7 TRAFFIC AND TRANSPORT

7.1 Introduction

7.1.1 This Chapter, prepared by WSP, reports the likely significant effects of the construction and subsequent operation of the Proposed Development in terms of Traffic and Transport in the context of the Site and surrounding area. In particular it considers the likely significant effects of changes in traffic flows on:

- Local Roads;
- Road Users;
- Land Uses;
- Environmental Resources; and
- Sensitive Receptors (including users and occupiers) fronting roads.

7.1.2 This Chapter is not intended to be read as a standalone assessment and reference should be made to the front end of this ES (Chapters 1 – 6), as well as the final chapters, 'Summary of Residual and Cumulative Effects' and 'Conclusions' (Chapters 21 - 22).

7.2 Legislation, Policy and Guidance

7.2.1 The relevant legislation, policy and guidance are listed below.

Legislative Framework

7.2.2 The applicable legislative framework is summarised as follows:

- Well-being of Future Generations (Wales) Act (2015) – sets out the Welsh Government's ambition, permission and legal obligation to improve the nation's social, cultural, environmental and economic well-being.

Planning Policy

7.2.3 The applicable planning policy is summarised as follows:

- Future Wales: The National Plan 2040 (2021) – forms the National Development Framework for Wales up to 2040.
- Planning Policy Wales (PPW) (Edition 11, 2021) – outlines land use planning policies.
- Cardiff Local Development Plan (LDP) (2016) – is the basis for decision making on land use planning in Cardiff. A renewed and updated plan called the Cardiff Replacement Local Development Plan is in development to consider land use between 2021 to 2036.

- Cardiff's Transport White Paper: Transport Vision to 2030 (January 2020) – lays out the council's 10-year plan to tackle the climate emergency, reduce congestion and improve air quality in the Welsh capital. It has been developed following consultation with thousands of city residents, health and transport experts.
- Wales Transport Strategy (March 2021) – sets out the Welsh Government's aims of creating *"an accessible, sustainable transport system"*. It complements the aforementioned Future Generations (Wales) Act.

Guidance

7.2.4 The applicable guidance is summarised as follows:

- Cardiff Council Supplementary Planning Guidance – Managing Transportation Impacts (July 2018) which sets out the Council's approach to assessing and managing the transport impacts of development, including the need for Transport Assessments and mitigation measures that should be adopted.
- Active Travel (Wales) Act (2013): requires the Welsh Government and all local authorities to actively promote and provide for walking and cycling opportunities. By doing this, the Government hopes that the benefits of using active travel modes will be realised by individuals and society across Wales.
- Active Travel Guidance (Welsh Government, February 2020): published under the Active Travel (Wales) Act and provides advice on the planning, design, construction and maintenance of active travel networks for all parties, including the public during consultation stages.
- Technical Advice Note (TAN) 18: Transport (March 2007) which forms the transport element of PPW. It sets out requirements for Transport Assessments and Transport Implementation Strategies to assess and respond to the impacts of development.
- The Guidelines for the Environmental Assessment of Road Traffic (GEART) (Institute of Environmental Assessment, 2019).
- Design Manual for Roads and Bridges (DMRB) sets out the information about the UK's standards for designing, assessing and operating motorway and all-purpose trunk roads in the UK.

- Manual For Streets / Manual For Streets 2 (2007 / 2010) outline the key principles of sustainable street design for locations with only light volumes of low-speed traffic.

7.3 Assessment Methodology and Significance Criteria

Scope of the Assessment

7.3.1 As set out in the Scoping Report (Appendix 5.1), the environmental factors which will be considered in relation to Traffic and Transport are the Proposed Development's impacts on population and human health during construction and operational phases.

7.3.2 Elements which have been considered are:

- Severance (separation of people from places or other people or obstruction of pedestrian access to essential facilities).
- Driver Delay (traffic delays to non-development traffic).
- Pedestrian Delay (ability of pedestrians to cross roads due to changes in traffic volume, composition and speed and the level of pedestrian activity, visibility and physical conditions of the Proposed Development).
- Pedestrian Amenity (effect of the Proposed Development on the experience of pedestrian journeys due to changes in traffic flow, composition, and separation from traffic).
- Fear and Intimidation (due to increase in traffic volume and its proximity or lack of protection).
- Accidents and Safety (risk of collisions occurring through the Proposed Development changing the character of existing traffic).

Extent of the Study Area

7.3.3 Figure 7.1 shows the study area agreed with Cardiff Council during preliminary consultation.

7.3.4 The assessment area has been established based on the potential geographical extent of significant effects that might arise from the Proposed Development in relation to a range of transport modes. For example:

- Travel by foot – the focus is on access to facilities within 5 - 30 minutes' walk of the Site;

- Travel by cycle – the focus is on access to facilities within 5 - 30 minutes' cycle of the Site;
- Travel by public transport – the focus is on access to public transport interchanges that are within a suitable walking range, (within 12 minutes to be considered as part of the Public Transport Access Level (PTAL) assessment). Once at the interchange, consideration is given to which destinations can be reached; and
- Travel by car – the focus is on a section of local highway network as agreed with Cardiff Council.

Figure 7.1 Study Area & Extent of VISSIM Model.

7.3.5 As can be observed, the study area covers the area surrounding the Proposed Development and the key ingress/egress roads for development users, including the Cardiff Bay Link Road/Eastern Bay Link Road.

Consultation Undertaken to Date

7.3.6 Table 7.1 provides a summary of the consultation activities undertaken in support of the preparation of this Chapter.

Organisation	Summary of Outcome of Discussion
Cardiff Council Highways & Traffic Modelling Teams	Development of the scope of the study area for assessment within the Transport Assessment (TA) and the level of transport modelling required. Subsequent meetings to consider key design matters and solutions.
Transport for Wales	Development and delivery of the Metro project and its phases of delivery
Transport for Wales	Data requirements from the South East Wales Transport Model and its use within the TA

Baseline Scenarios and Assessment Period

7.3.7 The Proposed Development is assessed against the following scenarios:

- **2018 Current Baseline:** representing the existing Site uses with existing public transport, pedestrian and cycle facilities and existing road traffic flows and road accident records;
- **2025 Future Baseline Plus Phase 1 Operational:** the likely future highway and transport baseline taking account of any cumulative schemes in the area operational by 2025, should the remainder of the Proposed Development not come forward; and
- **2032 Future Baseline plus Phase 1 + Phase 2 Operational:** the likely future highway and transport baseline taking account of any cumulative schemes in the area to be operational by 2036, and the Proposed Development including Atlantic Wharf, Butetown Masterplan.

7.3.8 The network AM and PM peak periods have been determined as follows:

- AM peak hour: 08:00 to 09:00; and
- PM peak hour: 16:30 to 17:30.

7.3.9 These peak periods represent times when the local transport network is most heavily utilised, therefore providing a 'worst-case' scenario. The selected assessment periods have been agreed with Cardiff Council.

Baseline

7.3.10 The existing Site is in the Inner Harbour area of Cardiff Bay within the unitary authority area of Cardiff Council and is governed by transport and planning policy pertaining to Wales.

7.3.11 The Site comprises two parcels of land located to the north and south of Hemingway Road.

7.3.12 The existing land uses present on the Site are as follows, with the northern parcel featuring:

- Cardiff County Hall;
- around 220 metres (m) of Schooner Way, and
- 550 space Cardiff County Hall Car Park.

7.3.13 The southern parcel features:

- The Red Dragon Centre (RDC) (11,007 square metres (m^2));
- 765 space Red Dragon Centre Car Park;
- 112-bed Travelodge Hotel, and
- 830m^2 restaurant.

Evolution of the Baseline

7.3.14 The evolved baseline is a baseline condition at an indeterminate point in the future, for a scenario which assumes all of the cumulative schemes are built, in the absence of the Proposed Development being built.

7.3.15 This scenario represents the future transport networks, should the Proposed Development not come forward. As common for city centre developments with a strong provision of public transport, it is assumed that there is no growth in baseline traffic flow for the future year of opening, excluding new trips generated by cumulative schemes. This has been agreed in consultation with Cardiff Council.

7.3.16 The Evolution of the Baseline scenario represents the future transport networks including full occupation of the cumulative schemes set out in Chapter 5 of this ES.

7.3.17 It should be noted that all of these have been reviewed in terms of their individual TAs and the associated impacts.

7.3.18 The Proposed Development proposals are split into two phases for the purposes of the Traffic and Transport assessment. Phase 1 involves the following development:

- Delivery of a 15,000 capacity Arena and Plaza
- Completion of a 182 room Hotel
- Construction of a 1,300 space MSCP
- Demolition of the existing Travelodge
- Demolition of the existing A3 Unit

7.3.19 Phase 2 consists of the following development:

- Construction of a new Red Dragon Centre (RDC2) with residential use above (150 units)
- Construction of This Is Wales (5D Flight Experience)
- Construction of a new Footbridge over the A4232
- Demolition of existing RDC
- Construction of a new Wales Millennium Centre (WMC) Academy
- Construction of Cardiff Story Museum
- Construction of mixed use development
- Construction of the new event square (Atlantic Square)
- Demolition of Cardiff County Hall
- Construction of a new commercial office adjacent to Lloyd George Avenue
- Construction of the new Contemporary Art Museum
- Completion of the Atlantic Square
- Construction of new residential development (900 units)
- Construction of 3no. Hotels

7.4 Assessment Methodology

7.4.1 This section provides a detailed methodology of how the IEMA Guidelines have been applied in this assessment to determine the transport and traffic related effects during both the demolition and construction stage of the Proposed Development as well as when it is complete and operational.

7.4.2 For both the construction and the operational stage assessments, two factors are considered. Firstly, the sensitivity of each receptor (e.g. users of the transport network) to transport impacts at which the assessment is being undertaken is considered. Secondly, the magnitude of the impact is assessed which will depend on the factor being considered (e.g. severance or pedestrian amenity): the change in traffic flow; and the total traffic flow.

7.4.3 The above two factors are then combined to give a 'Scale of Effect' which depends on the sensitivity of the receptor and the magnitude of the impact.

7.4.4 With reference to Paragraph 4.5 of the IEMA Guidelines, the assessment of magnitude of impact, sensitivity of receptors and the scale of an effect is primarily a matter for the assessor based on experience and an assessment of relevant factors, backed-up by data or quantified information wherever possible. Further detail on the methodology for defining the effects can be found in the Chapter 5 (Approach to Environmental Impact Assessment).

7.4.5 The 'Guidelines for the Environmental Assessment of Road Traffic, IEMA, 2019' set out several potential environmental effects generated by highways and transport which potentially require assessment. Those which relate to this assessment are:

- Severance;
- Delay (Driver, Pedestrian, Cycle, Public Transport);
- Amenity; and
- Fear and Intimidation.

7.4.6 These environmental effects are set out in more detail below.

Severance

7.4.7 Severance is defined in paragraph 4.27 of the Guidelines:

"Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance may

result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impede pedestrian access to essential facilities".

Delay (Driver, Pedestrian, Cycle, Public Transport)

7.4.8 The guidance refers to potential delays to drivers and to pedestrians. Users of other modes can also experience delays, such as cyclists and those travelling by bus and rail.

7.4.9 Drawing upon the 'IEMA Guidelines' and professional experience, driver delay and delay to bus users may change where:

- traffic flows change at junctions;
- new junctions are introduced;
- existing junctions are changed;
- speeds on existing links are changed;
- existing links are closed;
- new links are opened;
- frequency of use of controlled pedestrian or cycle crossings change; and
- new controlled pedestrian or cycle crossings are introduced.

7.4.10 The IEMA Guidelines note that the Department of Transport has assumed 30%, 60% and 90% changes in traffic levels should be considered as "slight", "moderate", and "substantial" impacts respectively. The guidelines also note that increases in traffic of as little as 5% may be significant in terms of the capacity criteria of highway but not its environmental impacts, and the criteria set out within the guidance make the higher thresholds more relevant to the assessment of the environmental impacts of traffic increases.

7.4.11 Delay to bus users may also change where bus routes or bus stops are proposed to be changed or where demand for a bus exceeds capacity.

7.4.12 Pedestrian and cyclist delay may change where:

- pedestrians and cyclists cross existing roads where traffic flows are projected to change;
- pedestrians and cyclists' cross new roads;

- existing roads which pedestrians and cyclists would have crossed are removed;
- road speeds change;
- pedestrian and cycle volumes change;
- new crossing facilities are provided; and
- existing pedestrian crossing facilities change.

7.4.13 Rail delay may change where:

- passenger areas within stations become congested; and
- demand for a train exceeds capacity.

Amenity

7.4.14 Amenity is defined in paragraph 4.39 of the IEMA Guidelines:

"the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition, and pavement width/separation from traffic. This definition also includes pedestrian fear and intimidation and can be considered to be a much broader category including consideration of the exposure to noise and pollution, and the overall relationship between pedestrians and traffic."

Fear and Intimidation

7.4.15 Fear and intimidation are defined in paragraph 4.40 of the IEMA Guidelines:

"The impact of this is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths."

7.4.16 Amenity, fear and intimidation may be considered for pedestrians, cyclists, bus passengers and rail passengers. Amenity, fear and intimidation can be considered together as they are strongly interrelated.

Methodology For Defining Effects

Receptors and Receptor Sensitivity

7.4.17 Receptors are defined as the users of the transport network, i.e. drivers, pedestrians, cyclists, or public transport users, for each mode of transport.

7.4.18 The criteria, taken from the IEMA guidance used to assess receptor sensitivity are presented below:

- High – modes of transport which are heavily used (by all users or particularly by vulnerable road users[1]) relative to other receptors within the study area or those which have a low capacity to accommodate modes of transport without significant effects arising;
- Moderate – receptors which are used (by all users or particularly vulnerable road users) to an average level relative to other receptors within the study area or those which have a moderate capacity to accommodate change without significant effects arising;
- Low – modes of transport which are lightly used (by all users or particularly vulnerable road users) to an average level relative to other receptors within the study area or those which have a high capacity to accommodate change without significant effects arising; and
- Negligible – modes of transport which are very lightly used (by all users or particularly vulnerable road users) to an average level relative to other receptors within the study area or those which have a very high capacity to accommodate change without significant effects arising.

Magnitude of Impact

7.4.19 To assist with the judgement of magnitude of impact, reference has been made to the IEMA Guidelines. This guidance sets out considerations, and, in some cases, thresholds in respect to changes in the volume and composition of traffic to facilitate a subjective judgement of impact and magnitude. These thresholds are guidance only and provide a starting point by which a detailed analysis will inform a subjective analysis of the impact magnitude.

7.4.20 It is important to note that during the demolition and construction works the impacts assessed are temporary, not permanent and this affects the magnitude (and so resulting effect scale) assigned to them.

7.4.21 The criteria that have been used to assess the magnitude of impact for qualitative assessment, are described in Table 7.2. Table 7.3 is used to help identify the

[1] *Vulnerable road users encompass pedestrians, cyclists and subgroups like children and elderly people.*

magnitude of change for quantitative assessments, supported by professional judgement to take full account of the specific context.

