122	1028	2459	
B	1106	0	138	593	1837	
C	94	180	0	27	301	
D	312	319	9	0	640	
Tot.	1512	1808	269	1648	5237	

Signal Timings Diagram



Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	106.9%	-	-	2773	0	0	95.6	-
Greystones Roundabout	-	-	-		-	-	-	-	106.9%	-	-	2773	0	0	95.6	-
1/2+1/1	High Street Ahead Left	O	-		-	-	301	2015:1994	70.7 : 88.1%	4.0	318+86	602	0	0	2.7	32.7
2/1	A1053 Greystone Road Left	O	-		-	-	312	1908	67.2%	7.2	464	312	0	0	2.8	31.9
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	328	1935:1940	36.2 : 34.4%	3.1	464+464	656	0	0	1.8	19.5
3/1	A174 SB Ahead	U	-		-	-	1285	1980	64.9%	0.9	1980	-	-	-	0.9	2.6
3/3+3/2	A174 SB Ahead	U	C		51	-	1174	1985:1985	74.5 : 74.5%	10.9	747+828	-	-	-	5.2	15.9
4/1	A174 NB Ahead Left	U	A		45	-	664	1908	68.1%	13.4	975	-	-	-	4.1	22.2
4/2+4/3	A174 NB Ahead	U	A		45	-	1173	1921:1937	88.7 : 88.7%	19.0	711+611	-	-	-	8.9	27.3
5/1	Ahead	U	-		-	-	613	1800	34.1%	0.3	1800	-	-	-	0.3	1.5
5/2	Right Ahead	U	-		-	-	791	1800	43.9%	0.4	1800	-	-	-	0.4	1.8
6/1	Right	U	D		29	-	266	1800	44.3%	6.9	600	-	-	-	2.2	30.1
6/2	Right Right2	U	D		29	-	266	1800	44.3%	7.0	600	-	-	-	2.2	30.1
7/1	Right Ahead	U	B		35	-	626	2015	77.7%	15.3	806	-	-	-	3.9	22.1
7/2	Right	U	B		35	-	557	2015	69.1%	12.6	806	-	-	-	2.8	18.4
8/1	Ahead	U	-		-	-	1021	1800	56.7%	0.7	1800	-	-	-	0.7	2.3
8/2	Right Ahead	U	-		-	-	1164	1800	64.7%	10.0	1800	-	-	-	1.0	3.0
8/3	Right	U	-		-	-	566	1800	31.4%	7.4	1800	-	-	-	0.3	1.7
12/1	Ahead	O	-		-	-	1285	1940	106.9%	141.8	1203	1203	0	0	55.4	155.1
12/2	Ahead	U	-		-	-	266	1940	13.7%	0.1	1940	-	-	-	0.1	1.1

Basic Results Summary

12/3	Ahead	U	-	-	-	257	1940	13.2%	0.1	1940	-	-	-	0.1	1.1
		C1	Stream: 1	PRC for Signalled Lanes (%)	20.7	Total Delay for Signalled Lanes (pcuHr):		9.62	Cycle Time (s):		90				
		C1	Stream: 2	PRC for Signalled Lanes (%)	1.4	Total Delay for Signalled Lanes (pcuHr):		19.71	Cycle Time (s):		90				
				PRC Over All Lanes (%)	-18.7	Total Delay Over All Lanes(pcuHr):		95.59							

Basic Results Summary

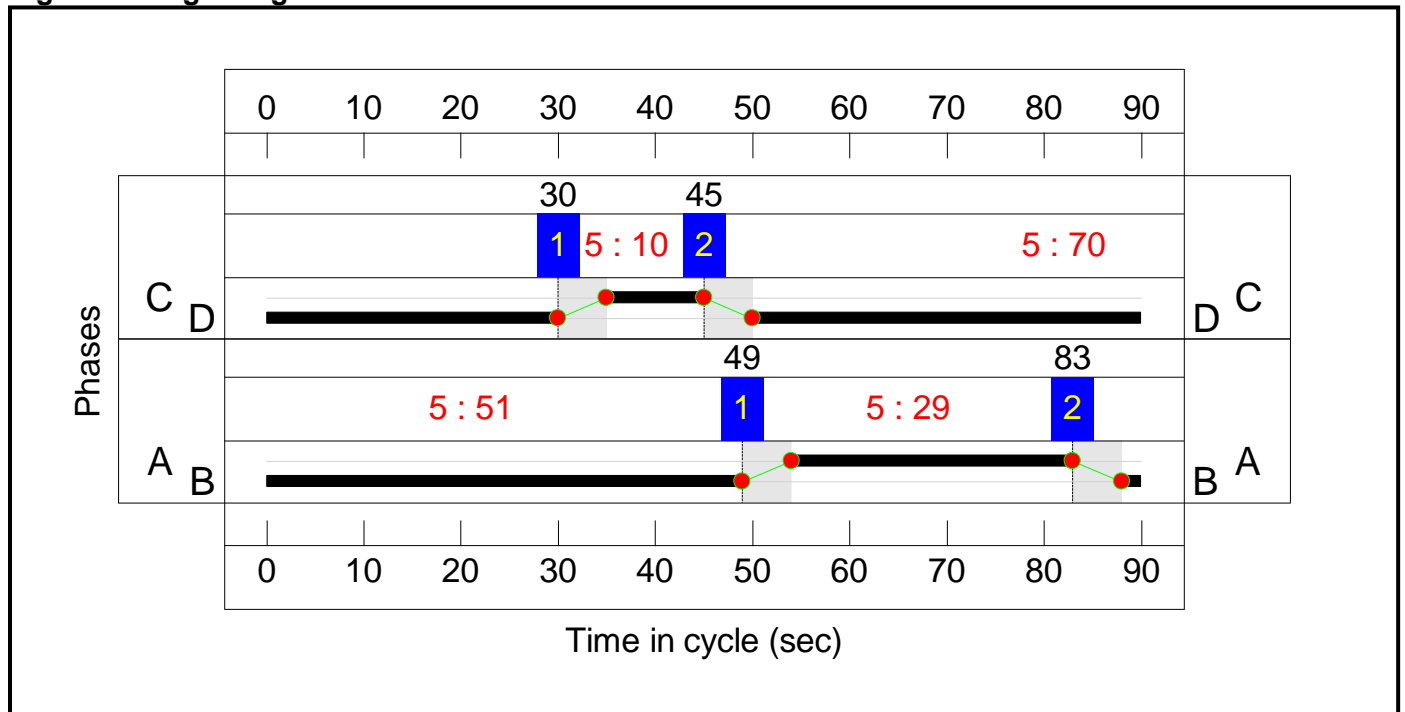
Scenario 6: '2033 PM Base+Lackenby' (FG6: '2033 PM Base + Lackenby', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	1278	132	286	1696
	B	1239	0	335	276	1850
	C	147	129	0	31	307
	D	846	483	17	0	1346
	Tot.	2232	1890	484	593	5199

Signal Timings Diagram



Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	166.9%	-	-	3167	0	0	644.2	-
Greystones Roundabout	-	-	-		-	-	-	-	166.9%	-	-	3167	0	0	644.2	-
1/2+1/1	High Street Ahead Left	O	-		-	-	307	2015:1960	35.6 : 35.6%	3.0	769+93	614	0	0	0.7	8.0
2/1	A1053 Greystone Road Left	O	-		-	-	846	1908	166.9%	234.2	507	507	0	0	190.8	812.0
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	500	1935:1940	51.5 : 47.1%	5.0	507+507	1000	0	0	2.5	17.8
3/1	A174 SB Ahead	U	-		-	-	1069	1980	54.0%	0.6	1980	-	-	-	0.6	2.0
3/3+3/2	A174 SB Ahead	U	C		10	-	627	1985:1985	156.2 : 156.2%	129.4	159+243	-	-	-	126.7	727.2
4/1	A174 NB Ahead Left	U	A		29	-	611	1908	96.1%	22.5	636	-	-	-	12.6	74.2
4/2+4/3	A174 NB Ahead	U	A		29	-	1239	1921:1937	166.3 : 166.3%	298.0	585+161	-	-	-	281.0	816.6
5/1	Ahead	U	-		-	-	974	1800	32.6%	0.2	1800	-	-	-	0.2	1.5
5/2	Right Ahead	U	-		-	-	750	1800	34.9%	3.8	1800	-	-	-	0.3	1.6
6/1	Right	U	D		70	-	383	1800	27.0%	4.1	1420	-	-	-	0.7	6.9
6/2	Right Right2	U	D		70	-	455	1800	31.0%	2.6	1420	-	-	-	0.6	4.6
7/1	Right Ahead	U	B		51	-	396	2015	22.3%	1.1	1164	-	-	-	0.5	7.4
7/2	Right	U	B		51	-	248	2015	19.8%	0.7	1164	-	-	-	0.4	5.7
8/1	Ahead	U	-		-	-	523	1800	24.1%	0.2	1800	-	-	-	0.2	1.3
8/2	Right Ahead	U	-		-	-	1011	1800	34.5%	9.3	1800	-	-	-	0.3	1.7
8/3	Right	U	-		-	-	476	1800	19.7%	1.7	1800	-	-	-	0.1	1.3
12/1	Ahead	O	-		-	-	1069	1940	102.2%	96.9	1046	1046	0	0	25.8	86.8
12/2	Ahead	U	-		-	-	383	1940	19.7%	0.1	1940	-	-	-	0.1	1.2