Table 7.1: Magnitude of Impact Criteria for Qualitative Assessments	
Magnitude	**Criteria**
High	Changes which are likely to be perceptible and which would significantly change conditions which would otherwise prevail to the extent that it would significantly affect travel behaviour.
Medium	Changes which are likely to be perceptible and which would materially change conditions which would otherwise prevail to the extent that it may affect travel behaviour to a measurable degree.
Low	Changes which are likely to be perceptible but not the extent that it would materially change conditions which would otherwise prevail.
Negligible	Changes which are unlikely to be perceptible.

Table 7.2: Magnitude of Impact Criteria for Quantitative Assessments				
Effect	**Negligible**	**Low**	**Medium**	**High**
Severance	Change in total traffic or HGV flows of less than 30%	Change in total traffic or HGV flows of 30% to 60%	Change in total traffic or HGV flows of 60% to 90%	Change in total traffic or HGV flows over 90%
Public Transport Users	Increase or decrease in peak hour passenger demand of less than 10%	Increase or decrease in peak hour passenger demand of 10-30%	Increase or decrease in peak hour passenger demand of 30-60%	Increase or decrease in peak hour passenger demand of more than 60%

7.4.22 The above severance criteria reflects the guidance set out in Paragraph 4.31 of the IEMA Guidance.

Screening Process

7.4.23 Within the IEMA Guidelines, two broad rules are suggested which can be used as a screening process to limit the scale and extent of the assessment:

- Rule 1 – include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows have increased by 10% or more.

7.4.24 Where the predicted increase in traffic flows is lower than the above thresholds, the IEMA Guidelines suggest that the magnitude of impact and so the resulting scale of

the effect can be stated to be Negligible (not significant) and further detailed assessments are not warranted. Furthermore, increases in traffic flows below 10% are generally considered to be insignificant in environmental terms given that daily variations in background traffic flow may vary by this amount.

Type of Impact

7.4.25 The IEMA Guidelines set out a number of potential environmental effects relating to highways and transport considerations which potentially require assessment. The following paragraphs cover each of the impacts that are considered in this assessment as having a potential resulting environmental effect.

Severance

7.4.26 Severance is defined as the perceived division that can occur within a community when it becomes separated by a major traffic artery and describes a series of factors that separate people from places and other people. Such division may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself.

7.4.27 For the purposes of the assessments presented within this Chapter, the measurement and prediction of severance is made with reference to road width, traffic flow, speed, the presence of crossing facilities and the number of movements across the affected route.

7.4.28 IEMA Guidelines refer to the DfT's 'Manual of Environmental Appraisal', which suggests the following impacts of changes in traffic flow resulting in severance:

- 30% – slight magnitude of change;
- 60% – moderate magnitude of change; and
- 90% – substantial magnitude of change.

7.4.29 It is advised that these broad indicators should be used with care and regard paid to specific local conditions. For the purpose of consistency with the remainder of the assessment, 'slight', 'moderate', and 'substantial' are referred to as 'low', 'medium' and 'high', respectively.

7.4.30 The IEMA Guidelines also note that increases in traffic of as little as 5% may be significant in terms of the capacity criteria of a highway but not its environmental

effects, and the criteria set out within the guidance make the higher thresholds more relevant to the assessment of the environmental effects of traffic increases.

Pedestrian Delay

7.4.31 IEMA Guidelines note that changes in traffic volume, composition and/or speed of traffic may impact the ability of people to cross-roads. Typically, increases in traffic levels result in effects of increased pedestrian delay, although increased pedestrian activity itself also contributes. The guidelines do not set any thresholds, recommending instead that assessors use their judgement to determine the magnitude of the impact.

7.4.32 The IEMA Guidelines refer to a report published by the Transport Research Laboratory (TRL)[2] SR356, Goldschmidt, 1976) as providing a useful approximation for determining pedestrian delay. The TRL research concluded that mean pedestrian delay was found to be 8 seconds at flows of 1,000 vehicles per hour and below 20 seconds at 2,000 vehicles per hour for various types of crossing condition. This research has been reproduced in Volume 11 of the Design Manual for Roads and Bridges (DMRB)[3]. Figure 1 of Part 8 provides predictive mean pedestrian delay based on empirical data, taking into account traffic flow and a range of parameters such as crossing width and vehicle speeds.

Pedestrian Amenity

7.4.33 The IEMA Guidelines define pedestrian amenity as the relative pleasantness of a journey and can include fear and intimidation if they are relevant. As with pedestrian delay, amenity is impacted by traffic volumes and composition, along with pavement width and pedestrian activity. The guidelines suggest tentative thresholds of impact would be where the traffic flow is halved (which is not relevant for this project as decreases in traffic are not likely) or doubled.

Cyclist Delay and Amenity

7.4.34 Professional judgement has been used to consider the likely effects on the surrounding cycle network during demolition and construction works and once the Proposed Development is complete and operational.

[2] *Transport Research Laboratory, SR356, Goldschmidt, 1976*
[3] *Volume 11, Section 3, Part 8 of the Design Manual for Roads and Bridges (2020)*

Driver Delay

7.4.35 Driver delay is identified in the IEMA Guidelines as an issue which can occur at several points on the highway network, although the effects are only likely to be significant when the traffic on the highway network is predicted to be at or close to the capacity of the system. The impact of the Proposed Development's traffic generation on driver delay has been assessed for the daily period.

Accidents and Safety

7.4.36 IEMA Guidelines do not include any definition in relation to accidents and safety, suggesting that professional judgment will be needed to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents.

Fear and Intimidation

7.4.37 Fear and intimidation are defined by the guidance in Paragraph 4.40 of the IEMA Guidelines:

"The impact of this is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths."

7.4.38 Amenity, fear and intimidation may be considered for pedestrians, cyclists, bus passengers and rail passengers.

Defining the Effect

7.4.39 The scale of the resulting effect is judged on the relationship between the magnitude of impact and the assessed sensitivity and/or importance of the receptor.

7.4.40 The significance of adverse or beneficial effects have been defined as either negligible, minor, moderate or major as set out in0 Table 7.4.

Table 7.3: Scale of Effect

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Minor	Minor
Medium	Negligible	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

7.4.41 The nature of effects is described as either:

- Beneficial - effects that produce benefits in terms of transportation and access; or

- Adverse - effects that produce a negative effect in terms of transportation and access.

7.4.42 The duration of effects has been reviewed based on the following criteria:

- Temporary - Short term: less than 12 months;
- Temporary - Medium term: 12 months - 5 years;
- Temporary - Long term: more than 5 years; and
- Permanent - effects that are considered to be extremely long lasting.

7.4.43 For the completed and operational Proposed Development, the effects are permanent whereas for the demolition and construction works, the effects are expected to be temporary short to medium-term.

7.4.44 Direct effects result without any intervening factors whilst indirect or 'secondary' effects are not directly caused by an action or trigger or result from something else.

Geographic Extent

7.4.45 With regard to the geographic extent of the effects, these will be local potentially affecting the Site and the neighbouring receptors.

7.4.46 The spatial extent of the effects is considered based on the following thresholds:

- 'Site' or 'Local' – affecting receptors in the Site and immediate surroundings;
- 'District' or 'Borough' – affecting receptors in the Cardiff Council area and surrounding boroughs;
- 'Regional' – affecting receptors in the Cardiff area; and
- 'National' – affecting receptors in different parts of the country.

Categorising Likely Significant Effects

7.4.47 In terms of the effect significance, moderate and major effects are considered to be 'significant'. Effects that are minor or negligible are 'not significant'.

Construction

7.4.48 The transport effects of the Proposed Development during the construction phase are considered through the key transportation issues assessed within the TA and include the following:

- vehicle routing;

- construction traffic impact;
- pedestrian and cycle impact; and
- public transport impact.

7.4.49 The forecast will be assessed against the baseline traffic data for each link in accordance with the IEMA[4] guidelines. Where the change in traffic flow is less than 30% (10% for sensitive receptors), the environmental effects have been assessed to be negligible as the IEMA Guidelines recommend that these limits should be used as a screening process to delimit the scale and extent of the assessment.

7.4.50 A quantitative assessment has been undertaken for the following effects by comparing the percentage change in vehicle and Heavy Goods Vehicles (HGVs) between the baseline and the forecast trip generation forecast for the construction stage of the Proposed Development, and by applying the rules set out in the IEMA Guidelines:

- Severance;
- Driver Delay;
- Pedestrian and cyclists delay, amenity;
- Pedestrian and cyclists fear and intimidation;
- Public Transport Delay (National Rail/Bus Network); and,
- Accidents and Safety.

7.4.51 During construction, the HGV activity, as a result of low vehicular numbers, is not expected to result in changes which could affect accidents and safety. Traffic changes arising from the construction of the Proposed Development will be low and not considered to be perceptible relative to baseline conditions. Road safety will also be further manged and mitigated through the Construction Logistics and Cycle Safety (CLOCS) scheme and use of contractors registered on the Considerate Contractors Scheme (CCS). An assessment of accidents and safety is therefore scoped out of the assessment.

7.4.52 Hazardous loads have also been scoped out of the assessment as there are not envisaged to be any in relation to the Proposed Development.

[4] *Guidelines on Environmental Assessment of Road Traffic, (IEMA)*

7.4.53 During construction, the Proposed Development is not expected to result in changes which could affect perceptions of fear and intimidation as there are no changes to the local road network junctions, and no fundamental changes to the prevailing travel patterns in the locality.

7.4.54 The change in HGV activity relative to the Baseline is unlikely to be perceptible on the surrounding road network as they already feature an above average number of HGVs due to the Site's location in close proximity to the docks which generate HGV trips.

7.4.55 The presence and movement of construction vehicles will also be managed and mitigated through the Construction Environmental Management Plan (CEMP) and Construction Transport Management Plan (CTMP) to minimise the potential for effects on amenity, fear and intimidation in the area.

Completed Development

7.4.56 Trip generation and modal split calculations for the proposed Arena have been based on surveys undertaken at the existing Cardiff Motorpoint Arena to understand existing travel patterns for customers. Staff mode split data have been sourced from the TRICS database.

7.4.57 Trip generation for the Hotel has been derived from the TRICS database.

7.4.58 The 'Guidelines for the Environmental Assessment of Road Traffic, IEMA, 1993' set out a number of potential environmental effects which may require assessment. Those which relate to this assessment are:

- Trip Generation, (methodology set out in the TA – considered to be worse case assessment);
- Servicing, (methodology set out in TA);
- Severance;
- Parking, (methodology set out in TA);
- Delay (driver, pedestrian and cyclist);
- Amenity (pedestrian and cyclist);
- Fear and intimidation (pedestrian and cyclist);
- Accidents and safety; and
- Hazardous loads.

Assumptions and Limitations

7.4.59 This assessment has utilised the Council's modal split targets for 2011, 2021 and 2026 which are illustrated in Figure 7.2.

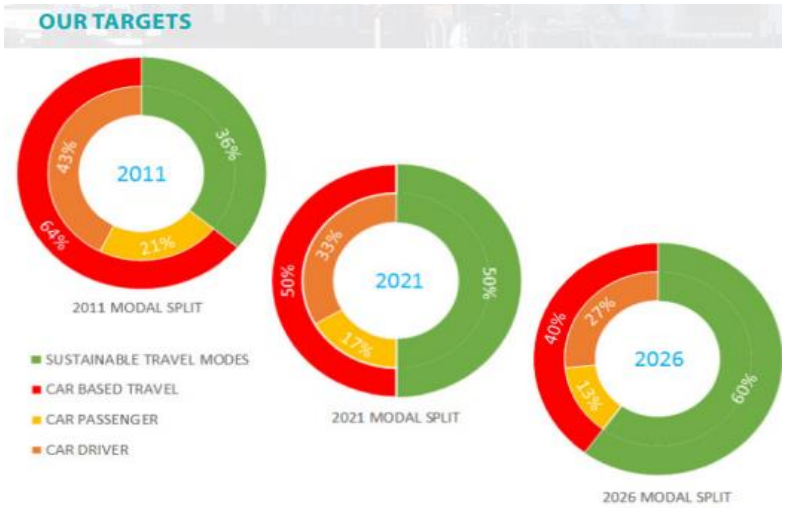

Figure 7.2 – Cardiff Council modal slit targets

7.4.60 The above indicates that the Council aims for a 50/50 split between sustainable and car-based travel in 2021 and a 60/40 split in 2026. At this stage, it has been assumed that the 50/50 split will be representative of the travel trends by visitors and staff at the Arena on event days once the venue is in operation. This will be supported by the presence of existing and future public transport facilities in the vicinity of the Site which will provide connectivity throughout Cardiff and to other cities.

7.4.61 At this stage, it has been assumed that the 50% of public transport trips will comprise 31% of trips by walking and/or cycling and 19% of trips by bus and/or train. This is as per the targets provided within the Cardiff Transport Strategy.

7.4.62 Based on the above, the anticipated mode split for visitors and staff associated with the Arena is presented in Table 7.5.

Table 7.4: Mode split for visitors and staff of Cardiff Arena

Mode	% Split
Car Driver	12%
Car Share	20%
Park and Ride	18%

Bus	11%
Coach	3%
Rail	11%
Walk	18%
Cycle	3%
Taxi (PUDO)	4%

7.4.63 In terms of traffic generation, the above mode split assumptions give the number of car occupants, rather than the number of expected vehicles. Given the nature of the Arena proposals, coupled with the social aspect of the destination, groups of people are more likely to travel together to/from the venue.

7.4.64 For car travel, an average car occupancy rate of 2.7 has been assumed. This figure was accepted as part of the Transport Assessment for Leeds Arena and was derived from surveys undertaken at the MEN Arena car park. The Leeds Arena Transport Assessment also states that this has been validated against other Arena venues, including the NEC in Birmingham and the Liverpool Echo Arena.

7.4.65 For coach travel, the majority of event type coaches can accommodate approximately 55 people at full capacity. A coach occupancy of 30 people has been used to reflect that not all coaches may be fully occupied, and that coach sizes do vary. An occupancy rate of 30 people per coach is considered to be a realistic assumption for coach travel. This, together with the coach mode split, has been used to estimate the typical number of coaches expected at different size events. However, it is accepted this could vary depending on the nature of the event and the main target demographic group.

7.4.66 Attendance is expected to vary based on the time, date and type of event. The Arena is expected to host its biggest events during midweek evenings according to the operator. For the purposes of this assessment, it has been assumed that the Arena will be at full capacity to account for a robust analysis.

7.4.67 As discussed in detail in the TA, a typical event set-up is forecast to consist of the following:

- Arrival – 07:00
- Sound check – 16:00

- Doors open – 18:30
- Curtains up – 19:30
- Curtains down – 22:30
- Curfew – 23:00
- Show Clear – 02:00

7.4.68 Based on the above, a typical event is expected to commence at 19:30 and will end at 22:30.

Severance

7.4.69 A quantitative assessment has been undertaken for the following effects by comparing the percentage change in vehicles and HGVs between the baseline and the forecast trip generation for the completed development stage of the Proposed Development, and by applying the rules set out in the IEMA Guidelines in terms of the effects of certain modes of transport.

Driver Delay and Stress

7.4.70 A qualitative assessment of driver delay and stress has been undertaken based on professional judgement considering the forecast change in traffic flow. The outcome of the assessment resulted in a negligible effect.

Pedestrian and Cyclists Delay, Amenity, Fear and Intimidation

7.4.71 Fear and intimidation have been scoped out of the construction assessment.

7.4.72 A qualitative assessment of pedestrian and cyclist delay, amenity, fear and intimidation (arising from vehicular traffic) has been undertaken based on the facilities that would be provided as part of the Proposed Development.

Public Transport

7.4.73 Due to the changing and improving provision of public transport in Cardiff, a capacity based assessment has not been undertaken on the public transport network.

Accidents and Safety

7.4.74 Accidents and safety have been scoped out of the construction assessment.

7.4.75 The Proposed Development is not expected to result in changes which could affect accidents and safety during operation. This is due to the nature of the carriageways which the construction routing will follow, as they are well suited for HGVs.

7.4.76 Any changes arising from activity generated by the Site are considered to be negligible. Any effects arising from highway and public realm improvements as part of the Proposed Development are designed to have a negligible or beneficial impact.

7.4.77 A qualitative assessment of accidents and safety during the operational phase has been undertaken based on professional judgement.

Hazardous Loads

7.4.78 Hazardous loads have been scoped out of the construction assessment, as there are not envisaged to be any.

7.4.79 A qualitative assessment of hazardous loads has been undertaken for the operational phase, based on professional judgement considering the nature of the Proposed Development.

7.4.80 Table 7.5 summarises the type of assessments that have been undertaken for each potential impact and likely effect and Table 7.6 sets out the Receptor Sensitivity Criteria.

Table 7.5: Type of assessment of Potential Impacts and Likely Effects

Potential Impact and Likely Effect	Construction	Completed Development
Severance	Quantitative	Quantitative
Driver delay & stress	Quantitative	Qualitative
Pedestrian & cycle delay and amenity	Quantitative	Qualitative
Pedestrian fear and intimidation	Quantitative	Qualitative
Public Transport delay	Qualitative	Qualitative
Accidents & Safety	Qualitative	Qualitative
Hazardous Loads	Qualitative	Qualitative

Table 7.6: Receptor Sensitivity Criteria

Sensitivity	Criteria
High	Modes of transport which are heavily used (by all users or particularly by vulnerable road users) relative to other modes within the study area or those which have a low capacity to accommodate change without significant effects arising.
Medium	Modes of transport which are used (by all users or particularly by vulnerable road users) to an average level relative to other modes within the study area or those

Table 7.6: Receptor Sensitivity Criteria	
Sensitivity	**Criteria**
	which have a moderate capacity to accommodate change without significant effects arising.
Low	Modes of transport which are lightly used (by all users or particularly by vulnerable road users) relative to other modes within the study area or those which have a high capacity to accommodate change without significant effects arising.
Negligible	Modes of transport which are very lightly used (by all users or particularly by vulnerable road users) relative to other modes within the study area or those which have a very high capacity to accommodate change without significant effects arising.

Magnitude of Impact

7.4.81 The criteria that have been used to assess the magnitude of impact, are described in Table 7.7.

7.4.82 Table 7.8 is used to help identify the magnitude of change for quantitative assessments, supported by professional judgement to take full account of the specific context.

Table 7.7: Magnitude of Impact Criteria	
Magnitude	**Criteria**
Large	Changes which are likely to be perceptible and which would significantly change conditions which would otherwise prevail to the extent that it would significantly affect travel behaviour.
Medium	Changes which are likely to be perceptible and which would materially change conditions which would otherwise prevail to the extent that it may affect travel behaviour to a measurable degree.
Small	Changes which are likely to be perceptible but not the extent that it would materially change conditions which would otherwise prevail.
Negligible	Changes which are unlikely to be perceptible.

		Table 7.8: Magnitude of Impact Criteria for Quantitative Assessments			
		Percentage change in flow (or HGV)			
		<30%	**<60%**	**<90%**	**>90%**
Absolute change in flow (or HGV)	<30 vehicles	Negligible	Negligible	Negligible	Negligible
	<60 vehicles	Negligible	Small	Small	Small
	<90 vehicles	Negligible	Small	Medium	Medium
	>90 vehicles	Negligible	Small	Medium	Large

Effect Significance

7.4.83 The significance of the likely effect has been derived by considering both the sensitivity of the receptor and the magnitude of impact, as demonstrated by Table 7.9.

Table 7.9: Significance Matrix

Receptor Sensitivity	Magnitude of Impact			
	Large	**Medium**	**Small**	**Negligible**
High	Major	Major	Moderate/Minor	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate/Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

7.4.84 Moderate and major effects are considered to be 'significant'.

7.4.85 Effects have been described as:

- beneficial, neutral or adverse;
- permanent or temporary; and
- short (<5 years), medium (5-10 years) or long term (10+ years).

7.4.86 Temporary effects are considered to be those associated with the construction works and long-term effects are those associated with the total Proposed Development once completed and operational.

7.5 Baseline Conditions

Cycling

7.5.1 The Site is well connected by cycle. There is a segregated foot/cycle path alongside the eastern side of Lloyd George Avenue, providing cycle access from Cardiff Central to Cardiff Bay Stations.

7.5.2 Some cyclists prefer to use the carriageway alongside busy traffic due to the need to frequently give way at each side road junction from Lloyd George Avenue when using the cycle path.

7.5.3 The off-road route to the east of Lloyd George Avenue is illustrated in Figure 7.3, along with other local provisions including, off-road connections along the northern sides of Bute Place and Pierhead Street, as well as the western side of Central Link (east of

Atlantic Wharf). These facilitate access to a wider cycle network which connects to Cardiff city centre and throughout the city.

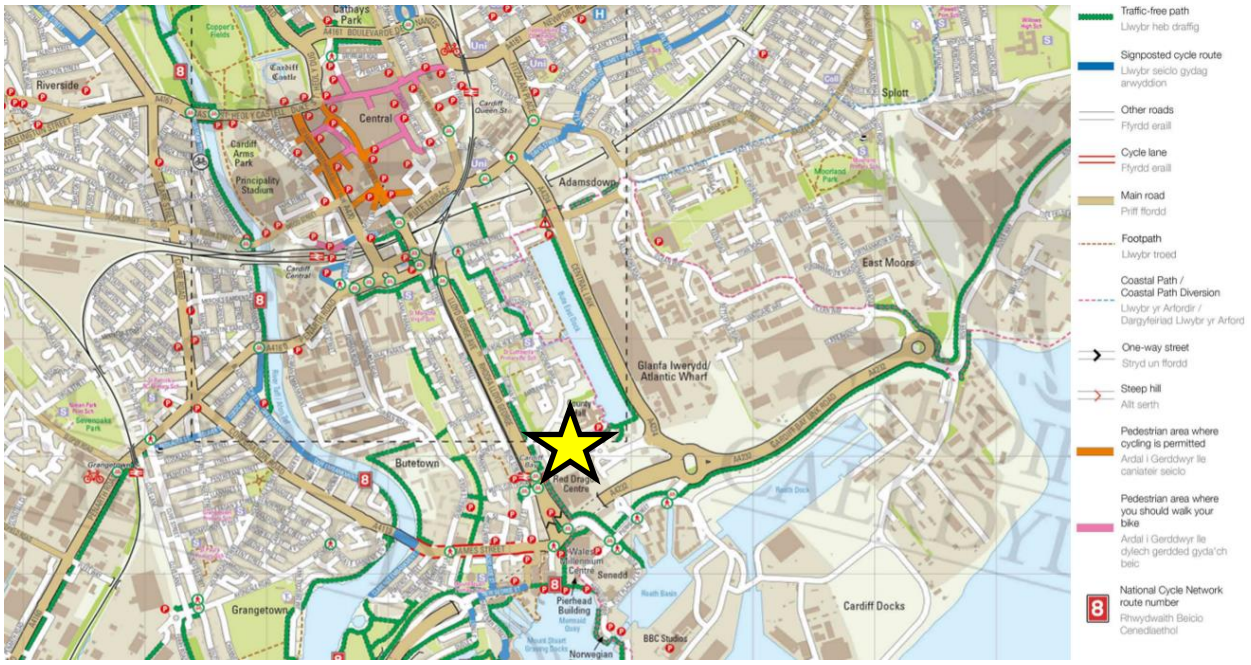

Figure 7.3 – Local Cycle Network[5]

7.5.4 Cardiff Council also identifies, in consultation with local residents and other stakeholders, its future route aspirations. These are routes which, over time and subject to feasibility and funding, Cardiff Council will seek to improve to Active Travel Act (ATA) standards. This feeds into a programme of improvements which can be expected to increase the availability of routes for existing and future users in and around Cardiff. This aspirational programme is published within the Council's Integrated Network Map (INM) which breaks the routes down in short, medium and long term projects.

7.5.5 Cardiff Council published a series of Existing Route Maps (ERMs) for walking and a single ERM for cycling in 2016. There are no ERM walking only routes in the immediate vicinity of the Site, with the closest in Grangetown.

7.5.6 The most developed part of the Council's ERM network for cycling is situated around the Site, as shown in Figure 7.3. This shows the footpath and cycleway along and connecting to either end of Lloyd George Avenue.

[5] Source: https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/Walking-and-cycling/Documents/Cardiff%202018_WEB.pdf

Local Cycle Routes – Active Travel Wales Existing and Potential Routes

7.5.7 As part of its duties under the Active Travel Act (Wales, 2013), the Council also assesses its existing walking and cycle routes with quality audits.

7.5.8 It identifies routes that are currently fully compliant with the ATA standards as either walking and / or cycling routes and publishes these on its ERM; an extract of which is shown in Figure 7.4.

Figure 7.4 - Extract from Cardiff Council's ERM for Cycling

7.5.9 Figure 7.5 shows an extract from Cardiff Council's INM for walking routes. This shows a future aspiration for Bay and City Centre trails (shown green) over the longer term

(2017/18–2027/28), along with the location of some pedestrian safety schemes and school safety schemes, within the slightly wider local area. The former is identified as darker blue spots (coded as LTP) and the latter as green-blue spots (coded as SCH). The yellow routes are ERM routes in Grangetown.

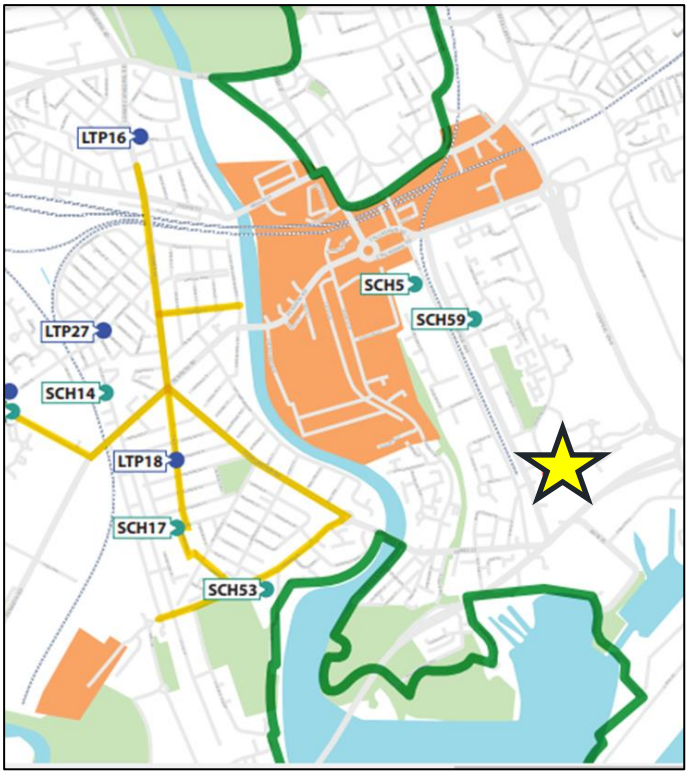

Figure 7.5 - Extract from Cardiff Council's INM (Walking)[6]

7.5.10 Figure 7.6 shows an extract from Cardiff Council's INM for cycling routes. The Lloyd George Avenue cycle route is again shown along with colour coding to show that this route is one of the Council's Cycle Superhighways which the Council hoped to upgrade to Active Travel (Wales) Act standards in the short term (2017/18–2021/22).

7.5.11 This connects northwards to other planned Cycle Superhighway routes (also shown Green). The yellow routes are ERM routes (2016) as shown in Figure 7.6.

6 Source: Cardiff Council's Integrated network map (Walking). https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/transport-policies-plans/integrated-network-map/Documents/Walking%20INM%20Map.pdf

Figure 7.6 - Extract from Cardiff Council's INM (Cycling)[7]

7.5.12 The pink routes on the map represent the Council's aspirations for secondary routes as part of its future improved cycle network. It has schemes identified in association with these for the short term (2017/18–2026/27) as outlined in a schedule accompanying the map. It is noted that the approximate position of the Proposed Development is where the '120' label is on the secondary cycle route identified along Hemingway Road.

7.5.13 The dark blue lines represent the aspirations for other cycle network routes for which the Council has yet to identify improvements but plans to do so, for delivery in the longer term (2027/28 and beyond).

7.5.14 Several of the INM routes pass through or connect to the Site, illustrating that it is in a location where accessibility by walking and cycling can be expected to improve in future years.

7.5.15 The schemes closest to the Site have been defined by Cardiff Council's schedule of cycle schemes as follows:

- NS1 (short term): Outside Millennium Centre to existing Toucan crossing: Provide appropriate cycle markings on existing shared space area to clearly indicate the presence of a cycle route.

[7] Source: Cardiff Council's Integrated network map (Cycling). https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/transport-policies-plans/integrated-network-map/Documents/Cycling%20INM%20Map.pdf

- NS2 (short term): Junction of Bute Place and Lloyd George Avenue: Convert existing two-stage toucan crossing to provide parallel single-stage crossing for cyclists, with low-level cycle signals.
- NS3 (short term): Lloyd George Avenue: Bute Place to Hemingway Road Provide 4.0m wide segregated two-way cycle track as per 'WG DE023 Cycle Track Alongside Road, separated from Pedestrians' on eastern side of carriageway. Consideration should be given to providing cycle track at the back of the existing footway rather than adjacent to the carriageway to avoid conflict with existing pelican crossings and to promote route continuity to the north. Replace existing block paving surface appropriate for cycling.
- NS4 (short term): Junction of Hemingway Road and Lloyd George Avenue: Widen existing Toucan crossing to provide parallel cycle crossing with low-level cycle signals, suitable to accommodate movements from adjacent proposed 4.0m wide segregated two-way cycle track. Remove guard railing at side road junctions to allow continuity for cyclists.
- NS5 (short term): Lloyd George Avenue - Hemingway Road to Herbert Street:
    - Option 1: Continue proposed segregated two-way cycle track on eastern side of Lloyd George Avenue at back of footway. Remove signal control from the Ffordd Garthorne, Glanhowny Close, Margretion Place, Letton Road and Vellacott Close junctions and convert each to become priority junctions. Provide parallel zebra crossings as per 'WG DE043 Parallel Crossing for Pedestrians & Cyclists' across all side road junctions. Remove guard-railing at side road junctions to allow continuity for cyclists. Replace existing block paving with appropriate smooth surface suitable for cycling.
    - Option 2: Provide segregated two-way cycle track on western side of Lloyd George Avenue.
- 119 (medium term): Shared use path along east side of Bute East Dock: Surface improvements.
- 138b (medium term): Schooner Way: Provision of 20mph limit and associated traffic calming.