Basic Results Summary

12/3	Ahead	U	-	-	-	438	1940	21.8%	0.1	1940	-	-	-	0.1	1.2
		C1	Stream: 1	PRC for Signalled Lanes (%)	-73.6	Total Delay for Signalled Lanes (pcuHr):		127.95	Cycle Time (s):		90				
		C1	Stream: 2	PRC for Signalled Lanes (%)	-84.8	Total Delay for Signalled Lanes (pcuHr):		294.53	Cycle Time (s):		90				
				PRC Over All Lanes (%)	-85.4	Total Delay Over All Lanes(pcuHr):		644.19							

Basic Results Summary

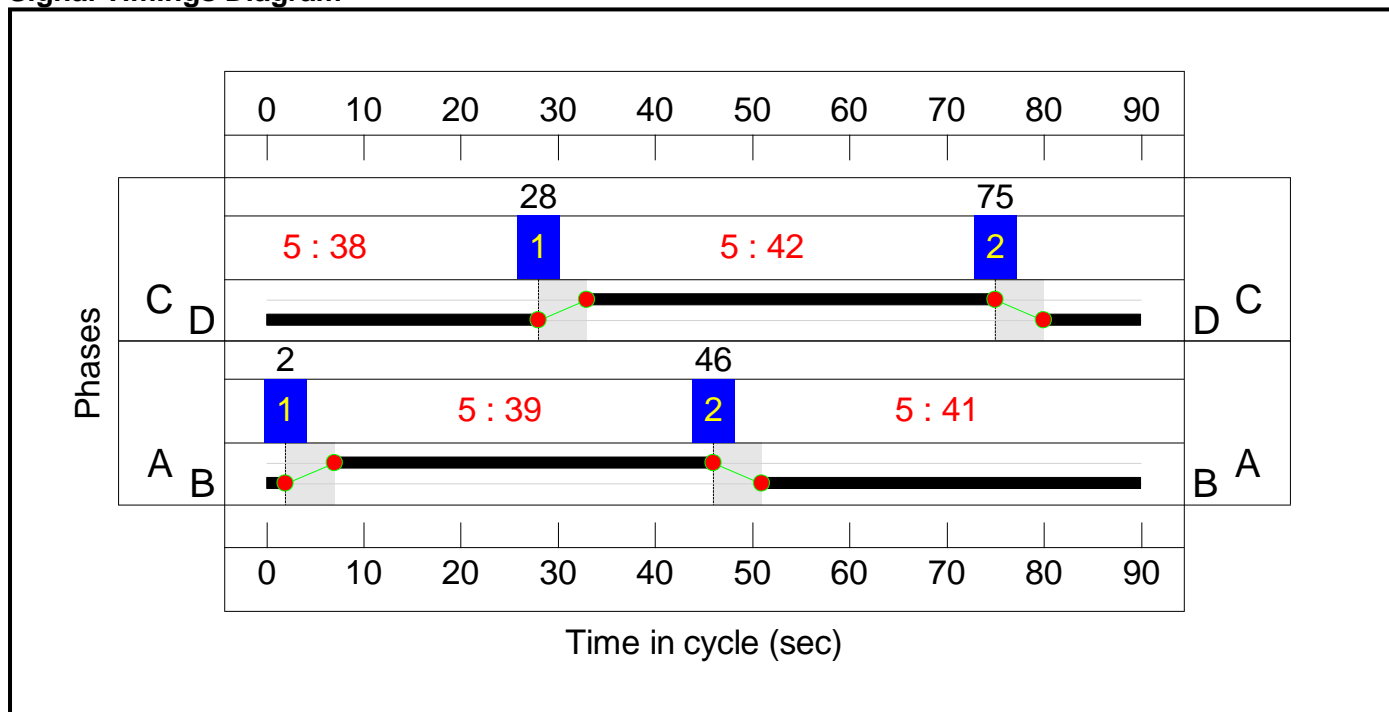
Scenario 7: '2033 AM Cumulative' (FG7: '2033 AM Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	1309	122	1618	3049
	B	1106	0	138	944	2188
	C	94	180	0	68	342
	D	460	467	24	0	951
	Tot.	1660	1956	284	2630	6530

Signal Timings Diagram



Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	123.4%	-	-	3212	0	0	424.6	-
Greystones Roundabout	-	-	-		-	-	-	-	123.4%	-	-	3212	0	0	424.6	-
1/2+1/1	High Street Ahead Left	O	-		-	-	342	2015:1965	122.9 : 122.9%	50.5	216+62	585	0	0	40.0	421.3
2/1	A1053 Greystone Road Left	O	-		-	-	460	1908	76.6%	11.1	601	460	0	0	4.1	32.2
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	491	1935:1940	44.3 : 38.7%	4.9	601+581	982	0	0	2.4	18.0
3/1	A174 SB Ahead	U	-		-	-	1309	1980	66.1%	1.0	1980	-	-	-	1.0	2.7
3/3+3/2	A174 SB Ahead	U	C		42	-	1740	1985:1985	123.4 : 123.4%	212.5	715+695	-	-	-	188.8	390.7
4/1	A174 NB Ahead Left	U	A		39	-	902	1908	106.4%	57.6	848	-	-	-	42.2	168.5
4/2+4/3	A174 NB Ahead	U	A		39	-	1286	1921:1937	106.2 : 106.2%	72.8	574+637	-	-	-	55.6	155.5
5/1	Ahead	U	-		-	-	441	1800	23.1%	0.2	1800	-	-	-	0.2	1.3
5/2	Right Ahead	U	-		-	-	942	1800	47.4%	13.6	1800	-	-	-	0.7	2.8
6/1	Right	U	D		38	-	267	1800	34.2%	5.4	780	-	-	-	0.8	10.9
6/2	Right Right2	U	D		38	-	407	1800	47.8%	5.2	780	-	-	-	1.2	11.1
7/1	Right Ahead	U	B		41	-	885	2015	76.8%	19.2	940	-	-	-	3.9	19.2
7/2	Right	U	B		41	-	882	2015	76.0%	19.3	940	-	-	-	3.7	18.5
8/1	Ahead	U	-		-	-	1503	1800	73.2%	1.4	1800	-	-	-	1.4	3.7
8/2	Right Ahead	U	-		-	-	1492	1800	71.6%	17.5	1800	-	-	-	1.5	4.3
8/3	Right	U	-		-	-	676	1800	35.4%	9.4	1800	-	-	-	0.3	1.8
12/1	Ahead	O	-		-	-	1309	1940	110.5%	165.1	1185	1185	0	0	76.7	211.0
12/2	Ahead	U	-		-	-	267	1940	13.8%	0.1	1940	-	-	-	0.1	1.1

Basic Results Summary

12/3	Ahead	U	-	-	-	380	1940	17.9%	0.1	1940	-	-	-	0.1	1.1
		C1	Stream: 1	PRC for Signalled Lanes (%)	-37.1			Total Delay for Signalled Lanes (pcuHr):	190.81			Cycle Time (s):	90		
		C1	Stream: 2	PRC for Signalled Lanes (%)	-18.2			Total Delay for Signalled Lanes (pcuHr):	105.31			Cycle Time (s):	90		
				PRC Over All Lanes (%)	-37.1			Total Delay Over All Lanes(pcuHr):	424.62						

Basic Results Summary

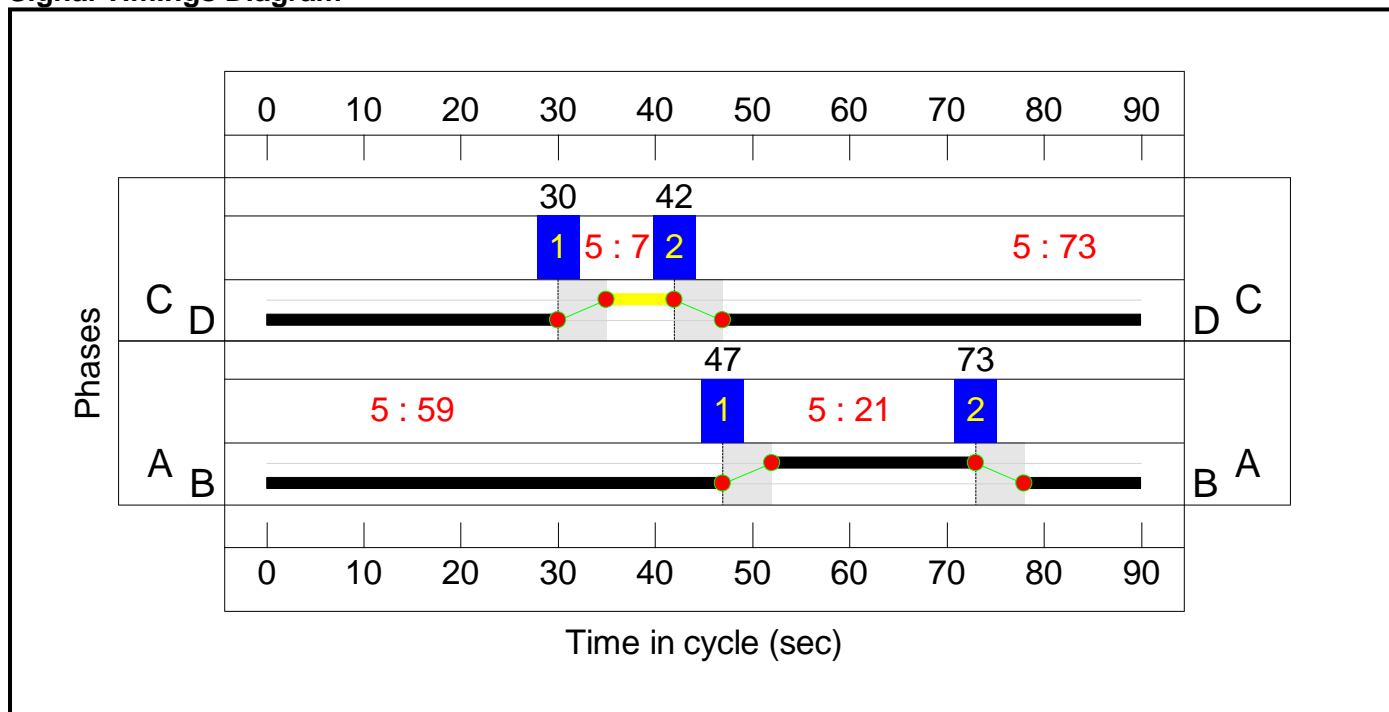
Scenario 8: '2033 PM Cumulative' (FG8: '2033 PM Cumulative', Plan 1: 'Network Control Plan 1')

Traffic Flows, Actual

Actual Flow :

		Destination				
		A	B	C	D	Tot.
Origin	A	0	1278	132	409	1819
	B	1239	0	335	401	1975
	C	147	129	0	43	319
	D	1374	775	54	0	2203
	Tot.	2760	2182	521	853	6316

Signal Timings Diagram



Basic Results Summary

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Deg Sat (%)	Mean Max Queue (pcu)	Capacity (pcu)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)
Network: As Existing	-	-	-		-	-	-	-	190.7%	-	-	3991	0	0	1141.7	-
Greystones Roundabout	-	-	-		-	-	-	-	190.7%	-	-	3991	0	0	1141.7	-
1/2+1/1	High Street Ahead Left	O	-		-	-	319	2015:1985	25.9 : 25.9%	2.0	900+332	638	0	0	0.5	5.9
2/1	A1053 Greystone Road Left	O	-		-	-	1374	1908	190.7%	430.9	720	720	0	0	366.8	961.1
2/2+2/3	A1053 Greystone Road Ahead	O	-		-	-	829	1935:1940	59.6 : 55.5%	6.6	720+720	1658	0	0	2.4	10.6
3/1	A174 SB Ahead	U	-		-	-	1239	1980	62.6%	0.8	1980	-	-	-	0.8	2.4
3/3+3/2	A174 SB Ahead	U	C		7	-	580	1985:1985	163.8 : 164.9%	125.0	176+176	-	-	-	130.2	808.3
4/1	A174 NB Ahead Left	U	A		21	-	736	1908	157.8%	165.2	466	-	-	-	155.6	761.2
4/2+4/3	A174 NB Ahead	U	A		21	-	1239	1921:1937	189.6 : 189.6%	344.5	444+210	-	-	-	330.7	960.7
5/1	Ahead	U	-		-	-	884	1800	27.0%	0.2	1800	-	-	-	0.2	1.4
5/2	Right Ahead	U	-		-	-	707	1800	27.2%	2.2	1800	-	-	-	0.2	1.4
6/1	Right	U	D		73	-	434	1800	29.3%	2.8	1480	-	-	-	0.4	3.7
6/2	Right Right2	U	D		73	-	600	1800	38.5%	3.5	1480	-	-	-	0.6	3.9
7/1	Right Ahead	U	B		59	-	382	2015	18.8%	1.6	1343	-	-	-	0.4	6.3
7/2	Right	U	B		59	-	289	2015	13.1%	0.5	1343	-	-	-	0.2	4.4
8/1	Ahead	U	-		-	-	597	1800	20.7%	0.1	1800	-	-	-	0.1	1.3
8/2	Right Ahead	U	-		-	-	1054	1800	31.9%	8.8	1800	-	-	-	0.3	1.7
8/3	Right	U	-		-	-	474	1800	14.2%	3.2	1800	-	-	-	0.1	1.2
12/1	Ahead	O	-		-	-	1239	1940	127.1%	223.5	975	975	0	0	151.6	440.5
12/2	Ahead	U	-		-	-	434	1940	22.4%	0.1	1940	-	-	-	0.1	1.2

Basic Results Summary

12/3	Ahead	U	-	-	-	509	1940	25.5%	0.2	1940	-	-	-	0.2	1.2
		C1	Stream: 1	PRC for Signalled Lanes (%)	-83.2			Total Delay for Signalled Lanes (pcuHr):	131.29			Cycle Time (s):	90		
		C1	Stream: 2	PRC for Signalled Lanes (%)	-110.7			Total Delay for Signalled Lanes (pcuHr):	486.94			Cycle Time (s):	90		
				PRC Over All Lanes (%)	-111.9			Total Delay Over All Lanes(pcuHr):	1141.66						

Appendix G

A19 Journey Time Routes

G1 A19 Corridor

The images in this appendix show the routes where journey time results have been extracted from Jacobs 2015 New Tees Crossing AIMSUN Model.

Figure G1: A19 North to A66 Eastbound



Figure G2: A19 South to A66 Eastbound

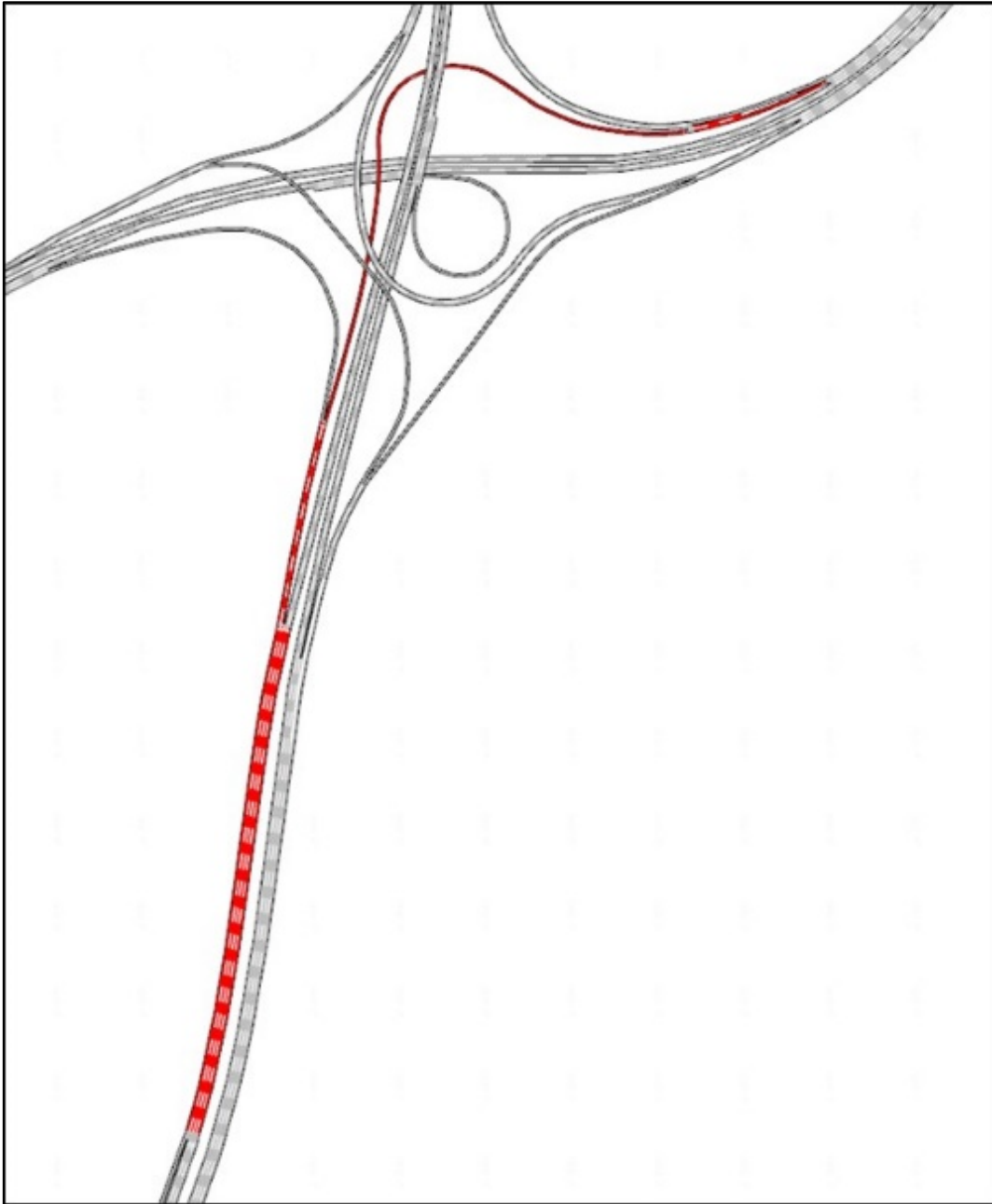


Figure G3: A66 Westbound to A19 North



Figure G4: A66 Westbound to A19 South



Appendix C2: Transport Assessment Scoping Note

South Tees Development
Corporation

Teesworks

Transport Assessments - Scoping
Report

001

Issue | 26 November 2020

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 602669-41

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ARUP

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1 Introduction

1.1 Purpose of the Scoping Report

Arup has been commissioned by the South Tees Development Corporation (STDC) to develop a Transport Assessment (TA) and Framework Travel Plan in support of five separate outline planning applications for development on the South Tees Development Corporation (STDC) site, known as 'Teesworks'.

An outline planning application for each of the five sites will be submitted separately and there will be five TA's produced. However, rather than producing five Scoping Reports, this document provides details of all five sites and outlines the key principles of the assessments.

Arup will also undertake the traffic and transportation assessment of the Environmental Impact Assessment.

The purpose of this scoping report is to agree the methodology and main parameters of the assessment with Redcar and Cleveland Borough Council (RCBC), the local planning and highway authority, and Highways England (HE). A copy will also be sent to the neighbouring highway authority, Middlesbrough Council (MC).