- 29a (medium term): James St between Bute St and Bute Pl junction: Provide off road route with links to rail station. Reduce traffic lanes and widen existing cycle lane.
- 29b (medium term): James St/Mermaid Quay: Upgrade pedestrian crossing to Toucan and remove guard rail.
- 29c (medium term): Mermaid Quay: Designate a shared use area.
- 29f (medium term): James St/Bute St junction: Early start for cyclists.

7.5.16 Overall the plans show that there is already an established cycle network with key (particularly north-south) routes nearby along Lloyd George Avenue and connecting to this, as well as south into Cardiff Bay. In addition, various improvements are planned in the local and wider area in the future. These include new / improved routes northward to the city centre and beyond, as well as south and west into and beyond Cardiff Bay. There are also aspirations for longer distance cycle route improvements eastwards and through the major development schemes to the northwest of the Site.

National Cycle Network and Other Local Routes

7.5.17 National Cycle Network Route 8 is located close by and connects to Cardiff Bay via the cycle routes southwards from the Site as outlined above.

7.5.18 This runs (primarily off-road) around the bay westwards and then on street along Clarence Embankment and west over the A4119 bridge, before connecting northwards via a mixture of on and off-road stretches alongside the River Taff. It continues north west through Cardiff.

7.5.19 It ultimately continues north west as part of the Taff Trail (from Brecon to Cardiff Bay, stretching for 55 miles (88 kilometres (km)) and more locally provides a connection to Tongwynglais, Taffs Wells and Caerphilly (via NCN4).

7.5.20 The Cardiff Bay Trail also runs close to the Site connecting to NCN8. This is a route from Mermaid Quay to the Cardiff Bay Barrage as a traffic-free trail stretching 6.2 miles. It connects / is partly formed by the NCN8 and can be accessed from Cardiff Bay train Station.

Cycle Superhighways

7.5.21 Cardiff Council is developing proposals for five cycleways to support and promote cycling for all ages and abilities. The proposed routes will connect communities to major destinations across the city, including the city centre and Cardiff Bay. According

to Cardiff Council the cycleways will *"provide continuous routes that are intuitive and comfortable to use and separated from motor vehicles and pedestrians where needed".*

7.5.22 The proposed Cycleway routes are:

- Cycleway 1: City Centre to Cathays, University Hospital Wales, Heath High Level and Heath Low Level Rail Stations, and North East Cardiff Strategic Development Site;
- Cycleway 2: City Centre to Adamsdown, Newport Road retail parks, Rumney, Llanrumney and St Mellons Business Park;
- Cycleway 3: City Centre to Cardiff Bay (as discussed above);
- Cycleway 4: City Centre to Llandaff, Danescourt and North West Strategic Development Site; and
- Cycleway 5: City Centre to Riverside, Ely and Caerau.

7.5.23 Cardiff Council's cycle superhighways map is provided in Figure 7.7.

Figure 7.7 – Cardiff Council's Cycle Superhighways[8]

7.5.24 Provided quality connections can be established through the city centre, the creation of these routes will promote cycling for those of all abilities ensuring that a segregated and continuous route is provided where cyclists are not intimidated by vehicular movements.

Propensity to Cycle

7.5.25 It is typically considered that there is reasonable propensity for cycling trips to replace vehicular journeys up to around 5 miles / 8 km, roughly equivalent to around a 30-minute cycle.

7.5.26 The time of travel and demographics of travellers may also have an impact. For example, some people may be more inclined to travel during summer months and/or hours of daylight and for some purposes over others. For visitors, for example, cycle

[8] Source: https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/travel/cycle-super-highways/Documents/Cycleways_map.pdf

mode share may vary by time of day and type of event, as well as by visitors' demographics (and formal or informal 'dress code / conventions') for certain shows.

7.5.27 Figure 7.8 shows a cycling isochrone of 8km (within 5-minute travel time bands) of the Site, assuming a cycling speed of 16 kilometres per hour (kph).

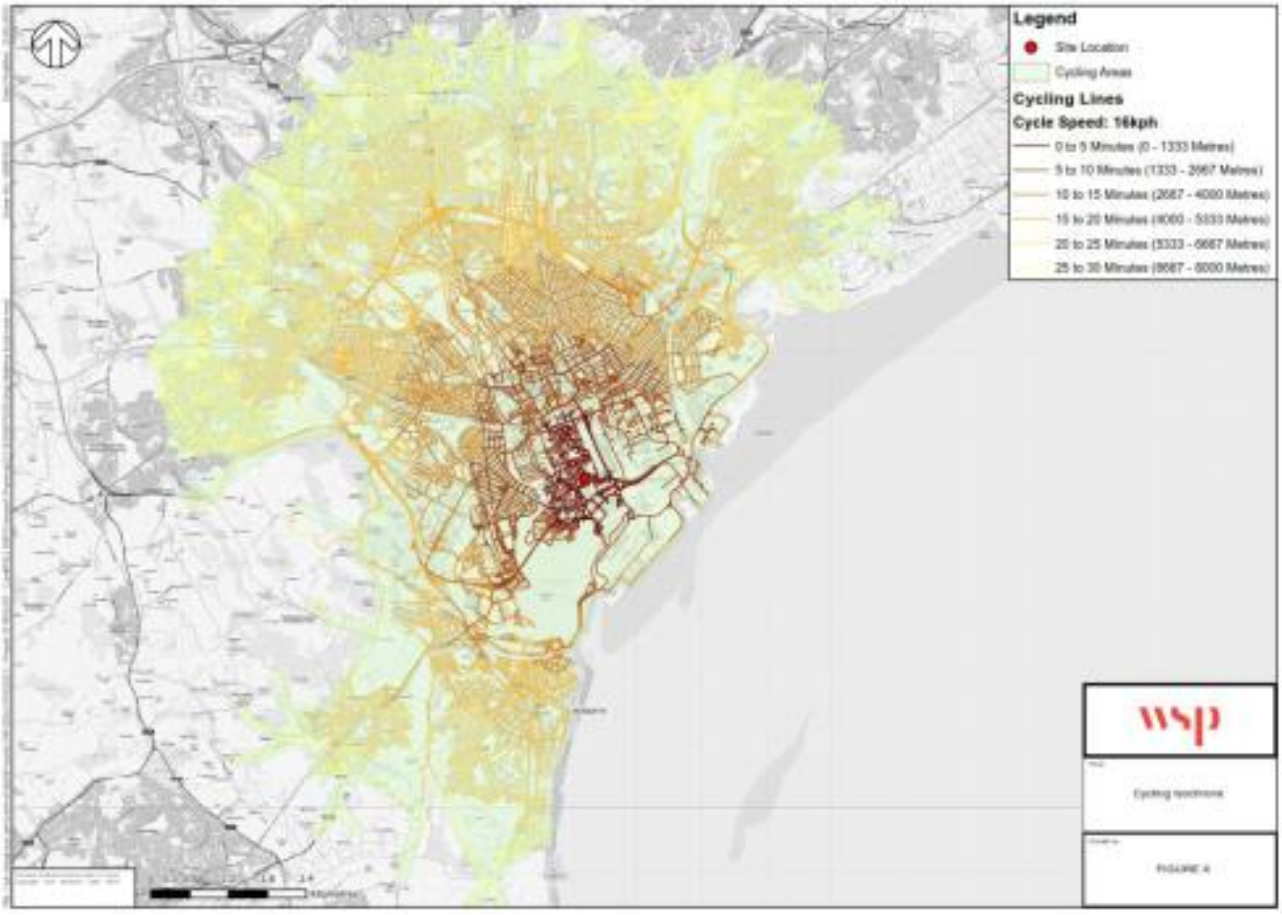

Figure 7.8 - Cycling Isochrones

7.5.28 The isochrone highlights that the Site is in a location which offers a good level of accessibility from residential areas throughout Cardiff and Penarth.

Next Bike – Public Hire Cycles

7.5.29 As well as the use of private cycles by staff, residents and visitors may use public hire bikes already available as part of an extensive Next Bike network within Cardiff.

7.5.30 Next bike provides a public bike rental scheme in Cardiff and Penarth, as well as other cities in Wales (Swansea) and across the UK and abroad. The scheme was introduced in Cardiff in May 2018 and Penarth in 2020.

7.5.31 In Cardiff / Penarth the provider has grown considerably and now offers over 1,000 standard hire cycles, as well as some e-bikes which have recently been launched in Penarth. It operates from over 100 docking stations.

7.5.32 In the immediate vicinity of the Proposed Development there are currently Next Bike stations at:

- Lloyd George Avenue / Hemingway Road Junction;
- Cardiff County Hall;
- Bute Place (Wales Millennium Centre);
- Pierhead Street; and
- Roald Dahl Plass.

Cycle Parking

7.5.33 Cycle parking is expected to be at or close to a destination. Table 7.10 summarises existing provision near the Site. There are no existing cycle lockers or undercover cycle storage facilities. The figures in Table 7.11 excludes Next Bike spaces.

Table 7.10: Cycle Parking

Location	Type of Parking	Number of Bicycles
Cardiff Bay	5 hoops	10
The Flourish	8 hoops	16
Red Dragon Centre	35 hoops	70
Hemingway Road	7 hoops	14
Mermaid Quay Car Park	2 hoops	4
West Bute Street	2 hoops	4

Future Cycle Parking

7.5.34 Cycle parking provision for the proposed uses of Phase 1 will be provided in line with Cardiff Council standards.

7.5.35 Cardiff Arena will provide 300 cycle parking spaces. These will be provided in the form of a combination of covered two-tier cycle racks and open Sheffield stands which will be provided parallel to the section of Hemingway Road that will be closed to traffic leading from Lloyd George Avenue. Additionally, there will be a new Next Bike hire

station located within the vicinity of the area (exact position to be confirmed). This will have a capacity for 20 bicycles.

7.5.36 The Hotel will provide 14 cycle parking spaces undercover to the northwest of the basement car park, immediately east of the undercroft car park entry. These will be provided in the form of seven Sheffield stands.

7.5.37 Details relating to the quantum and locations of cycle parking for the proposed uses of the outline element of the application will be fixed through reserved matters applications, with the starting point to be SPG compliance. For any buildings for which BREEAM credits are sought, consideration will also be given to necessary requirements. In all cases, likely levels of uptake of cycling will be considered.

Public Transport Accessibility

Introduction

7.5.38 This section describes the existing public transport network which provides accessibility to the Site. It also provides an overview of Cardiff Council's planned future improvements to enhance accessibility to the Site and throughout the city.

Local Bus Network

7.5.39 The proximity of existing bus stops on Lloyd George Avenue, Bute Street, Schooner Way and at the Wales Millennium Centre are all located within a 5-minute walk.

7.5.40 Figure 7.9 shows the network of the main bus operator in Cardiff, Cardiff Bus.

Figure 7.9 - Cardiff Bus Bus Network[9]

7.5.41 Services run by Cardiff Bus, in the vicinity of the Site, include:

- 6 Baycar service: which runs to/from Central Station directly along Lloyd George Avenue, serves the Wales Millennium Centre and then returns back via Lloyd George Avenue, with provision to Cardiff County Hall via Hemingway Road on Monday to Friday daytimes only. The closest stops are Hemingway Road (immediately adjacent) and the Flourish and Lloyd George Avenue (both c. 200m, <3-minute walk).
- 8: Which runs to/from Heath Hospital via the city centre (via Grangetown). This runs a loop round Cardiff Bay clockwise via Hemingway Road and Pierhead Street to/from Corporation Road (via Mermaid Quay / New George Street). The closest stops are Hemingway Road (immediately adjacent) and the Flourish (c. 335m, < 5-minute walk).

[9] Source: https://images.cardiffbus.com/2020-01/cardiff%20network%20map%20A4%20jan20.pdf (Cardiff Bus Website accessed February 2021)

- 13: Which runs from Drope to Windsor Quay via the city centre and Bute Street (serving Cardiff Bay Station). The closest stops are at Cardiff Bay Station, 260–310m away (around a 3–4-minute walk).
- City Circular 2: Serving Heath Hospital, Roath and Canton via the city centre and Grangetown. These complete a loop clockwise via the A4119, Bute Place, Stuart Street, New George Street and Adelaide Street before returning away from Cardiff Bay again via Grangetown. The closest stop is on New George Street (approximately 600m from the Site < 8-minute walk).

7.5.42 In addition, there are services provided by other operators which serve Bute Street, Welsh Millennium Centre, Mermaid Quay / New George Street and Schooner Way. These include airport services and longer distance services calling at Cardiff Bay on their way into and out of the city.

7.5.43 All bus services that operate from within the vicinity of the Site are summarised in Table 7.11.

7.5.44 Where possible the pre-COVID-19 timetables / frequencies have been reported. Where these have not been available January 2021 timetables have been consulted.

7.5.45 In terms of daytime services, the Site is very accessible particularly on weekdays, with regular services throughout the day and week to/from various destinations. It is likely that these can cater well for future employees, residents, and visitors of the development.

7.5.46 It should be noted that with the introduction of the Arena and closure of Hemingway Road and Schooner Way a number of bus services would be rerouted and as such the timetables associated with these services are likely to change with the inclusion of the Proposed Development.

7.5.47 It is recognised that some of the proposed uses, such as the Hotel, operate 24 hours and may have some (albeit reduced) late night and overnight staffing requirements. For typical check in and check out times it is likely the Hotel can be served well by public transport choices for Hotel patrons. For staff arriving during later shifts, it is

likely that these trips would be undertaken by alternative modes such as walking, cycling, taxi or car.

7.5.48 Similarly, major Arena events are expected to finish at 22:30 with many services having typically ceased operation by this time. The X8, 304, 8, X2 and T9 services do operate later than this (plus the 6 Baycar on Fridays only).