Decision points throughout the document are provided in a text box

1.2 Development Sites

The five development sites are as follows:

Dorman Point

The development site is located in the south-western part of the Teesworks area and the proposed maximum floorspace is just under 140,000sqm. It is largely free of active use, although the former Torpedo Ladle Workshop is present in the southern part of the site. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 1,620 people when operational.

Lackenby

The development site is located in the southern part of the Teesworks area and lies between Dorman Point and the British Steel area. It provides just under 93,000sqm of floorspace and is currently occupied by buildings and structures associated with the former steelmaking facilities. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 1,080 people when operational.

The Foundry

The development site, providing a maximum floorspace of 464,515sqm, is located in the northern part of the Teesworks area and is largely vacant industrial land, sparsely occupied by building and structures associated with the former steel making complex. The development proposals for the site are that it will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. It is forecast that the site could employ approximately 5,401 people when operational.

Long Acres

The development site is located between Steel House to the south and the Foundry to the north and provides just under 186,000sqm of floorspace. It is proposed that the site will provide general industrial (B2) use and storage and distribution facilities (B8), with ancillary office accommodation. The development is forecast to employ approximately 2,161 people when operational.

Steel House

The development site is bound to the south by the A1085 Trunk Road and is currently occupied by the Steel House office complex. It is proposed that the floor area, of around 16,000sqm, provides office and incubator space (use class E). It is forecast that the site could employ approximately 1,128 people when operational.

The location of the five sites is shown in **Figure 1**. The construction of the development sites will be phased, and all are expected to be operational by 2033.

Figure 1 Site Locations



2 Planning Policy Review

2.1 Literature Review

The TA for each of the five sites will address the relevant transport related policy documents as follows:

- National Planning Policy Framework (NPPF) 2019;
- Tees Valley Combined Authority Strategic Transport Plan 2020 - 2030;
- Redcar and Cleveland Local Plan 2018;
- Redcar and Cleveland Local Transport Plan 2011-2021;
- South Tees Regeneration Masterplan 2019; and
- South Tees Area Supplementary Planning Document (SPD) 2018.

It is proposed that the development considers relevant transport policies from the policy and guidance documents listed above. RCBC to advise if any other documents should be considered.

3 Baseline Conditions

The scope of each TA will include a full audit of available transport modes following the methodology outlined in this section.

3.1 Site Description and Location

This section of each TA will provide a high-level description of the characteristics of the site and the surrounding area.

3.2 Sustainable Transport Networks

A desktop audit of existing facilities and routes will be provided in this section of the TA. Information such as bus and rail routes, destinations and example journey times will be provided. For scheduled services, information such as frequencies and service times will be included.

3.3 Highway Network

This section of each TA will provide an overview of the main local roads and Strategic Road Network connecting the site to the wider area.

Due to current circumstances with the Covid 19 pandemic and lockdown measures, it is not possible for traffic surveys to be undertaken to inform the baseline condition assessment. To establish the baseline traffic flows, the following data sources have been utilised:

- Traffic data from HE North Regional Transport Model (NRTM);
- Traffic data from the Tees Valley Combined Authority (TVCA) Tees Valley Cube Model (TVM);
- Department for Transport traffic counts available online;
- WebTRIS (HE) online data;
- Traffic surveys collected on behalf of Capita in 2019 to construct a VISSIM model of the area for RCBC – permission to obtain a copy of these surveys was granted by RCBC, Capita and NETDC Ltd; and
- Survey data publicly available online from other local developments, including the planning application for the York Potash development (application number R/2013/0669/OOM).

Peak hour data from the two traffic models (NRTM and TVM) was input into two separate traffic flow diagrams for the study area. On both diagrams, any observed data was added above the links to enable a comparison to be made and determine which data source provided the most comparable base. The NRTM was found to be a comparable match against the baseline flows, and therefore the NRTM flows were predominantly used to inform the baseline, except for where observed data was available. All data has been adjusted to 2020 and 2033 (for operational year assessment) using NRTM growth.

The methodology described above was also used on application number R/2020/0357/OOM for development on the South Industrial Zone of the Teesworks site (referred to as ‘South Bank’).

3.4 Road Safety Analysis

To inform road safety considerations associated with the development proposals, a high-level review of five years’ worth of accident data on the roads within the vicinity of each site will be undertaken.

Should any common factors pertaining to road traffic accidents be identified, suitable mitigation features may be considered as part of the development proposal.

This section seeks agreement that:

- The scope of the transport networks audit is acceptable;
- The methodology for establishing baseline traffic flows is acceptable; and
- The scope of the accident appraisal is adequate.

4 Development Proposals

This section of each TA will provide an overview of the proposed development, including details about site accesses and proposed transport provisions for the site.

4.1 Vehicular Access

The TA for each development site will provide details about the site access arrangements. It is anticipated at this stage that the development sites will be accessed as follows:

Dorman Point

The parameter plan shows four indicative access points into the Dorman Point site:

- One via a new roundabout junction on Eston Road, the works for which have planning permission (application number R/2020/0270/FFM);
- One at the north east corner of the site where an existing Teesworks internal road enters the site;
- One at the south east corner where an existing Teesworks internal road enters the site; and
- One potentially to be provided at the south west corner of the site at the Bessemer Gate entrance into the Bolckow Industrial Estate.

For the purpose of the assessment, the main vehicular access will be the new roundabout junction on Eston Road with all trips generated by the site using the roundabout to access the wider highway network.

Lackenby

It is proposed that the main vehicular access into the Lackenby site will be via a new fourth arm provided on the A66/Tees Dock Road roundabout into the site. All development trips will be assigned to this main access for the purpose of junction impact assessments. Access is expected to also be permitted via the internal Teesworks road network that connects to Dorman Point.

Long Acres, Foundary and Steel House

It is proposed that these sites access the public highway network via the Trunk Road Roundabout (also known as Steel House Roundabout).

4.2 Walking and Cycling Facilities

The TA for each of the five sites will provide information about the proposed walking and cycling facilities for each development and how these connect to the external network.

4.3 Public Transport Facilities

Details of existing public transport connections will be provided in each of the TA's.

4.4 Cycle Parking

High quality cycle parking is expected to be provided, in excess of the usual standards, in support of a more sustainable travel policy for the site.

4.5 Car Parking

As all five applications will be in outline, the internal site layouts have not yet been developed, and therefore the level of car parking provision is unknown. A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets (including RCBC's ambition to be carbon neutral by 2030). It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.

This section seeks agreement on the transport proposals for the proposed development.

5 Trip Generation

5.1 Person Trips

The approach to trip generation will follow the same methodology as that agreed for the South Bank development (planning application number R/2020/0357/OOM). The methodology applies trip rates from the TRICS database based on employee numbers. TRICS is a recognised database widely used by transport professionals which predicts trip rates of developments based on survey information of comparable sites.

The industrial trip rates used in the South Bank assessment are shown in **Table 1**.

Table 1: Industrial Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.322	0.089	0.411	0.078	0.314	0.392	2.134	2.121	4.255
LGVs	0.029	0.022	0.051	0.01	0.016	0.026	0.294	0.287	0.581
HGVs	0.19	0.16	0.035	0.014	0.01	0.024	0.218	0.208	0.426

These were identified and agreed as comparable trip rates to apply to large scale industrial sites and will therefore be applied at Long Acres and the Foundry. However, during the consultation process for the South Bank planning application, Middlesbrough Council indicated that the trip rates that were applied on the TeesAMP development (planning application number 18/0308/FUL) should be applied at the Teesworks site. The TeesAMP trip rates are more applicable to smaller sized industrial sites and therefore could be applicable at both Dorman Point and Lackenby. These trip rates are shown in **Table 2** and will be applied at Dorman Point and Lackenby.

Table 2: TeesAMP Industrial Person Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Trip Rates	0.475	0.245	0.720	0.175	0.425	0.60	3.434	3.435	6.869

The Steel House site is proposed for office type use (use class E) and therefore office trip rates have been obtained from TRICS and these are shown in **Table 3**.

Table 3: Office Trip Rates

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Person Trips	0.317	0.023	0.340	0.025	0.317	0.342	1.370	1.311	2.681
LGVs	0.003	0.002	0.005	0	0.001	0.001	0.029	0.029	0.058
HGVs	0.001	0.001	0.002	0	0	0	0.002	0.002	0.004

The trip rate for service and delivery vehicle trips (light goods vehicles and heavy goods vehicles) has been shown to disaggregate the overall person trip rate and determine how many trips are likely to be made by commuters, versus service vehicle trips. No information is provided in the TeesAMP Transport Assessment regarding service vehicle trip rates. It is useful to distinguish service trips, particularly HGVs, to assist assessments into noise and air quality. Therefore, the proportion of LGV and HGV trips from the TRICS analysis will be applied to the trip rates from the TeesAMP assessment to distinguish service vehicle trips.

The resultant person trips for each site, excluding LGVs and HGVs, is summarised in **Table 4**.

Table 4: Person Trips by Site

Trip rates/employee	AM Peak (08:00 – 09:00)			PM Peak (17:00 – 18:00)			Daily (7am – 7pm)		
	In	Out	Total	In	Out	Total	In	Out	Total
Dorman Point	654	226	921	196	633	846	4,228	4,229	8,457
Lackenby	436	151	614	130	422	564	2,819	2,819	5,638
The Foundry	1,480	275	1,755	292	1,555	1,847	8,760	8,782	17,542
Long Acres	592	110	702	117	622	739	3,505	3,514	7,019
Steel House	353	23	376	28	356	385	1,510	1,444	2,954

All sites were previously occupied. However, as the development sites are currently vacant, it is proposed that the trip generation does not take into account previous or permitted uses and therefore the overall trip generation will not be discounted; all trips will be added to the network as new trips.