Table 7.11: Bus Services

Service Number	Operator	Route of Travel	Closest Bus Stop(s)	Typical daytime frequency	Last Return Service
X8	NAT Group	Cardiff Bay – Thornhill	The Flourish / WMC	Every 15 mins Mon-Sat. Every 2 hours Sun/ Bank Hols	22:40 (depart WMC – Bute Street 22:42)
6 Baycar	Cardiff Bus	Cardiff Bay – Cathays Park	Lloyd George Avenue / The Flourish (County Hall - Mon-Fri only)	Every 12 mins Mon-Fri. Every 15 mins Sat / Sun.	19:33 (23:00 Fri) Depart WMC. Last from County Hall 18:39.
13*	Cardiff Bus	Cardiff Bay – Sports Village via Drope	Cardiff Bay Station	Hourly Mon-Sat Two hourly Sun	18:47 (Mermaid Quay) 18:49 Bute Street
502	Unknown	P&R to city centre	From County Hall Car Park / Bus Stop	Sat, Sun and Bank Hol Mon only Every 15 mins	Sat: 17:45 Sun/BHM: 17:15
89A / B	NAT Group	Cardiff – Dinas Powys (or Landough)	Schooner Way, The Flourish, WMC,	3–4 per day each way on each route.	A: 19:57 (Schooner Way). B: 17:47 Similar Sat. No Sunday service
304	NAT Group	Cardiff – Llantwit Major via Dinas Powys	Lloyd George Avenue / The Flourish / WMC	Hourly each way Mon-Sat (Hourly Sunday but reduced hours)	23:09 Mon-Sat towards Dinas Powys 23:18 Mon-Sat towards City Centre

Table 7.11: Bus Services					
Service Number	**Operator**	**Route of Travel**	**Closest Bus Stop(s)**	**Typical daytime frequency**	**Last Return Service**
8	Cardiff Bus	Heath Hospital – City Centre - Atlantic Wharf Loop	County Hall, WMC	3 per hour (every 20 mins). Mon-Fri. Less frequent early / late. 2 per hour Sat & Sun. Different timetables.	County Hall: 22:46 WMC: 22:49
2* – City Circle Anticlockwise	Cardiff Bus	Heath Hospital – Centre – Cardiff Bay	Mermaid Quay	Hourly Mon-Fri only. No weekend services.	20:37 to Canal Street (City Centre).
1* – City Circle Clockwise	Cardiff Bus	Arrives Mermaid Quay from City Centre	Mermaid Quay	Hourly Mon-Fri only. No weekend services.	Arrives Mermaid Quay 19:14.
X2	First Cymru	Cardiff to Porthcawl via Cardiff Bay	Mermaid Quay (towards City). WMC (towards Porthcawl)	Mon-Sat Every 30 mins. Sundays Hourly.	23:02 (toward City Centre, Penarth Road) 23:22 (toward Porthcawl)
X10	First Cymru	Cardiff to Swansea via Cardiff Bay	Mermaid Quay (towards City). WMC (towards Swansea)	Hourly Mon-Sat 6 per day Sundays.	Weekday: 18:37 (City) / 19:07 (Swansea) Sat: 18:17 / 18:43 Sun / BH: 19:02 / 19:22
T9 Traws Cymru	NAT Group	Red Dragon Centre – Cardiff Airport (some via city centre).	Hemingway Road / Red Dragon Centre	Weekday: 3 per hour (every 20 mins)	Weekday: 23:20 (City Centre then Airport) 00:40: Toward Airport (not via City Centre)
T1C Traws Cymru	NAT Group	Aberystwyth - Cardiff Central	Unknown	One per day from / to Aberystwyth.	Timings / location calls

Table 7.11: Bus Services					
Service Number	**Operator**	**Route of Travel**	**Closest Bus Stop(s)**	**Typical daytime frequency**	**Last Return Service**
		Station via Camarthen, Port Talbot and Cardiff Bay			at Cardiff Bay are unknown. [CC Penarth Road 13:05pm. Departs Cardiff Council Penarth Road 16:45.]

*Only 2021 service timetable found, which could be at lower than typical frequency

Existing Bus Stop Locations and Infrastructure

7.5.49 Figure 7.10 shows the location of the bus stops near the Site, to/from which the services discussed above, run.

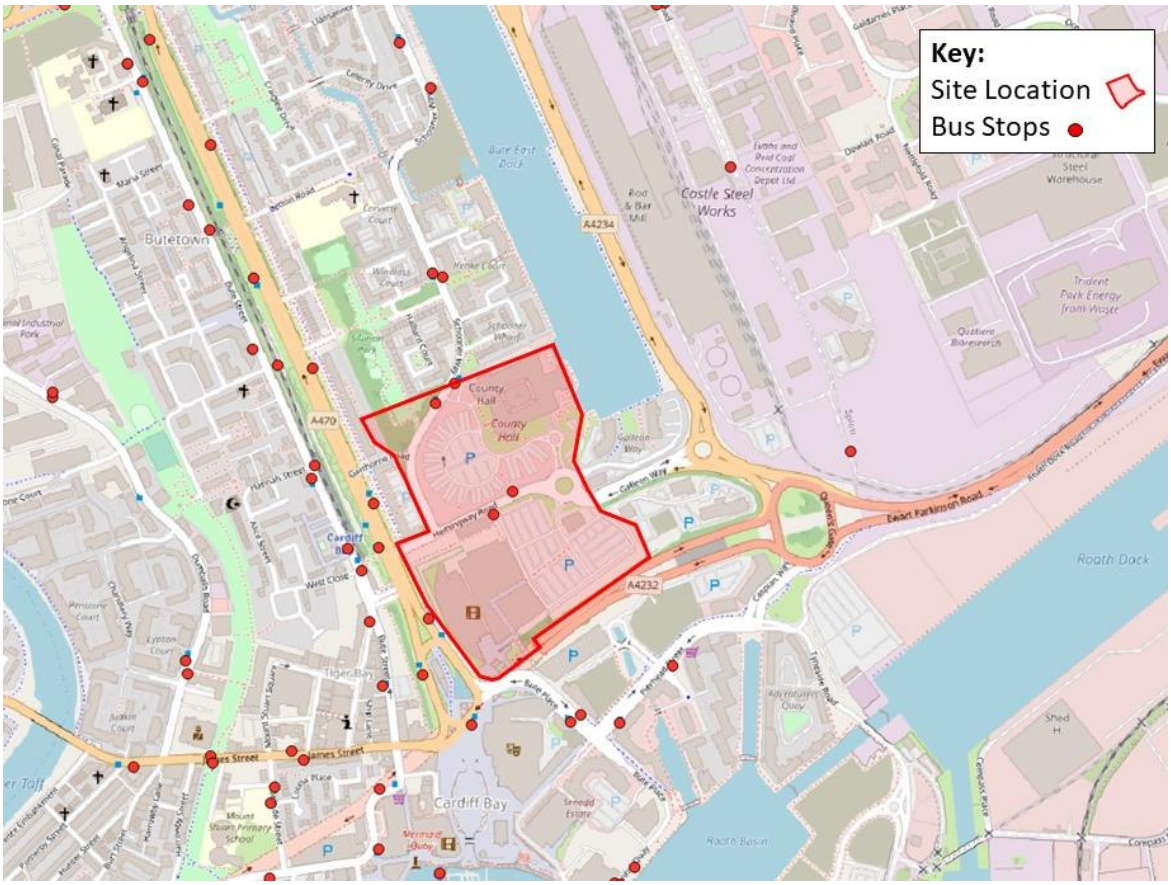

Figure 7.10 – Existing Bus Stop Locations

7.5.50 A desk-based review of the availability and quality of current public transport infrastructure at the nearby stops identified above has been undertaken and is summarised below:

- Lloyd George Avenue Southbound: Marked bus box on the street, raised platform kerbs, flag and pole and no shelter. As this is typically a drop off point for inbound services towards or via Cardiff Bay, the absence of a shelter is less of a shortcoming to the considered destinations than it would be for an outbound service.
- Lloyd George Avenue Northbound: Marked bus box on the street, raised platform kerbs, flag and pole and bus shelter with published timetable information and real-time passenger information (RTPI) display.
- The Flourish Southbound: Marked bus layby with flag and pole but no shelter or real-time information.
- The Flourish Northbound: No marked bus box, bus shelter and bin. No real-time information but published timetable information in stop.
- Hemingway Road Eastbound: Marked bus layby with one flag and pole and one extended shelter with timetable information, RTPI and litter bin.
- Hemingway Road Westbound: Bus layby with smaller bus shelter and published timetable information and litter bin.
- Wales Millennium Centre: Marked bus layby, bus shelter with RTPI.
- Mermaid Quay Westbound: Area near turn in the road marked for buses to pull in with shelter, published timetable information and raised boarding kerb.
- New George Street Eastbound: Marked bus layby, flag and pole and some published timetable information.
- Cardiff Bay Station Northbound: No on street markings or layby but raised boarding kerbs, shelter with RTPI, published timetable information and litter bin.
- Cardiff Bay Station Southbound: Flag on streetlight column with some published information. No other provision.

- Schooner Way Northbound: No street or layby markings but raised boarding kerb, bus shelter, RTPI and published information, litter bin.
- Schooner Way Southbound: Flag on streetlight column with some published information. No other provision.

7.5.51 In summary, the level of provision in proximity to the Site varies from stop to stop. Many of the stops which would function as outbound stops (where people would board the bus rather than alight it) in the local area already benefit from shelters, seating and RTPI or timetable information. Many are also designed to assist service accessibility (e.g. step free boarding).

Park and Ride

7.5.52 There are three existing park and ride sites in Cardiff, comprising Cardiff West, Cardiff East and Cardiff South.

7.5.53 Cardiff East Park and Ride is located approximately seven miles to the north-east of the Site. It provides 943 car parking spaces. It is served by bus service H59 which provides a service to University Hospital Wales and service X59 to Cardiff. The X59 route goes to Cardiff Queen Street every 15-minutes, where visitors would be able to take a direct train to Cardiff Bay. Additional services are provided between the city centre and the Park and Ride when there are events at the Principality Stadium or other city centre events.

7.5.54 Cardiff South Park and Ride is located within the Site at Cardiff County Hall and has already been discussed above. It currently provides 820 car parking spaces.

7.5.55 Cardiff West Park and Ride is located approximately four miles to the north-west of the Site, near Cardiff City Stadium. It has historically been served by bus services 95A, 95B and 95C which route to and from Penarth, and do not serve Cardiff Bay. There is a good level of service towards Cardiff city centre, with the 2-City Circle service described previously, operating every 30-minutes into Cardiff city centre, to Cardiff Bay and returning to the Park and Ride. The last service was operating at 20:35 from the Park and Ride towards the bay and at 20:45 from Mermaid Quay towards the Park and Ride.

7.5.56 Whilst services have been subject to change in light of the COVID-19 pandemic, the service provision in 2019 prior to this impact has been summarised to provide an overview of the typical levels of services (Table 7.13).

Table 7.12 - Cardiff Park and Ride Bus Services (2019)

Service	Destination	Frequency	First Bus	Last Bus	Hours of Operation
Cardiff East Bus Services					
H59	Heath Hospital	10-minutes	06:30	22:50	Monday - Friday
	East Park and Ride		06:46	23:06	
X59	Cardiff Gate Business Park	15-minutes	07:08	19:43	Monday to Sunday (Reduced service on Sunday)
	City Centre		06:57	19:13	
Cardiff South Bus Services					
502	Cardiff City Centre	15-minutes	09:00	17:45	Saturday
	County Hall		09:10	18:01	
6 Baycar	Cathays Park	12-minutes	07:19	18:38	Monday – Saturday (additional services until 23:00 on Fridays)
	Millennium Centre		06:53	19:05	
8	County Hall (via City Centre)	30-minutes	05:15	23:25	Monday - Sunday
	Heath Hospital (via City Centre)		05:10	22:46	
Cardiff West Bus Services					
95A/B	Penarth	30-minutes	08:06	18:15	Monday - Saturday
	Cardiff		08:54	18:23	
1 and 2 City Circle	Clockwise – Route 1	30-minutes	05:29	19:25	Monday - Saturday
	Anticlockwise – Route 2		06:50	20:32	

7.5.57 The services provide good levels of provision during typical daytimes, when the existing highway network is likely to be most busy. They could therefore be used by

some staff within the Proposed Development, although staff catchments would be expected to be more local. Most services typically operate for too limited hours as to be available for homeward journeys by evening event visitors at present. Whilst the X59 service runs later, given the need to reach Cardiff Queen Street to access it the timing of events and connections will influence whether it is an option selected by users. If a connection is available, it would likely offer insufficient comfort and flexibility with current hours of operation to be attractive to many (e.g. many could be deterred from using it given the risk of missing the last bus service).

7.5.58 Conversely, some services could be available to those attending daytime events, exhibitions or matinee performances. Further information is required on typical event times, scales and timings to understand the opportunities and constraints better.

7.5.59 Similarly, Hotel patrons are expected to undertake overnight stays and whether they can use the Park and Ride sites will depend upon their policies on and security for vehicles left overnight in the Park and Ride site. Typically Park and Ride sites do not permit overnight parking. This will need to be explored further.

7.5.60 There could be an opportunity for the Joint Applicant to explore in more detail with the operators of current and future Park and Ride services, the potential to incorporate additional provisions, better aligned to meeting visitor and patron needs, as part of bespoke Event Management Plans. This would be subject to further assessment, discussion and negotiation.

Future Park and Ride Provision

7.5.61 A fourth Park and Ride site has been approved for Cardiff. An application (14/00852/DCO) has been granted planning permission for a new park and ride facility and transport interchange at: Land to the North of the M4 Junction 33, Creigiau, Cardiff. The application was submitted to Cardiff Council in April 2014 and was subsequently approved in September 2017.

7.5.62 The facility will provide 1,000 parking spaces, including a transport interchange hub. The following items were agreed as part of a Section 106:

- The provision of bus services serving the car park to provide a minimum of four buses per hour between the hours of 7am–7pm, Monday to Saturday, for a period of three years from the commencement of operation of the Phase 1 car park; and

- A bus subsidy of £2,250,000 towards the provision of five bus services serving the Site and the Park and Ride, for a period of three years.

7.5.63 Whilst this Park and Ride could capture some visitors or staff travelling from the west, the hours of operation are again a constraint to its availability for some Site users outside of operating hours. Similarly, Hotel patrons are expected to undertake overnight stays and whether they can use the Park and Ride sites will depend upon their policies on, and security for, vehicles left overnight in the park and ride site. Typically Park and Ride sites do not permit overnight parking.

National Rail

Cardiff Bay Station

7.5.64 The closest rail station to the Site is Cardiff Bay railway station. It is located approximately 260m (around a 3 to 4-minute walk) to the west of the Site.

7.5.65 There is no frequent direct service from Cardiff Central station to Cardiff Bay station. Passengers are required to change at Queen Street station if travelling to / from Cardiff Central to the Bay.

7.5.66 Connectivity to the Bay is also available from Cardiff Central station using the Baycar service. This operates on a turn up and go frequency of 12-minutes from outside Cardiff Central. The evening services are currently limited although additional services may be considered as required.

7.5.67 The National Rail enquires website states that the station is located on the Butetown Branch Line and that: *"a shuttle service …runs every twelve minutes from and to Cardiff Queen Street. This service operates on Monday – Saturdays from 06:30am to 11:30pm, while on Sundays it runs between 11:00am to 4:30pm".*

7.5.68 Services to Queen Street may be used by visitors to the Site from some residential areas and / or city accommodation near Queen Street, provided the hours of operation are long enough for the event they choose to attend, and timings required for other elements of the masterplan.

7.5.69 Interchange is possible at Cardiff Queen Street both to Cardiff Central and to the Cardiff Valley lines (to Coryton, Rhymney, Aberdare, Treherbert and Merthyr Tydfil). Further assessment is, however, necessary to consider the interchange convenience

and hours of operation, against typical times of travel demand and expected staff and visitor catchments.

7.5.70 It is likely that some daytime and Hotel patron trips to/from the Site could be made using services from Cardiff Bay, with interchange at Queen Street. The Cardiff Bay station is considered less likely to be used by those travelling to the Site from Cardiff Central Station due to the time and inconvenience associated with several interchanges (no matter how well timetables are found to align).

7.5.71 There are plans to address the lack of connectivity between Cardiff Central and Cardiff Bay as part of the Cardiff Metro Project – Phase 3 (see Section 3.7 in the TA).

Cardiff Central Station

7.5.72 Cardiff Central station is a key hub on the South Wales Main Line, which operates a local, regional and national service to key locations across the UK, including Bristol, Birmingham, Manchester and London.

7.5.73 An overview of national and local rail services to Cardiff Central station is shown in **Error! Reference source not found.** based on 2019 rail timetables.

7.5.74 National Rail timetables are updated twice a year in May and December and therefore prior to any planning application submission the table will be updated with the latest information and the assessment revisited appropriately.

7.5.75 The usefulness of these services needs to be reviewed against typical event times and scales, with reference timing, frequency, quality and capacity of connections to/from Cardiff Central station, to understand the realistic potential for rail travel to/from different events. This requires discussions with Cardiff Council.

7.5.76 It is noted that Cardiff Central station is due to be upgraded. Whilst details are not yet known, the improvements would be expected to increase the capacity of the railway station.

7.5.77 A new interchange and bus hub has recently been constructed as part of the Central Square development adjacent to Cardiff Central station. This will also improve access to / from the station from surrounding areas that may not be served by rail.

7.5.78 Regional rail priorities also include for increasing services along the South West Mainline (SWML) in South East Wales and these along with other regional rail

improvements can be expected to increase the opportunities for sustainable travel to and from the Proposed Development in future years, subject to hours of operation.

Table 7.14 - Rail Services to/from Cardiff Central Station

Origin	First Departure	Last Departure	First Arrival	Last Arrival	Frequency	Duration
National Routes						
Bristol Temple Meads	05:15	23:37	6:27	23:52	30 mins	50 mins
Manchester Piccadilly via Birmingham	04:35	21:17	9:01	1:21	30 mins	2 hours
Paddington	5:15	21:35	8:13	2:25	30 mins	3 hours
Swansea	5:35	1:20	5:12	23:40	30 mins	55 mins
Valley Routes						
Aberdare	5:26	22:46	7:24	23:04	30 mins	65 mins
Coryton	5:49	22:21	6:48	23:06	30 mins	20 mins
Ebbw Vale Parkway	6:34	23:05	7:42	23:40	Every Hour	55 mins
Treherbert	6:36	22:46	6:48	23:22	30 mins	65 mins
Maestag	5:53	22:36	7:34	23:08	Every Hour	50 mins
Merthyr Tydfil	5:26	22:26	7:38	23:42	30 mins	65 mins
Penarth	5:45	23:12	6:13	23:45	15 mins	12 mins
Rhymney	7:31	22:35	7:08	22:34	Every Hour	60 mins

Source: National Rail Enquires 2019.

Potential constraints to rail-based travel / from major events

7.5.79 Travel for major events involves the following constraints to travel in the study area by rail:

- Cardiff Queen Street closes at 22:00, disturbing onward connections to Cardiff Central.
- There is limited capacity on local Cardiff and Valleys routes.

7.5.80 Advice will be given to not wait until the last train service to travel home post the event.

South West Wales Metro and other Improvement Proposals

7.5.81 The Cardiff Capital Region Metro vision is for a multi-modal rapid transit network which aspires to have a frequency of at least four services per hour, increasing to six per hour over time.

7.5.82 The Cardiff Metro proposals include the potential for three new rail stations in Cardiff Bay as 'potential future phases' to be delivered beyond 2023[10]. Two stations would be north of the existing Cardiff Bay station at Stryd Herbert and Butetown, and one to the south at Porth Teigr. This includes an extension of the Bay branch further into Cardiff Bay, and provision of a direct link from Cardiff Bay to Cardiff Central.

7.5.83 Figure 7.11 shows the metro map for the South Wales Metro.

[10] https://gov.wales/sites/default/files/publications/2018-06/south-wales-metro-brochure.pdf.

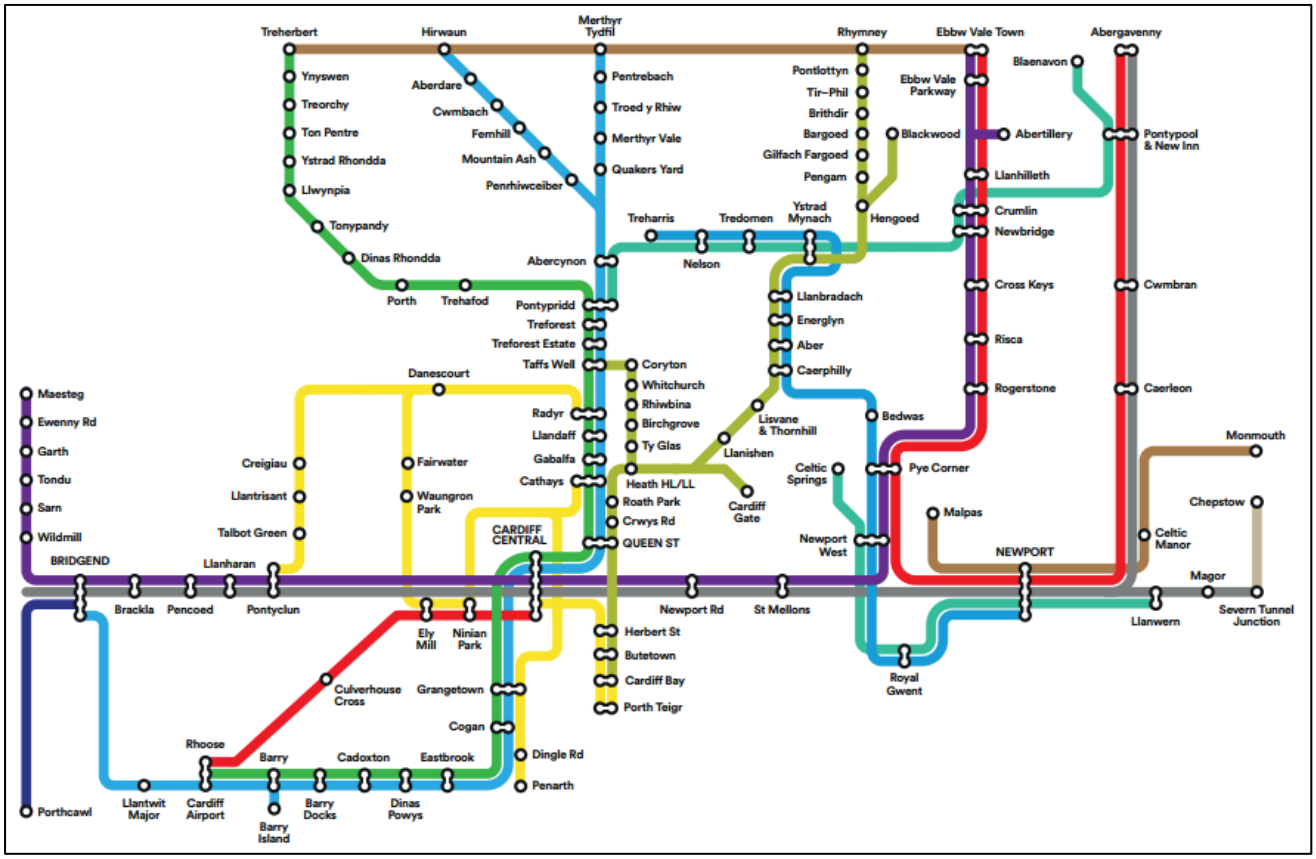

Figure 7.11 - South Wales Metro Map

7.5.84 Whilst schemes are subject to change over time as further assessment and development of proposals occurs, the following are identified as improvements which can be expected in the near future.

Weekdays

- Four services per hour between Cardiff and the Heads of each Valley;
- two of the four services from Treherbert, Aberdare and Merthyr Tydfil will extend from Cardiff to Cardiff Bay;
- an extra service per hour between Cardiff and Bridgend via the Vale of Glamorgan Line from December 2023;
- two services per hour between Cardiff and Shrewsbury via Abergavenny from December 2022; and
- an hourly service between Cardiff and Cheltenham via Chepstow from December 2022.

Sundays

- Two services per hour on Sundays between Cardiff and the Heads of each Valley;
- the first ever Sunday service on the Coryton and City Lines, with an hourly service from December 2023;
- the first ever Sunday service on the Maesteg Line, with one service every two hours from December 2019, increasing to an hourly service from December 2023;
- an extra service per hour between Cardiff and Bridgend via the Vale of Glamorgan Line from December 2024; and
- an hourly service between Cardiff and Cheltenham via Chepstow from December 2023.

7.5.85 In addition to these operational aspirations the following large scale improvements will also be carried out:

- Electrifying around 170 km of track;
- upgrading all our stations and signalling; and
- building at least five new stations.

7.5.86 It is also recognised that as improvements occur on valley lines and across the network these will also be likely to improve the opportunities for public transport travel to the Site in future, for example by increasing available connections and potentially the ease and convenience and therefore likelihood of interchange if higher frequencies are established across the wider network.

Cardiff Crossrail

7.5.87 Cardiff Council is currently developing proposals for Cardiff Crossrail which, subject to further scheme development, business case and funding, will provide a new light rail/tram line from east to west connecting new and existing residential areas to the northwest of Cardiff with Cardiff Central, the Cardiff Bay and Roath Dock area, Splott and a new Cardiff Parkway Railway Station (already proposed separately to Cardiff Cross Rail).

7.5.88 Using tram-train technology, the new route under consideration includes interchanges close to the development at Loudon Square and Roald Dahl Plass, as well

as a proposed interchange within the wider redevelopment at Pierhead Street. The latter would be located approximately 450–600m (around a 6 to 8-minute walk) from the new Arena and masterplan location of building accesses. A footbridge is proposed to reduce severance of the A4232, as part of the wider local redevelopment scheme.

Local Highway Network

7.5.89 Access to the Site is currently via:

- Schooner Way to the north (connecting to Tyndall Street);
- Hemingway Road and Ffordd Garthorne (connecting to Lloyd George Avenue to the West); and
- a highway link from the central roundabout within the wider local redevelopment Site which connects to a three arm roundabout with the Central Link (connecting to Tyndall Street, Tyndall Street East and the A4160 to the north) and the A4234 (connecting to Queensgate Roundabout and the A4232, east and west, and Caspian way to the south).

7.5.90 Improvements were made to the Queensgate Roundabout to facilitate the opening of the Eastern Bay link. Further improvements are required on the adjoining highway network, as part of the planning conditions associated with the approved Porth Teigr development to the south. This four-arm roundabout connects the A4234 and Caspian Way with the A4232 west and the Bute Tunnel and the A4232 east (Bay Link).

7.5.91 In terms of operation of the local road network it is noted that:

- The Bute Tunnels are periodically closed for maintenance. At these times an on-street diversionary route exists through Cardiff Bay which increase local traffic levels. This has separate eastbound and westbound diversions, one of which travels via Hemingway Road through the Site and the other along Pierhead Street.
- The Eastern Bay Link (EBL) was completed in 2017 and is a 1.2km long elevated dual carriageway which extended the A4232 link road around the southern perimeter of Cardiff from Queensgate Roundabout to Ocean Way Roundabout through Cardiff Docks, removing traffic that previously used Ocean Way, East Tyndall Street and the Central Link route (c. 3km).
- It is a long-term ambition of Cardiff Council to extend the Eastern Bay link further to connect Ocean Way with the A48 (to reduce use of the existing

routes through Adamstown and along Rover Way). Delivery will depend on route assessment as part of various stages of business case development and the outcomes of appraisal, as well as deliverability, value for money and final funding decisions.

Accident Data

7.5.92 Accident data for the past three years has been obtained from CrashMap and has been analysed as part of the Transport Assessment.

7.5.93 One accident occurred on Central Link, to the east of the Site, on the 15th September 2018. The accident involved two vehicles and two casualties.

7.5.94 Two accidents occurred on the A4119 James Street. The first was a serious accident on the 28th February 2018, which involved two vehicles and one casualties. The second accident was a fatal accident which occurred on the 3rd of April 2020, the accident involved two vehicles and one casualty.

7.5.95 Additionally, a small number of minor collisions were recorded, however no large clusters of note were identified.

Car Parking

7.5.96 Table 7.13 summarises the existing council owned parking in Cardiff by location and capacity.

Table 7.13 - Cardiff Council Controlled Car Parks

Location		Capacity (Spaces)	Opening Hours	Charging Hours
City Centre	North Road	189	24 hours a day	Mon-Sun 08:00-18:00
	Castle Mews	48	24 hours a day	Mon-Sat 08:00-20:00, Sun 10:00-17:00
	Sophia Gardens	284	24 hours a day	24 hours a day
Cardiff Bay	Havannah Street	238	24 hours a day	24 hours a day
	The Barrage	119	24 hours a day	24 hours a day
Park and Ride	Cardiff East	943	Mon-Fri 07:00- 19:30 / Sat 07:30–19:00 Sun 09:30–17:00	

	Cardiff West	820	Mon-Fri 08:30–18:00

Source: Cardiff.gov.uk

7.5.97 The closest Council Car Park to the Site is at Havannah Street, which is just under 1km from the Proposed Development.

7.5.98 This is a surface car park open 24-hours a day and therefore may attract some trips destined for the Arena and/or Hotel during Phase 1 of the Proposed Development, although other car parks including Q-Park and Mermaid Quay are likely to be more popular.

7.5.99 Whilst the Barrage Car Park is noted as being in Cardiff Bay, it is located on the Penarth side of the barrage and therefore unlikely to attract usage in association with the Proposed Development.

7.5.100 The Cardiff Council city centre car parks are all located to the northwest of the city centre and whilst open 24 hours per day without evening charges, these are beyond likely common walking distance to the Proposed Development.

7.5.101 A summary of non-council (commercially run) car parks in Cardiff is summarised in Table 7.14.

Table 7.14 - Commercial Car Parks in Cardiff[11]

Location		Capacity (Spaces)	Disabled Spaces (if known)	Opening Hours
Cardiff Bay	Q Park	1,239	74	24 hours a day
	Mermaid Quay Car Park	380	16	24 hours a day
	Red Dragon Centre	780	-	24 hours a day
City Centre	St David's car park	2,000	-	24 hours a day
	John Lewis car park	550	-	06:30–00:30
	Marriot Hotel car park	130	-	24 hours a day
	Radisson Blu Hotel car park	200	-	Sun-Fri 06:00–00:00

[11] Sources: NCP capacity information from https://www.ncp.co.uk/parking-solutions/cities/cardiff/. Cardiff Stadium car parking is closed during some large events. It is possible to pre-book spaces at Rapports NCP during selected events.