5.2 Trips by Mode

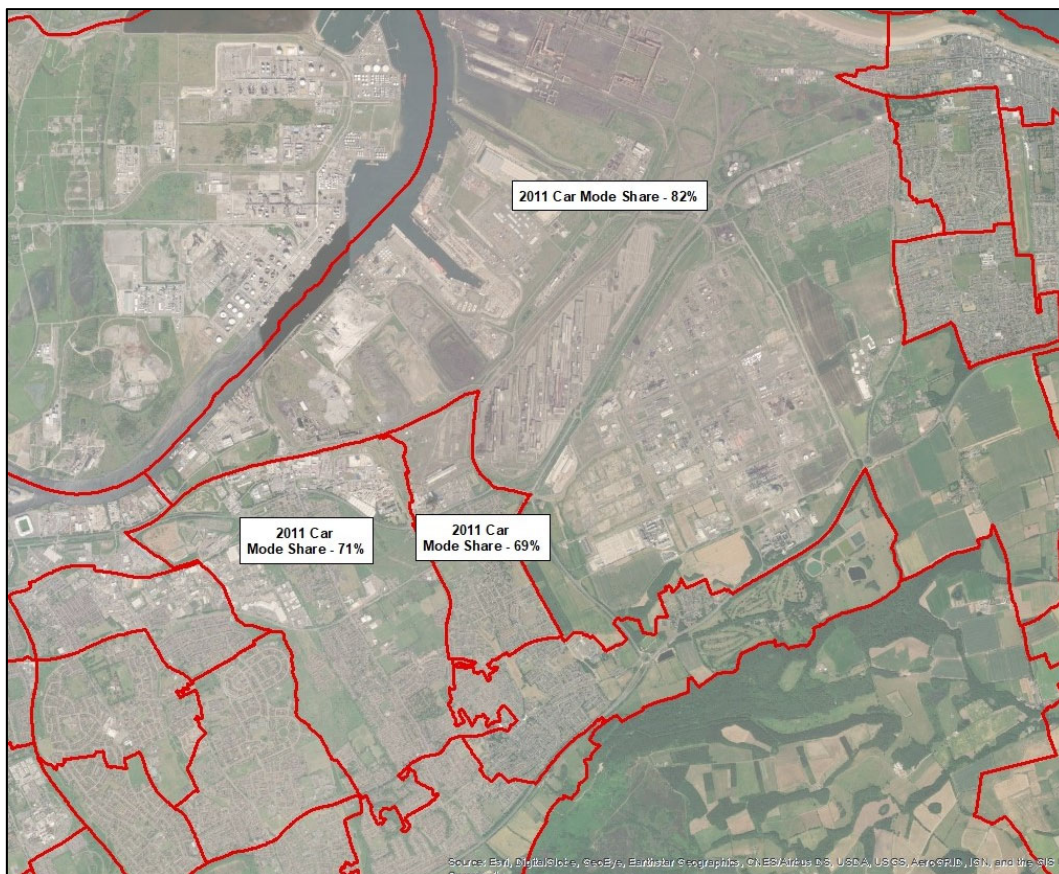
Having established a method for calculating the number of trips, the mode of transport for commuters has been informed by reviewing data from the 2011 UK Census Journey to Work dataset. The Teesworks area is split across two travel to work areas, Census zone E02002517 to the north and E02002523 to the south. Data regarding how people working in these areas travelled to work in 2011 is shown in **Table 5**.

Table 5 2011 Census Method of Journey to Work

Mode	2011 UK Census Northern Zone %	2011 UK Census Southern Zone %
Car Driver	82%	69%
Car Passenger	8%	8%
Bus	3%	5%
Bicycle	3%	2%
Walking	3%	13%
Motorcycle	1%	0%
Taxi	0%	2%

It can be seen that car mode share in 2011 varied between 82% and 69% and the areas this applies to is shown in **Figure 2**. The Dorman Point and Lackenby sites are located in the area where car mode share, in 2011, was 69% and the other sites are located to the north where travel to work, by car, was the higher 82% in 2011.

Figure 2 2011 Census Data – Car Mode Share



The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.

It is proposed that measures will be implemented to support sustainable accessibility to the site, including a dedicated bus service that will connect the

local towns of Middlesbrough and Redcar to the development sites. The bus service, funded initially by the Teesworks development, will travel into the site to provide a service that connects directly to each of the five development sites. The provision of a bus service, alongside other travel planning measures, is considered to enable at least a 5% reduction in those travelling to the site by car when these sites are operational. It is therefore assumed that the maximum car mode share for Dorman Point and Lackenby be 64%, with the other sites having a car mode share of 77%. **Table 6** shows how the base and adjusted car mode share equates to commuter car trips in the AM peak hour for each site.

Table 6 Car Trips

Site	Base Car Mode Share			Adjusted Mode Share (-5%)		
	AM In	AM Out	Total	AM In	AM Out	Total
Dorman Point	451	156	635	419 (-33)	145 (-11)	590 (-46)
Lackenby	301	104	424	279 (-22)	97 (-8)	393 (-31)
The Foundry	1,214	226	1,439	1,138 (-76)	212 (-14)	1,350 (-88)
Long Acres	485	90	576	455 (-30)	85 (-5)	540 (-35)
Steel House	289	19	308	272 (-18)	17 (-2)	289 (-19)
Total	2,741	595	3,382	2,562 (-178)	555 (-40)	3,164 (-218)

It can be seen from **Table 6** that the travel planning measures must aim to remove around 200 trips from private cars in the morning peak hour onto more sustainable modes to achieve a 5% car mode share reduction.

5.3 Trip Distribution

Feedback received on the South Bank planning application (application number R/2020/0357/OOM) from HE indicated that consideration should be given to journey to work data from the UK Census (which indicates the origin and destination trips for commuters), as well as existing turning proportions on the highway network, to assign development traffic to the highway network.

For all five sites the trip distribution at the main access will be informed by Census data. It is proposed to distribute traffic on the remainder of the highway network using the turning proportions in the baseline traffic flow diagrams.

Traffic will be distributed as far west to the A19 corridor, south to the A174 corridor and east to the Trunk Road / Kirkleatham Lane junction. The site is bound by the River Tees to the north.

5.4 Cumulative Assessment and Future Growth

A cumulative assessment will be undertaken to consider the cumulative effects of all five developments, plus the South Bank development. This cumulative assessment of all STDC sites will be undertaken for a future year of 2033. Rather than review and extract traffic flows for the committed developments that have been identified, it is proposed to extract growth from Highways England's North Regional Transport Model (NRTM). This approach is considered to be

reasonable as it is underpinned by the National Trip End Model (NTEM) which informs TEMPro growth, as well as a full variable demand model, accounting for changing economic conditions and competing transport modes. Growth in the NRTM is controlled to NTEM at district level (as per TAG guidance) however individual developments are explicitly accounted for. This means that local trip end growth is calculated in a detailed way.

This scoping report seeks agreement on:

- The employee trip rate approach which applies large industrial site trip rates to the Long Acres and Foundry sites, and the TeesAMP trip rates to the Dorman Point and Lackenby sites. Office trip rates will be applied to the Steel House development;
- Applying 2011 Census mode share proportions to determine trips by mode, but reducing car mode by 5% to account for trips transferred onto the proposed bus service and other sustainable travel initiatives. This results in the assumed car mode share at Dorman Point and Lackenby of 64% and 77% at the other three sites;
- The approach to vehicular trip distribution; and
- The approach to use NRTM forecasts to growth traffic to 2033 which will be used to both assess the impact of each development in 2033, but also to assess the cumulative impact of all five sites being operational by 2033. The cumulative assessment will also include trips from the South Bank development.

6 Development Impact Assessment

6.1 Scope of Highway Impact Assessment

6.1.1 Local Junction Assessments

A number of junctions have been identified on the surrounding network where the development trips could have an impact. **Table 7** lists the junctions that will be assessed for each development.

Table 7 Junctions Impact Assessments

Site	Type	Dorman Point	Lackenby	Foundry	Long Acres	Steel House
A66/Old Station Road roundabout	ARCADY	X	X			
A66/Eston Road	LINSIG	X	X			
A66/Normanby Road	LINSIG	X	X			
A66/Tees Dock Road roundabout	ARCADY	X	X			
A66/Trunk Road/A1053 Greystones Road	LINSIG	X	X	X	X	X
Eston Road roundabout	ARCADY	X	X			
Greystones roundabout	LINSIG	X	X	X	X	X
Steel House roundabout	ARCADY			X	X	X
Trunk Road/Kirkleatham Lane	LINSIG			X	X	X

The junction assessments will be undertaken for the following scenarios for both the AM and PM peak hour:

- 2033 Base;
- 2033 Base + 1 development site (x5);
- 2033 Base + all five developments + South Bank development (cumulative assessment).

6.1.2 Strategic Highway Assessment

As requested by HE for the South Bank development, the scope of the traffic assessment will extend to include the A19 corridor. Jacobs has provided a copy of the 2015 New Tees Crossing AIMSUN Model so that the impact of trips from

the Teesworks sites on the A19 can be assessed. The impact of each development site, and the cumulative scenarios, will be undertaken.

6.2 Environmental Impact Assessment

A traffic and transportation assessment will be included in the Environmental Statement (ES) for each development. The Environmental Impact Assessment (EIA) will be carried out in accordance with the EIA Regulations and guidance contained in relevant publications including:

- Environmental Impact Assessment: A Guide to Procedures (Department of the Environment, Transport and the Regions (DETR), 2000); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management & Assessment (IEMA), 2004).