Table 7.14 - Commercial Car Parks in Cardiff[11]				
Location		**Capacity (Spaces)**	**Disabled Spaces (if known)**	**Opening Hours**
				Sat 06:00–01:30
	Capitol Shopping Centre	338	-	-
	Cardiff Central Station NCP	426	20	24 hours a day
	Dumfries Place NCP	957	13	24 hours a day
	Cardiff Stadium NCP	78	2	06:00–21:00
	Greyfriars NCP	244	4	06:00–24:00
	Knox Road NCP	747	20	05:30–01:30
	Pellet Street NCP	292	10	05:00–01:00
	Rapports NCP	127	2	24 hours a day
	Westgate Street NCP	334	24	24 hours a day
	Adam Street NCP	500	23	24 hours a day

7.5.102 Of most relevance to the proposed Arena and Hotel are the existing commercial car parks in Cardiff Bay, including most notably Q-Park and Mermaid Quay. The Red Dragon centre would close as part of wider redevelopment in the immediate locality and timescales for this redevelopment once the new MSCP opens in Phase 1.

7.5.103 Whilst the Red Dragon Centre car park and Cardiff South Park and Ride will be lost, it is proposed that a c. 1,300-space multi-story car park would be provided within the Proposed Development, in order to serve the mixed-use regeneration, including the proposed land uses. It must be noted that although this is part of the outline element of the application, a procurement exercise is currently underway to enable a reserved

matters application to be brought forward following this application decision to allow this to be delivered within the same timescale as the Arena and Hotel.

7.5.104 It is also noted that there is a planning application (19/01012/MJR) pending with Cardiff Council to increase the capacity of Mermaid Quay Car park by 310 spaces, from 372 to 682 spaces.

7.5.105 As well as car parks, on-street car parking exists in surrounding residential areas under different management and control arrangements (where these are in place). For example, there are already extensive double yellow line waiting / parking restrictions along parts of Schooner Way and the residential streets accessed from this, although there are also notable stretches of long stay pay and display car parking on Schooner Way.

7.5.106 There are similarly some stretches of on-street pay and display car parking on the southern end of Bute Street and on other nearby streets (e.g. West Bute Street, Mount Stuart Square, Adelaide Street and Louisa Place).

7.5.107 Consideration of capacities against demands have been undertaken as part of the Transport Assessment, with allowance for potential mode shift, including linked to the Travel Plans for the Proposed Development (recognising that the availability, convenience and promotion of alternatives, as well as the availability of parking will in turn have impacts on demand).

7.5.108 Disabled car parking requirements and provision, close to the proposed land uses have been assessed as part of the Transport Assessment and Travel Plan, along with any operational parking provisions and servicing arrangements.

7.5.109 Cardiff Council periodically published car parking strategies which consider parking availability, cost and management against other comparator cities and destinations, as well as setting out future strategies.

7.5.110 Working with parking technology firm Smart Parking Limited, Cardiff Council was the first Council in Europe to roll out technology to install sensors in thousands of ‘paid-for' and disabled parking bays. Drivers can download an app called ‘Park Cardiff’ and search and view a real-time map of parking availability, to be directed to an available space. This connects to mobile parking payment services.

Enterprise Car Club

7.5.111 Enterprise car club operates in Cardiff, with two vehicles situated within Cardiff Bay, namely in Bute Place / Britannia Quay and in Mount Stuart Square.

7.5.112 Car clubs offer the opportunity for occasional utility or leisure trips to be taken by members without having their own vehicle present and whilst these are schemes requiring membership, may offer a favourable alternative to the costs of private car parking for Hotel guests or staff largely working or visiting the immediate area, but with some desire to visit locations that can be most readily reached or explored by car.

7.5.113 Whilst it is unlikely that the Arena or Hotel would warrant provision of an additional vehicle in their own right, Enterprise Car Club may have an interest in operating from within the wider masterplan area and may be interested in an additional space if one could be provided as part of the development.

7.5.114 This will be explored in further detail as part of the Framework Travel Plan for both the Arena and the illustrative masterplan Site.

Coach and Taxi drop off and collections

7.5.115 There is a taxi rank currently situated on New George Street, serving Mermaid Quay. It provides space for three taxis.

7.5.116 Key bus and coach bays in Cardiff are currently located in the following locations:

- Churchill Way in Cardiff city centre, approximately 200m from Cardiff Queen Street station; and
- Greyfriars Road and Kingsway, next to Friary Gardens.

7.5.117 More locally to the Site, there are existing bus bays marked on the eastern side of Bute Street and the northern side of Pierhead Street, approximately 240m and 375m respectively from the Proposed Development. These are key locations for coaches serving the Wales Millennium Centre and/or tours visiting Cardiff Bay. The potential demands associated with different scales of events at the Proposed Development could also be met by provision in these locations.

7.5.118 As part of the Travel Planning, ongoing monitoring will be undertaken to establish if further monitoring will be required.

Existing Trip Generation

7.5.119 As part of the trip generation and distribution exercise the existing trips associated with both Cardiff County Hall and the Red Dragon Centre have been redistributed (Phase 1) and removed (Phases 2 – 6) from the surrounding local highway network.

7.5.120 These flows are summarised in Table 7.17 and have been netted off from the trip generation associated with the Proposed Development.

Table 7.15 – Existing Red Dragon Centre / County Hall Trips

	Arrivals	Departures	Two-Way	Arrivals	Departures	Two-Way
County Hall						
Car	331	54	385	37	258	295
Car Share	36	6	42	4	28	32
Bus	98	16	114	11	77	88
Coach	0	0	0	0	0	0
Rail	98	16	114	11	77	88
Walking	579	94	673	65	451	516
Cycling	9	2	11	1	7	8
Taxi	0	0	0	0	0	0
Red Dragon Centre						
Car	94	19	113	104	169	273
Car Share	79	16	95	87	141	229
Bus	34	7	41	38	62	99
Coach	26	5	32	29	47	76
Rail	22	4	26	24	39	63
Walking	96	20	116	107	173	280
Cycling	2	0	2	2	4	6

Table 7.15 – Existing Red Dragon Centre / County Hall Trips						
	Arrivals	**Departures**	**Two-Way**	**Arrivals**	**Departures**	**Two-Way**
Taxi	6	1	7	7	11	18

7.6 Receptors and Receptor Sensitivity

7.6.1 The potential receptors identified in this assessment are all people making journeys within the study area for each mode. The existing and introduced receptors are detailed separately. The sensitivity of these receptors varies by location and is reflected in the assessment of effects.

Existing

7.6.2 The sensitive receptors on the Site and within the surrounds that may be affected by the Proposed Development are:

- Car drivers / local road network;
- Pedestrians;
- Cyclists;
- Bus passengers/ network; and
- Rail Passengers/ network (both LUL and DLR).

Introduced

7.6.3 The receptors that are being introduced on the Site as part of the Proposed Development are:

- Residents (pedestrians, cyclists, public transport users);
- Visitors (pedestrians, cyclists, public transport users) and
- Commercial Use Staff (pedestrians, cyclists, public transport users).

7.7 Assessment of Effects / Potential Effects

7.7.1 The Proposed Development is being delivered via a hybrid planning application. As such, the effects of the Proposed Development have been considered in two phases:

- Phase 1 considers the enabling works, construction of Arena and Hotel, and associated infrastructure and landscaping (anticipated timescales: 2022 – 2025). This is undertaken in parallel with construction of 1,300 space MSCP, demolition of the existing Travelodge Hotel, and associated infrastructure and landscaping (anticipated timescales: 2022 – 2025).
- Phase 2 considers construction of new Red Dragon Centre, demolition of the existing Red Dragon Centre, construction of a pedestrian bridge over A4232, and associated infrastructure and landscaping (anticipated timescales: 2024 – 2032).

Construction

7.7.2 The assessment of the potential effects during the construction works associated with the Proposed Development has been undertaken based upon the anticipated requirements concerning deliveries and traffic management. This covers:

- Severance;
- Driver Delay;
- Pedestrian and cyclists delay, amenity;
- Pedestrian and cyclists fear and intimidation;
- Public Transport Delay (National Rail, Bus Network); and,
- Accidents and Safety.

7.7.3 Traffic generation estimates for the construction of the Proposed Development are based on a number of assumptions on matters such as materials quantities, number of workers, construction programme, etc.

Severance

7.7.4 Regarding any severance created by the construction process, the impact is negligible, the sensitivity is negligible and therefore the effect is negligible adverse (not significant), as if required, alternative routes will be provided.

7.7.5 An alternative route for Schooner Way traffic would be travelling via Central Link, or Lloyd George Avenue. An alternative route for Hemingway Road traffic would be

travelling via Cardiff Bay Link Road, or travelling north via Central Link, or Lloyd George Avenue, both via Tyndall Street.

Driver Delay

7.7.6 It is proposed that all routes to the Site would be agreed with Cardiff Council prior to construction commencing. HGVs will be advised to follow the primary access route to the Site dependent on the direction of travel.

7.7.7 The access routes to the Site are set out as follows:

- From the West and North – A4232
- From the East – Eastern Bay Link Road and Rover Way

7.7.8 A CEMP and CTMP would be adhered to throughout the constructions works for the Proposed Development.

7.7.9 Construction works would generate short-term increases in vehicle movements on the highway in the vicinity of the Site. It should also be noted that these increases are not constant throughout the construction period and consideration has only been given to the highest peak, or worst case.

7.7.10 Based on experience of similar construction projects, it is considered that the majority (if not all) construction traffic would relate to HGVs during construction hours. Construction traffic has been assumed to be spread evenly over a 10 hour long working day although there may be slight peaks throughout the day.

7.7.11 A CEMP will be adhered to throughout the constructions works for the Proposed Development. It must be noted that the CEMP submitted as part of the hybrid planning application only relates to the Arena and Hotel enabling works, and other CEMPs will be produced as part of each phase of development.

7.7.12 This supports the negligible adverse effect (not significant) on the above receptors. This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Pedestrian and Cyclist Delay and Amenity

7.7.13 Construction traffic associated with the Proposed Development has the potential to affect pedestrians and cyclists using the highway network in the vicinity of the Site as a result of temporary disruption from vehicles (particularly HGVs), however this is expected to be minimal when accessing and egressing the Site as traffic will arrive via Central Link/Hemingway Road which do not form part of the cyclist or pedestrian

footway network. The only location where there is potential that construction vehicles would affect pedestrians is when crossing over the junction with entry to Cardiff County Hall Car Park.

7.7.14 There will be temporary road or footway closures and temporary alterations to vehicle routing subject to discussions with the CC. As a result there will also be proposed re-routing of cycle network paths to be discussed with Cardiff Council.

7.7.15 Given the low number of construction vehicles, in comparison to the existing HGV flows, predicted to be associated with the Site, the likely significant effects of construction traffic on pedestrian and cyclist delay and amenity would be short-term, local, adverse and of negligible adverse (not significant). This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Pedestrians and Cyclists Fear and Intimidation

7.7.16 As noted, whilst an increase in HGVs is forecast, the HGV proportion of total traffic flows will be minimal.

7.7.17 Furthermore, minimal changes are proposed to be made to the surrounding roads or footpaths as part of the construction works. On this basis, the resultant scale of effect on fear and intimidation (medium sensitivity) is considered to be a negligible adverse effect (not significant). The effect will be local, indirect, temporary, and medium-term.

Public Transport Delay (DLR, LUL, Bus Network)

7.7.18 During the construction period there would be an increased number of workers in the local area that would use the public transport network. Normal hours of demolition and construction work would be 08:00 to 18:00 (Monday to Friday) and 08:00 to 13:00 (Saturday). This would include a one-hour period of mobilisation / demobilisation at the start and end of each day.

7.7.19 The majority of the workforce would be travelling to and from the Site outside of the peak periods due to the fact that the construction work hours are between 08:00 and 18:00. As set out in the TA the AM and PM Peak Travel Periods are 08:30 to 09:30 and

17:30 to 18:30, therefore all construction workers will travel outside of the AM Peak but there will be an element of overlap during the PM Peak (between 18:00 to 18:30).

7.7.20 To account for the overlap and to mitigate any potential effects during the construction period, the CEMP and CTMP would be adhered to throughout the constructions works for the proposed Arena and Hotel elements of the development.

7.7.21 The above measures should assist in encouraging construction workers to use modes of public transport which have existing capacity during peak hours therefore, as overall demand is lower, these modes would also have capacity outside of these peak hours.

7.7.22 Taking the above points into consideration it is considered that due to the majority of travel taking place outside peak hours and that the workers will be using public transport modes with capacity, the likely significant effect upon public transport capacity would therefore be a negligible adverse effect (not significant).

Accidents and Safety

7.7.23 The proposed construction works are not expected to generate a significant number of vehicle trips; on this basis, the magnitude of impact on accidents and safety will be negligible. The resultant effect on drivers, pedestrians and cyclists (low sensitivity) will be a negligible effect (not significant). The effect will be local, direct, temporary and medium term.

Completed Development
Phase 1 – Travelodge Relocation, Car Park Construction & Arena Traffic

7.7.24 This section considers the impacts of Phase 1 on the following key receptors:

- Severance (separation of people from places or other people or obstruction of pedestrian access to essential facilities).
- Driver Delay (traffic delays to non-development traffic).
- Pedestrian Delay (ability of pedestrians to cross-roads due to changes in traffic volume, composition and speed and the level of pedestrian activity, visibility and physical conditions of the Proposed Development).
- Pedestrian Amenity (effect of the Proposed Development on the experience of pedestrian journeys due to changes in traffic flow, composition, and separation from traffic).
- Cyclist Delay and Amenity.

- Fear and Intimidation (due to increase in traffic volume and its proximity or lack of protection).
- Accidents and Safety (risk of collisions occurring through the Proposed Development changing the character of existing traffic).

7.7.25 Once occupied, the Proposed Development will generate additional movements on the surrounding transport network. This section assesses the likely environmental effects of transport related to the operational phase of the Proposed Development.

7.7.26 The trip generation is forecast based on sources of existing travel behaviour patterns. Travel Plans (TP) have been produced for the Proposed Development. Copies of the TPs are attached to the TA and the documents set out measures for monitoring and supporting sustainable and active travel choices and modal shift away from private car-based trips. Detailed Travel Plans are expected to be secured through a planning condition.

7.7.27 An outline Delivery and Servicing Plan would be produced for the Proposed Development setting out the management strategy for delivery trips to the Site and consolidating activity where possible.

Phase 1 Trip Generation

7.7.28 The trips that are predicted to be generated, by mode, for Phase 1 of the Proposed Development in the AM and PM peak hours, using the methodology set out earlier in this Chapter, are presented in Table 7.19. It must be noted from the outset that the effect on the highway network and traffic flows is negligible, (it should be noted that this statement also incorporates the servicing trip generation as set out below). This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Table 7.16 - Total Phase 1 (Arena, Hotel and Car Park) Trip Generation*

	AM (0800 – 0900)			PM (1700 – 1800)		
Mode	**ARR**	**DEP**	**Two-Way**	**ARR**	**DEP**	**Two-Way**
Car	6	13	19	520	-1	519
Car Share	2	4	6	885	-4	881
Public Transport	1	3	4	471	-5	466

Table 7.16 - Total Phase 1 (Arena, Hotel and Car Park) Trip Generation*						
	AM (0800 – 0900)			**PM (1700 – 1800)**		
Mode	**ARR**	**DEP**	**Two-Way**	**ARR**	**DEP**	**Two-Way**
Walk	0	0	0	57	0	57
Cycle	6	13	19	504	-2	502

*(Figures may not total exactly due to rounding). For detailed trip generation associated with the existing and forecast uses of The Site, please see the associated TA document.