In accordance with the IEMA Guidelines, it is proposed that the following conditions on the transport network within the study area be assessed during the operational phase (2033 with development) for each site:

- Severance (change in traffic flows);
- Driver and bus user delay (derived from the junction assessments);
- Pedestrian and cyclist amenity (change in traffic flows on local routes used by pedestrians and cyclists); and
- Accidents and safety (following a review of existing conditions, a judgement will be made as to whether the proposed development will result in any changes to highway safety).

Construction details are not yet finalised and as such, construction traffic will not be included in the scope of the traffic and transportation assessment of the EIA. A framework Construction Environmental Management Plan (CEMP) will be prepared and will form part of the embedded mitigation of the development. The CEMP will identify that a Construction Traffic Management Plan (CTMP) will be implemented either at site level or for each development phase. The CTMP will identify any necessary mitigation to minimise the impact of construction traffic on the transport networks.

This section of the scoping report seeks agreement on:

- The scope of the junction impact assessments for the TA's;
- The junction assessment scenarios; and
- The scope of the EIA assessment.

7 Travel Plan

7.1 Overview

All of the proposed developments are located within the Teesworks site and subsequently will be encompassed into the Transport Strategy and benefit from the measures that will be delivered to serve the wider site. The Transport Strategy is still under development but is expected to include ambitious targets to reduce car use and recommend measures that significantly improve the accessibility of the site by public transport, walking and cycling.

However, as these sites will be developed in advance of the strategy being adopted, a Travel Plan Framework for each site will be outlined in the TA, detailing measures that will be applied in advance of the wider strategy coming forward, but also outlining how the site will be incorporated into the wider masterplan in due course.

7.2 Bus Service

A key recommendation arising from the Transport Strategy is the need to provide a bus service that travels within the site. The scale of the site means that the location of the public bus stops are well outside the generally accepted 400m walking distance between a bus stop and a destination.

It is therefore anticipated that the TA's will recommend that to provide an attractive alternative to private car travel to the site, a bus service will be required. Further details of this will be provided in the Travel Plan Framework.

RCBC to confirm that this application can be incorporated into the wider STDC Transport Strategy and that a Travel Plan Framework, which outlines the measures that occupiers could introduce prior to more wide-ranging measures coming forward, will be sufficient to support each planning application.

8 Conclusions and Next Steps

This Scoping Report has considered the potential impact of five proposed development sites on the Teesworks site. It has outlined what is proposed to be covered by the Transport Assessment and Environmental Statement that will be submitted as part of the planning application for each of the proposed developments.

Arup would be grateful if RCBC, MC and HE could respond in writing to confirm that the methodology proposed in this report is acceptable. Should there be any significant issues with regards to the scope, an online meeting is requested at the earliest convenience.

Appendix C3: Consultation Responses

South Tees Development Corporation: Teesworks – Response to “Transport Assessments – Scoping Report”

PREPARED FOR: Chris Bell / Sunny Ali (Highways England)
PREPARED BY: Gavin Nicholson (CH2M)
DATE: 14th December 2020
PROJECT NUMBER: 679066.AA.20.18.12
SITE/ DOCUMENT REF: DevTV0062/TM001
REVIEWED / APPROVED BY: Jonathan Parsons (CH2M)

Introduction

CH2M has been commissioned by Highways England to provide a review of the document titled “South Tees Development Corporation: Teesworks, Transport Assessments – Scoping Report” prepared by Arup on behalf of the South Tees Development Corporation and dated 26th November 2020 [the Scoping Report].

The single Scoping Report seeks to set the scope for five separate Transport Assessments [TAs] which will support the five outline planning applications for development within the South Tees Development Corporation [STDC] site.

The STDC site is located on the south bank of the River Tees, between Redcar town centre to the east and Middlesbrough town centre to the west. The site location, indicating each of the five sites that will require a TA, is shown in Figure 1, extracted from the Scoping Report.

The consultation with Highways England at this stage of the process should be welcomed as early engagement enables the assessment to be aligned to Highways England’s requirements. A summary and conclusion are provided at the end of this Technical Memorandum [TM].

Figure 1 – Location of application sites



(Extract from the Scoping Report)

According to the Scoping Report, it is expected that the proposed outline planning applications will be for the level of development identified in Table 1.

Table 1 – Application sites information

Application site	Floorspace (sqm)	Land Use	Approximate operational jobs
Dorman Point	140,000	B2 / B8 with ancillary office	1,620
Lackenby	93,000	B2 / B8 with ancillary office	1,080
The Foundry	464,515	B2 / B8 with ancillary office	5,401
Long Acres	186,000	B2 / B8 with ancillary office	2,161
Steel House	16,000	Office and incubator space (use class E)	1,128
Total	899,515	-	11,390

All of the development sites are expected to be operational by 2033.

Background

For background, it is important to note that Highways England has recently been consulted on an application for an initial element of development within the STDC site – the Southern Industrial Zone. This development (located north of the Dorna Point site (indicated by the red boundary in Figure 1 above) was for a plot of approximately 418,000sqm of B2 / B8 floorspace with ancillary office development, expecting to accommodate 3,870 employees. Highways England were able to accept the development following a period of dialogue and provision of appropriate assessment at the SRN.

Technical Memorandum structure

This TM:

- Firstly, considers the technical elements of the Scoping Note in order to enable a response to be made to that; and
- Then considers the fit of these development aspirations with the wider strategy for the site (Local Plan policy, SPD, Masterplan) to ensure that the sites are being brought forward in a manner that fits this wider context.

Scoping Report review

This TM mirrors the structure of the Scoping Report and specifically aims to focus on the elements of the Scoping Report that are of interest to Highways England and seeks to provide a response to all the decision points identified by Arup.

Baseline conditions

Highway network

The Scoping Report sets out that the TAs will provide an overview of the local road and the SRN connecting the site to the wider area. It is identified that due to current (Covid-19) conditions, it is not possible for traffic surveys to be undertaken to inform the baseline assessment. This situation is recognised by CH2M.

As with the Southern Industrial Zone scoping, the elements of the SRN that are required to be assessed should be informed by the trip assignment analysis and with a view to the absolute level of impact (noting that percentage impacts will not be considered as an indicator). Information in relation to the full assignment of trips should be presented early in the process (prior to completion of the TAs), in order for agreement to the study area to be reached and to inform other elements of the TAs. Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction on the SRN.

Upon definition of the study area (based on the impact analysis), CH2M recommend that a fully defined approach of reflecting typical traffic conditions is established including sourcing all available traffic data (traffic count companies and Highways England).

With regard to growth and future operational scenarios, CH2M recommend that scenarios mirroring those ultimately agreed as part of the Southern Industrial Zone assessment would be reasonable.

Road safety analysis

The Scoping Report proposes that a high-level review of five years' worth of accident data within the vicinity of the site is to be undertaken.

This approach is accepted but the review will also need to cover any SRN geography that is needed to be included in the study area.

Development proposals

Vehicular access points

The Scoping Report identifies that each TA will provide details about the site access arrangements. While these access points will all be located on the local road network and subject to local highway authority review, information should be available to ensure that Highways England can be satisfied that:

- The trip distribution and assignment analyses pay appropriate cognisance to the access points and the routes which vehicles would traverse the networks; and
- Any operational consequences at the local road network that have the potential to cause subsequent operational issues at the SRN are fully detailed.

Car parking

It is identified that, given the five applications will be in outline form, the level of parking provision is unknown at this stage. While the scale of parking is generally a matter for the local highway authority to satisfy itself with, the level of parking has the potential to influence the trip generation and the sustainability credentials of the site, Highways England will need to be subject to consultation on the reserved matters applications that seek to define the level of parking.

Trip generation

Person trips

The Scoping Report identifies that the trip rates are based on:

- For the large scale industrial sites (Long Acres and the Foundry) the application of the trip rates used in the South Industrial Zone assessment;
- For the smaller sized industrial sites (Dorman Point and Lackenby), the application of trip rates from the TeesAMP development (application ref 18/0308/FUL); and
- For the office based site (Steel House), office trip rates from TRICS have been used.

CH2M has undertaken a review of this information and make the following comments (on the basis that the planning application will be specific in relation to the scale and mix of development proposed):

- Long Acres and the Foundry

It can be confirmed that the trip rates utilised are those agreed as part of the Southern Industrial Zone assessment and these can therefore be accepted.

- Dorman Point and Lackenby

The use of the TeesAMP trip rates for these elements of the development are accepted.

- Steel House

The TRICS assessment and parameters used have not been provided to enable validation of the office trip rates and these should be provided to enable these to be agreed.

Trips by mode

Journey to Work data has been used to infer the proportion of highway trips based on Census zones E02002517 and E02002523 for the northern and southern parts of the site respectively. This is considered a reasonable approach by CH2M.

It is identified that it is proposed that measures will be implemented to support sustainable accessibility to the site. On the basis of these measures, it is identified in the Scoping Report that this will enable at least a 5% reduction in travel to the site by car and therefore it is assumed that the number of car trips could be reduced by 5%.

The Scoping Reports does not suggest whether the base car mode share trips or the adjusted (-5%) car trips will be utilised within the operational assessments in the TAs. Should it be proposed that the latter, there will be a requirement for:

- 1) Clarification in relation to how the measures being proposed transpire into the defined 5% reduction – how has the 5% reduction been quantified;

- 2) A detailed commitment to the identified initiatives, secured through appropriate planning conditions requiring measures to be in place prior to occupation; and
- 3) Potential need for consideration of fallback positions within the Travel Plan in the event that the sustainable measure targets have not been achieved.

Vehicular trip distribution

The Scoping Report proposes that vehicular trip distribution is to be based on (i) at the site access, journey to work distribution trips from the Census data and (ii) existing turning proportions on the highway network.

As discussed through the Southern Industrial Zone application, the use of existing turning proportions to distribute development traffic is not considered acceptable. CH2M therefore recommends that the trip distribution analysis is founded on Census data and that the analysis be provided in spreadsheet form to enable checking and validation.

While initial extents of the trip distribution analysis are provided, noting that Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction, the trip distribution analysis should extend to cover all potential elements fitting this criteria.

Cumulative Assessment and Future Growth

The Scoping Report identifies that a cumulative assessment of all five proposed developments alongside the Southern Industrial Zone will be undertaken. This assessment is welcomed by CH2M.

With a view to consideration of other committed developments and other background growth calculations, CH2M consider that the forecasts utilised as part of the ultimately agreed analysis for the Southern Industrial Zone is utilised rather than create a variant set of analyses that require further development, checking and validation.

The provision of the information in spreadsheet form (including all component elements) will enable a review to be undertaken.

Development Impact Assessment

Scope of Highway Impact Assessment

With regards to the SRN, it is identified in the Scoping Report that elements of the network that will be assessed will mirror those ultimately assessed as part of the agreed Southern Industrial Zone assessments. As identified above, the study area will need to be agreed on the basis of the trip assignments determined from the earlier elements of the analysis.

At this time, it is not possible to validate the areas of the network that require assessment (Highways England consider that the starting point to identifying the need for assessment is based on an impact exceeding 30 two-way trips at a junction) and these should be clarified prior to the undertaking of any operational assessment.

In addition, the assessment of a 2033 future year assessment is welcomed by CH2M, although it will need to be ensured that validated base models are utilised in assessments.

Environmental Impact Assessment

Given the scale of development, there is the potential that there could be significant construction impacts. It may be necessary for the Construction Traffic Management Plan [CTMP] to be conditioned until a clear view on construction impacts (construction trip impacts and potential abnormal loads) is known.

Travel Plan

The Scoping Report outlines that a Travel Plan framework for each site will be prepared. Whilst it would have been welcomed for the transport strategy for the wider STDC site to have set the strategic sustainable transport framework for the site, in terms of the Travel Plans, as discussed earlier, it will need to be considered that:

- 1) Clarification in relation to how the measures being proposed transpire into the defined 5% reduction – how has the 5% reduction been quantified;
- 2) A detailed commitment to the identified initiatives, secured through appropriate planning conditions requiring measures to be in place prior to occupation; and
- 3) Potential need for consideration of fallback positions within the Travel Plan in the event that the sustainable measure targets have not been achieved.

CH2M would welcome these points being considered as the assessment moves forward.

Fit of sites with wider strategies

The site forms parts of the wider STDC site. Whilst reference to the STDC Transport Strategy is made, it is fully recognised that these sites are coming forward in advance of the Transport Strategy having been completed:

- The Scoping Report acknowledges:
 - Within section 4.5 (relating to car parking) that *“A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets) ... It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.”*
 - Within section 5.2 (relating to trips by mode) that *“The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.”*
- As part of discussions relating to the Southern Industrial Zone site, Arup identified *“The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.”*

Bringing such a scale of site forward in advance of a fully defined Transport Strategy is considered by CH2M to be somewhat of a concern to Highways England as this restricts the ability to bring them forward in a strategically-planned manner.

Rewinding a little back to the Local Plan, the Supplementary Planning Document [SPD], the site Masterplan and the Transport Strategy, the following summary is provided with a view to the current position:

Redcar and Cleveland Local Plan (Adopted May 2018)

Local Plan provisions

In relation to development:

- Policy LS4 (South Tees Spatial Strategy) (which includes the STDC) identifies that Redcar and Cleveland Council [the Council] will:
 - (p) *“support improvements to the strategic and local road network to support economic growth”*

- Para 3.27 identifies that a Master Plan is being prepared and this will help guide development of this area, including infrastructure improvements.
- Policy ED6 (Promoting Economic Growth) identifies that:
 - Land and buildings within existing industrial estates and business parks, as shown on the policies map, will continue to be developed and safeguarded for employment uses.”
 - Specialist uses, such as heavy processing industries and port logistics, will be focussed in the following areas, with 405 hectares of additional land available over the plan period. In these areas proposals falling within Use Classes B1, B2, B8 and suitable employment related sui-generis uses will be supported.
 - ED6.2 Land at South Tees 184 hectares.
 - ED6.4 South Tees Industrial Estates and Business Parks 3.5 hectares

In relation to Infrastructure:

- Para 1.112 identifies that the Council will work with organisations to ensure the infrastructure is delivered when required.
- Para 1.113 identifies the Tees Valley Strategic Infrastructure Plan as setting out the current barriers to growth and priorities for improving infrastructure across Tees Valley.
- Para 1.114 identifies that there are plans to deliver improvements to rail and road infrastructure.
- Para 1.124 identifies that it is important to ensure that the borough’s road infrastructure will have the capacity to cope with the expected increase in traffic levels over the life of the Local Plan.
- Para 1.125 states that “Improving transport links will require continued, proactive joint working with ...the Highways Agency ... with the overall aim of establishing a high quality, safe, secure and reliable network ...”

In relation to Transport:

- Para 9.7 identifies the key objectives of the transport strategy component of the Local Plan, including - improve access and connectivity to and from Teesport and the surrounding South Tees area
- Policy TA1 (Transport and New Development) identifies:
 - The Council and its partners will ensure that the transport requirements of new development, commensurate to the scale and type of development, are taken into account...
- Para 9.8 recognises the borough has particular congestion hotspots at the SRN including the A19, A174 and A66 and that new infrastructure may be needed to tackle these congested areas.
- Para 9.17 indicates that the Council follows the requirements of the Guidance on Transport Assessment as the standards for when TS, TA and TPs are required.
- Policy TA2 (Improving Accessibility Within and Beyond the Borough) identifies that the Council will work together with Developers and transport providers. This will include:
 - (f) working with Highways England to improve capacity to the A66, A1053 and A174, particularly Greystones roundabout.
 - (k) working with the Tees Valley Combined Authority and Highways England to deliver capacity improvements to the Strategic Road Network including across the sub-region including improvements to the A19, A1085 and A689 to improve access to key development sites, all providing indirect benefits to Redcar and Cleveland;

- (m) supporting proposals being prepared by Tees Valley Combined Authority and Highways England to deliver improvements to the A66 and A174 road links to the A19 and beyond to the A1/A1(M), providing appropriate access to the strategic highway network from South Tees, to reduce bottlenecks and maintain highway capacity;
 - Where necessary, developers may be required to fund transport improvement schemes through Section 106 agreements where infrastructure provision and capacity would be affected or could constrain new development.
- Para 9.25 states that Redcar and Cleveland benefits from good highways provision catering for heavy vehicles and industrial uses. Linkages between the South Tees, Greater Eston and Redcar and the strategic highway network on the A66, A174 and A19 make the area highly accessible and attractive to industry, business and commuters. It is imperative that this operational benefit over other areas, where capacity is more limited, is not detrimentally affected by any development proposals. It will be essential that improvements and enhancements to the borough's infrastructure continue in order to facilitate local economic development and growth. The Council will continue to work strategically with its neighbouring local authorities and the LEP to maximise on funding opportunities via the Government. The Local Plan is being developed in parallel with the sub-regional Strategic Economic Plan and the Local Growth Fund and is ensuring consistency of objectives. We will also work proactively with the private sector to secure developer contributions to ensure the highway network advantage is maintained and enhanced wherever possible.

The development principles establish that:

- Policy SD4 (General Development Principles) identifies that in assessing suitability, development will be permitted where it:
 - a) meets the requirements of the locational policy and accords with other Local Plan policies and designations
 - g) will have access to adequate infrastructure ... to serve the development
 - p) provide suitable and safe vehicular access
- Policy SD5 (Developer Contributions) identifies that the Council may secure developer contributions in order to fund necessary infrastructure.

Highways England position

The joint position statement between Highways England and the Council noted that the development in the Local Plan is unlikely to have a significant impact on the SRN and the package of measures proposed are acceptable to both Highways England and the Council in ensuring that the SRN can support the growth aspirations identified in the Local Plan.

The proposed schemes are promoted through the Local Plan in Policy TA3 and the supporting Infrastructure Delivery Plan, specifically identifying improvements to the A19, A1053, A66 and A174; while recognising that further work is required to specifically identify the phasing of the improvements and the quantum of development that can be accommodated on the SRN prior to the improvements being required.

It was noted that applications for development will be managed on an individual basis.

South Tees Area Supplementary Planning Document [SPD] (Adopted May 2018)

During the consultation on the SPD, Highways England noted general support, but that it should be delivered in accordance with Local Plan Policy TA2 and the Infrastructure Delivery Plan and that there

was a need to ensure that the implications at the SRN are understood and addressed in line with the package of SRN improvements detailed within the Local Plan and Tees Valley AAP.

In summary, the SPD:

- Seeks to guide and inform future planning applications in the area and used as a material consideration in determining planning applications.
- Identifies requirements and provides a broad strategy to deliver supporting infrastructure.
- Commits to the development of a Transport Strategy.
- Seeks the creation of up to 20,000 new jobs.
- Contributions relevant to the nature and scale of the development may be sought, including ... in order to fund necessary infrastructure ... required as a consequence of development and in accordance with Local Plan policy SD5.
- Seek to improve and enhance the transport infrastructure serving the South Tees Area, as supported by Local Plan Policy LS4.
- All new development proposals shall be in accordance with Local Plan Policies SD4 and TA1 and will be required to have access to adequate infrastructure to meet their transport requirements.
- Other highways infrastructure proposals will be delivered in line with emerging development priorities and funding availability and will be identified through the Transport Strategy for the Area.
- The Council, working in partnership with the STDC, the Tees Valley Combined Authority and other infrastructure providers will actively seek public sector funding to support infrastructure development in line with the SPD. Necessary off-site infrastructure contributions would be sought through Section 106 planning obligations or through the use of 'Grampian' planning conditions. Obligations could include physical works or contributions towards highway measures to mitigate the transport impacts of the development.
- It is intended that the SPD will be reviewed with a view to the preparation of the technical supporting documents (including the transport strategy).

South Tees Regeneration Master Plan (November 2019)

The South Tees Regeneration Masterplan identifies:

- The Tees Valley's key road transport assets include the strategic growth corridor of the A19, the A1(M), linking North and South, and the A66, providing Trans-Pennine East to West connectivity. Few areas of the UK are better served by road services.
- Centrally placed within the Tees Valley, the STDC area has excellent road transport connections. The A66 East-West route commences at the STDC boundary, and the nearby A174 Parkway provides direct access to the A19. Both the A66 and A19 provide direct connectivity to the A1(M) North-South route, which in turn affords access to the M62 strategic Trans-Pennine road corridor.
- To support the proposed major development of South Tees, coupled with the ambitions of TVCA in its delivery of the Strategic Economic Plan, there will be a need to improve the area's transport connectivity.
- Notwithstanding the STDC's excellent transport connections, there are some wider connectivity barriers, including significant pressure points on the A19 and on the road network accessing the A1(M) and A19.
- The future redevelopment of the STDC area for industrial use will need to consider and address Transport infrastructure requirements.

- Consideration will be given to the impact on the local highway network of the planned major increases in development traffic that will ensue as the proposals for the regeneration programme begin to be realised, so that junction capacities are not adversely impacted and that the current favourable position the South Tees area benefits from is not compromised. The requirements for Transport Appraisals to assess transport impacts, particularly highways, will be given due attention as the development proposals begin to be fleshed-out.
- Next steps: STDC will continue to develop key thematic delivery strategies, as discussed within the South Tees Area SPD, including Transport.

Transport Strategy

Highways England has engaged in the process of the transport strategy development with the last dialogue in April 2020. A Phase 1 Report was produced outlining modelling to be undertaken in Phase 2, but Phase 2 has not been forthcoming to date.

As part of work in reviewing the STDC South Industrial Zone application, it was identified that the next Steering Group meeting would be being arranged in due course.

As part of the initial review of that application scoping, CH2M identified *“The South Tees Regeneration Master Plan states that “consideration will be given to the impact on the local highway network of the planned major increases in development traffic that will ensue as the proposals for the regeneration programme begin to be realised, so that junction capacities are not adversely impacted and the current favourable position the South Tees area benefits from is not compromised. The requirements for Transport Appraisals to assess transport impacts, particularly highways, will be given due attention as the development proposals begin to be fleshed-out”.* With this in mind, CH2M recommend that a view of the full site impacts is provided, either in the Scoping Report itself or alongside it, so that a view can be gained.

Wider Strategies - considerations

The Scoping Report acknowledges:

- Within section 4.5 (relating to car parking) that *“A transport strategy for the wider Teesworks site is currently in development but will limit car parking within the site to meet sustainability targets) ... It is subsequently anticipated that the internal layout, when developed, will support the strategy and limit car parking as far as reasonably possible.”*
- Within section 5.2 (relating to trips by mode) that *“The transport strategy for the site will seek to reduce car mode share significantly. However, these earlier developments coming forward may not benefit from the longer-term strategy improvements proposed up to 2042.”*

As part of discussions relating to the Southern Industrial Zone site, Arup identified *“The transport strategy for the wider STDC site will be looking at a longer-term horizon in terms of future year assessments. The impact of the wider STDC site up to a final year scenario, expected to be circa 2040, will be assessed by undertaking strategic modelling of the surrounding highway network.”*

With a view to this, the following comments are made:

- The requirement for consideration of the impact on infrastructure, and the need to work with Highways England in relation to the SRN, is clear throughout the documents.
- The very fact that there is a location-specific SPD, a Masterplan, and a requirement for a Transport Strategy, highlights the need for a strategic approach to this site. It is disappointing that this is not flowing through the work undertaken. Dealing with the sites on an application by application basis may lead to a point whereby later applications on the site / other developments in the area may need infrastructure measures to enable them, due to these developments having consumed the available capacity. Similarly, the competitive advantage that the area has with regard to the

strategic connectivity may be diminished if the impacts are not considered in a more strategic manner.

- The SPD has committed to the production of the Transport Strategy, but this is still forthcoming. Priorities and funding availability for highways infrastructure is suggested as being identified through the Transport Strategy.
- The SPD points towards the creation of 20,000 jobs. The five applications under current consideration, along with the Southern Industrial Zone application, amount to an estimated 15,260 jobs. This is a significant (over 75%) proportion of the sites’ aspirations that are coming forward in the absence of any form of strategic approach to transport.
- The SPD identifies that it would be reviewed 12-18 months post adoption to take account of the various technical documents including the Transport Strategy. Having been adopted in mid-2018 this review being informed by the Transport Strategy (amongst others) would have been expected to have happened by now.
- The Masterplan identifies that there is a need to improve the area’s transport connectivity to support the proposed major development in South Tees.

Summary and Conclusion

The following table lists all the items that were highlighted in the Scoping Report as decision points and Highways England’s response.

Table 2 – Scoping Report Decision Points

Scoping Report Section	Decision point (as defined in Scoping Report)	Highways England response	Suggested Action
2. Planning Policy Review	Documents proposed for planning review	Acceptable	No action
3. Baseline Conditions	Scope of transport networks	Comments made	<p>Definition of the study area, based on the SRN criteria, should be provided early in the process to provide clarity of network to be assessed.</p> <p>At this point the establishment of the baseline position at the SRN should be confirmed.</p> <p>Growth and future operational scenarios should match that considered during the review of the Southern Industrial Zone.</p>
	Methodology for establishing baseline traffic flows	Comments made	<p>At the point of having established the study area, the baseline position at the SRN should be confirmed.</p> <p>Growth and future operational scenarios should match that considered during the review of the Southern Industrial Zone.</p>

Scoping Report Section	Decision point (as defined in Scoping Report)	Highways England response	Suggested Action
	Scope of the accident appraisal	Comments made	Needs to cover extents of SRN geography.
4. Development Proposals	Transport Proposals	Comments made	Access points will need to be considered in as far as they influence definition of SRN impacts.
5. Trip Generation	Trip rates	Comments made	Information supporting the derivation of the office trip rates is required in order to verify their use.
	Mode share proportions	Comments made	The use of Census data is supported. Further information in relation to a proposed 5% reduction would be required in order for this to be accepted.
	Proposed trip distribution	Comments made	Census data distribution is accepted, but assessment using existing turning proportions is not accepted. The analysis should extend as far as is required to ensure appropriate consideration of the SRN.
	Approach to growth forecast	Comments made	The approach should mirror that ultimately used in the Southern Industrial Zone assessment.
6. Development Impact Assessment	Scope of highways impact assessment	Comments made	The starting point for identifying the need of assessment at the SRN is based on an impact exceeding 30 two way trips at a junction
	Junction assessment scenarios	Acceptable	
	Scope of the EIA	Acceptable	The CTMP will need to be conditioned until a clear view on construction impacts is known.

In the wider sense, an update on the Transport Strategy and how the intentions of the wider policies are being secured needs to be questioned. While Highways England need to respond to these planning applications on their own merits, the strategies were put in a place for a reason and without them, a significant proportion of this large employment site is likely to come forward in a manner that is not consistent with the ambitions of the wider strategies.

Finally, with regard the applications currently subject to review, CH2M would promote that these are progressed through proactive collaboration between the parties. While noting that all development applications have time pressures with a view to gaining approval, the discussions allied with the Southern Industrial Zone application involved significant pressure to get things resolved. These timescales did not seem to fit with (i) the scale of development being proposed or (ii) the lack of initial

appetite to give appropriate consideration to the SRN. This should be avoided as part of these applications, which themselves are of a significant nature.

From:
To:
Subject: [External] RE: TA Scoping Report for Teesworks
Date: 30 November 2020 14:54:27

Thanks for sharing the draft scoping report.
Collective thoughts from Tony & myself are below.
Please do get in touch if anything needed.
Thanks

Comments so far.

- The Local Transport Plan has been partially replaced by the Tees Valley Strategic Transport Plan and will be fully replaced when the Local Implementation Plan is adopted in 2021.
- Focus should also include how pedestrians, cyclists and public transport users will access each site upon first occupation (we recommend footway & cycleway links on both sides of each internal road from 3m shared surfaces on minor roads up to 2m+2m segregated facilities on the major links). But connectivity may not be along the same alignments as general road access & will connect directly to adjacent residential areas &
- early (temporary) internal connectivity between sites before the masterplan infrastructure is in place needs to be resolved before first occupation. The operation of financially viable and attractive bus services for users will be difficult if the sites are effectively served by a series of dead end roads from the A66 or A1085.
- Dorman Point site – access direct to Tees Dock Road should also be considered for this site. Possibly via the Grangetown Station Road corridor?
- Re-opening of Redcar British Steel Railway Station should be programmed at first occupation of Foundry, Long Acres & Steel House sites.
- Charging point infrastructure for electric vehicles needs to be integral to each car park/or distributed through each site. Solar farms using building roofs should be considered.
- Hydrogen filling stations will be initially provided at Eston Road and Teesport by TVCA, but more hydrogen infrastructure may be required.
- A Teesworks wide travel plan should be developed based on the evidence contained in the Transport Study & best practice. This should establish core principles/actions that developers will be required to sign up to with additional measures introduced as required by each business. Appointing a Travel Plan Co-ordinator for the Teesworks site with a delivery budget before first occupation would be preferable.

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