Locations Considered in Association with Phase 1

7.7.29 As previously established, this assessment has been undertaken in line with GEART principals. On this basis, only links meeting the following criteria are considered:

- Traffic flows increase by more than 30%
- Sensitive areas where traffic flows increase by <10%

7.7.30 Following the completion of Phase 1 of the development, Table 7.20 illustrates the Baseline plus the Phase 1 Proposed Development trips, and a calculation showing the percentage impact compared to the existing baseline flows.

7.7.31 The 2018 Baseline data has been used as a robust comparison when comparing to the proposed trip generation as this is pre-growth and therefore will illustrate and inflated percentage increase proportion.

Table 7.17 - Total Phase 1 (Arena, Hotel and Car Park) Trip Generation						
Mode	**AM**	**PM**	**AM**	**%age Impact**	**PM**	**%age Impact**
County Hall Access	54	259	-54	-100%	-258	-100%
Galleon Way (E)	41	19	0	0%	0	0%
Hemingway Road (E)	700	462	-9	-1%	186	40%
Red Dragon Centre / MSCP Access	51	185	33	65%	247	133%
Hemingway Road (W)	382	375	0	0%	0	0%
Stuart Street	280	607	0	0%	0	0%
Dudley Street	29	45	0	0%	0	0%

Table 7.17 - Total Phase 1 (Arena, Hotel and Car Park) Trip Generation						
Mode	**AM**	**PM**	**AM**	**%age Impact**	**PM**	**%age Impact**
A4232	605	324	0	0%	104	32%
Ffordd Caspian (N)	745	241	0	0%	103	43%
Pierhead Street (E)	77	219	0	0%	0	0%
Pierhead Street (W)	143	433	0	0%	0	0%
Stuart Street (E)	288	618	0	0%	0	0%
Havannah St	40	59	0	0%	0	0%
Stuart Street (W)	600	315	0	0%	104	33%
Stuart Street (E)	2	49	0	0%	0	0%
Mermaid Quay Car Park	171	366	0	0%	0	0%
Stuart Street (W)	266	227	0	0%	73	32%

7.7.32 As shown in Table 7.20 the Proposed Development will generate the primary movements along all links during the PM peak period. This is consistent with the nature of the Arena use.

7.7.33 During the PM peak period due to minimal demand associated with the Proposed Development it is in fact considered that the Proposed Development could have a beneficial impact on the local highway network.

7.7.34 In addition, the Proposed Development would see the redistribution of background movements associated with the stopping up of both Schooner Way and Hemingway Road. As such, this will see a reduction in background vehicular movements along these links.

7.7.35 This redistribution exercise will be captured further as the planning application.

7.7.36 It should also be noted that where the impact of the development exceeds 30% this occurs on the approach roads to the car parks that are likely to be utilised by visitors of the Arena.

Severance

7.7.37 As per the guidance set out in Table 7.6 the number of additional vehicular trips associated with the completed and operational development does not exceed 60% on any of the links with the exception of the Red Dragon centre / Multi-Storey Car Park access road.

7.7.38 It is therefore considered that on the vast majority of the local highway network that the impact of the development will be negligible.

7.7.39 Along the multi-storey car park access road as a result of the redistribution of movements from the Cardiff County Hall Car Park as well as the movements associated with the proposed Arena development it is considered that the impact of the development would be large, however, there is significant capacity to accommodate this level of demand on the surrounding highway network.

Driver Delay

7.7.40 The Proposed Development is not expected to result in changes which would significantly affect perceptions of driver/bus delay during operation as the number of vehicle trips generated by the Proposed Development in operation is expected to be imperceptible on the wider network.

7.7.41 Some minor changes are required to bus routes currently operating along Schooner Way / Hemingway Road as a result of the Proposed Development. These are however unlikely to have a significant impact on the journey times. Therefore, the effect of which is a negligible effect (not significant).

Pedestrian Delay

7.7.42 The development proposals seek to enhance the pedestrian routing options, with the potential to benefit journey times as a result.

7.7.43 Table 7.20 indicates changes to daily traffic flow as a result of the Proposed Development; these are unlikely to be perceptible from a pedestrian delay perspective

and the changes in traffic flow are therefore expected to have a minor beneficial effect (not significant) on pedestrian delay.

7.7.44 Additionally, the development proposals seek to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in pedestrian flows once the Proposed Development is complete and operational. The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, reducing delay.

Pedestrian Amenity

7.7.45 Pedestrian amenity is impacted by changes in traffic, pedestrian flows and footway widths. This assessment of the impact of the Proposed Development on amenity therefore considers surrounding footway widths and pedestrian comfort levels.

7.7.46 The development proposals seek to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in pedestrian flows once the Proposed Development is complete and operational.

7.7.47 The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, improving the amenity.

7.7.48 Table 7.20 indicates changes to daily traffic flow as a result of the Proposed Development; these are unlikely to be perceptible from a pedestrian amenity perspective and the changes in traffic flow are therefore expected to have a minor beneficial effect (not significant) on pedestrian delay.

Fear and Intimidation

7.7.49 The design of the Proposed Development and the pedestrian routes within the landscaping can be expected to be designed to create an attractive and secure environment that provides increased natural surveillance and lighting encouraging pedestrian activity. The existing routes to and from the Proposed Development to key travel destinations are of good quality, with plenty of places to stop and rest, shade and shelter, lighting and natural surveillance.

7.7.50 The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, reducing the effect of fear and intimidation by providing segregated routing.

7.7.51 The Proposed Development could result in changes which could beneficially affect perceptions of amenity, fear and intimidation during operation. The design of the Site and the pedestrian routes within it can be expected to be designed to create an

attractive and secure environment. The effect of which is a moderate beneficial effect (significant).

7.7.52 This is based on the impact being medium, the sensitivity being medium and therefore the effect is moderate beneficial.

Cyclist Delay and Amenity

7.7.53 The Proposed Development will not result in any changes to the existing cycle infrastructure and routing that surrounds the Site, with the development proposals seeking to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in cyclist flows once the Proposed Development is complete and operational.

7.7.54 A NextBike Cycle Hire docking station will also be provided off-Site; the location will be agreed with Cardiff Council and funded by the Joint Applicant.

7.7.55 In summary, the effect of cyclist delay and amenity is deemed as a minor beneficial effect (not significant).

Accidents and Safety

7.7.56 The Proposed Development is not expected to result in changes which could affect accidents and safety during operation. Any effects arising from highway and public realm scheme improvements proposed as part of the Proposed Development are designed to have a negligible beneficial effect (not significant). This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Hazardous Loads

7.7.57 The Proposed Development is not expected to generate or attract hazardous loads once complete and occupied; on this basis, negligible (not significant) effects associated with hazardous loads are anticipated. This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Phase 2 – 6: Masterplan Development

7.7.58 This section considers the impacts of Phase 2 on the following key receptors.

- Severance (separation of people from places or other people or obstruction of pedestrian access to essential facilities).
- Driver Delay (traffic delays to non-development traffic).
- Pedestrian Delay (ability of pedestrians to cross-roads due to changes in traffic volume, composition and speed and the level of pedestrian activity, visibility and physical conditions of the Proposed Development).
- Pedestrian Amenity (effect of the Proposed Development on the experience of pedestrian journeys due to changes in traffic flow, composition, and separation from traffic).
- Cyclist Delay and Amenity.
- Fear and Intimidation (due to increase in traffic volume and its proximity or lack of protection).
- Accidents and Safety (risk of collisions occurring through the Proposed Development changing the character of existing traffic).

7.7.59 As previously established, this assessment has been undertaken in line with GEART principals. On this basis, only links meeting the following criteria are considered:

- Traffic flows increase by more than 30%
- Sensitive areas where traffic flows increase by <10%

Trip Generation

7.7.60 Table 7.18 sets out the Net Trip Generation associated with Phase 2. For detailed trip generation associated with the existing and forecast uses of the Site, see the associated TA.

7.7.61 The movements are an amalgamation of existing and proposed. As a result of the existing movements exceeding those calculated as part of the trip generation exercise for the individual uses this has resulted in a reduction in the number of trips expected during the AM peak period as well as a reduction in the PM peak departure movements.

7.7.62 This is likely to be primarily associated with a reduction in scale of the office uses on Site as well as the loss / reduced scale of some of the leisure facilities (i.e. Gym) that would have attracted trips during the peak periods.

Table 7.18 - Total Phase 2 - 6 (Masterplan) Trip Generation						
	AM (0800 – 0900)			**PM (1700 – 1800)**		
Mode	**ARR**	**DEP**	**Two-Way**	**ARR**	**DEP**	**Two-Way**
Car	-351	-33	-384	115	-243	-128
Car Share	-102	-8	-111	152	-36	116
Public Transport	-232	-25	-257	23	-187	-163
Walk	-541	-39	-580	64	-417	-352
Cycle	-9	-1	-10	1	-7	-5

Locations Considered in Association with Phase 2 - 6

7.7.63 Following the completion of Phase 2 of the Proposed Development, Table 7.22 illustrates the Baseline plus Phase 1 plus Phases 2 – 6 Proposed Development trips, and a calculation showing the percentage impact compared to the existing baseline flows.

7.7.64 Similarly, the 2018 Baseline data has been used as a robust comparison when comparing to the proposed trip generation as this is pre-growth and therefore will illustrate and inflated percentage increase proportion.

Table 7.19 - Total Phase 2 - 6 (Masterplan) Trip Generation						
Mode	**AM**	**PM**	**AM**	**%age Impact**	**PM**	**%age Impact**
County Hall Access	54	259	-54	-100%	-258	-100%
Galleon Way (E)	41	19	0	0%	0	0%
Hemingway Rd East	700	462	-306	-44%	314	68%
Red Dragon Centre / MSCP Access	51	185	0	-1%	15	8%

Table 7.19 - Total Phase 2 - 6 (Masterplan) Trip Generation

Mode	AM	PM	AM	%age Impact	PM	%age Impact
Hemingway Road (W)	382	375	0	0%	0	0%
Stuart Street	280	607	0	0%	0	0%
Dudley Street	29	45	0	0%	0	0%
A4232	605	324	0	0%	104	32%
Ffordd Caspian (N)	745	241	0	0%	103	43%
Pierhead Street (E)	77	219	0	0%	0	0%
Pierhead Street (W)	143	433	0	0%	0	0%
Stuart Street (E)	288	618	0	0%	0	0%
Havannah St	40	59	0	0%	0	0%
Stuart Street (W)	600	315	0	0%	104	33%
Stuart Street (E)	2	49	0	0%	0	0%
Mermaid Quay Car Park	171	366	0	0%	0	0%
Stuart Street (W)	266	227	0	0%	73	32%

7.7.65 As shown in Table 7.22 the Proposed Development will generate the primary movements along all links during the PM peak period. This is consistent with the nature of the Arena use.

7.7.66 During the PM peak period due to minimal demand associated with the land uses it is in fact considered that the Proposed Development could have a beneficial impact on the local highway network.

7.7.67 In addition, the Proposed Development will see the redistribution of background movements associated with the stopping up of Hemingway Road under Phase 1, with

Schooner Way being reconnected during Phases 2-6. As such, this will see a reduction in background vehicular movements along these links.

7.7.68 This redistribution exercise will be captured further for the planning application.

7.7.69 It should also be noted that where the impact of the development exceeds 30% this occurs on the approach roads to the car parks.

Severance

7.7.70 As per the guidance set out in Table 7.6 the number of additional vehicular trips associated with the completed and operational development does not exceed 60% on any of the links with the exception of the Red Dragon centre / Multi-Storey Car Park access road.

7.7.71 It is therefore considered that on the vast majority of the local highway network that the impact of the development will be negligible.

7.7.72 Along the multi-storey car park access road as a result of car parking locations for various uses amalgamating it is considered that the impact of the development would be large, however, there is significant capacity to accommodate this level of demand on the surrounding highway network.

Driver Delay

7.7.73 The Proposed Development is not expected to result in changes which would significantly affect perceptions of driver/bus delay during operation as the number of vehicle trips generated by the Proposed Development in operation is expected to be imperceptible on the wider network.

7.7.74 Some minor changes are likely to be required to bus routes currently operating along Schooner Way / Hemingway Road as a result of the Proposed Development. These are however unlikely to have a significant impact on the journey times. Therefore, the effect of which is a minor beneficial effect (not significant).

Pedestrian Delay

7.7.75 The development proposals seek to enhance the pedestrian routing options, with the potential to benefit journey times as a result.

7.7.76 The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, reducing delay.

7.7.77 Table 7.22 indicates changes to daily traffic flow as a result of the Proposed Development; these are unlikely to be perceptible from a pedestrian delay perspective and the changes in traffic flow are therefore expected to have a minor beneficial effect (not significant) on pedestrian delay.

7.7.78 Additionally, the development proposals seek to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in pedestrian flows once the Proposed Development is complete and operational.

Pedestrian Amenity

7.7.79 Pedestrian amenity is impacted by changes in traffic, pedestrian flows and footway widths. This assessment of the impact of the Proposed Development on amenity therefore considers surrounding footway widths and pedestrian comfort levels.

7.7.80 The development proposals seek to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in pedestrian flows once the Proposed Development is complete and operational.

7.7.81 The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, improving the amenity.

7.7.82 Table 7.22 indicates changes to daily traffic flow as a result of the Proposed Development; these are unlikely to be perceptible from a pedestrian amenity perspective and the changes in traffic flow are therefore expected to have a minor beneficial effect (not significant) on pedestrian delay.

Cyclist Delay and Amenity

7.7.83 The Proposed Development will not result in any changes to the existing cycle infrastructure and routing that surrounds the Site, with the development proposals seeking to strengthen the permeability of the public realm, and provide additional capacity for the forecast increase in cyclist flows once the Proposed Development is complete and operational.

7.7.84 A NextBike Cycle Hire docking station will also be provided off-Site; the location will be agreed with Cardiff Council and funded by the Joint Applicant. In summary, the

effect of cyclist delay and amenity is deemed as a minor beneficial effect (not significant).

Fear and Intimidation

7.7.85 The design of the Proposed Development and the pedestrian routes within the landscaping can be expected to be designed to create an attractive and secure environment that provides increased natural surveillance and lighting encouraging pedestrian activity. The existing routes to and from the Proposed Development to key travel destinations are of good quality, with plenty of places to stop and rest, shade and shelter, lighting and natural surveillance.

7.7.86 The proposed construction of a pedestrian bridge over A4232 will improve and enhance the pedestrian routing, reducing the effect of fear and intimidation by providing segregated routing.

7.7.87 The Proposed Development could result in changes which could beneficially affect perceptions of amenity, fear and intimidation during operation. The design of the Site and the pedestrian routes within it can be expected to be designed to create an attractive and secure environment. The effect of which is a moderate beneficial effect (significant).

7.7.88 This is based on the impact being medium, the sensitivity being medium and therefore the effect is moderate beneficial.

Accidents and Safety

7.7.89 The Proposed Development is not expected to result in changes which could affect accidents and safety during operation. Any effects arising from highway and public realm scheme improvements proposed as part of the Proposed Development are designed to have a negligible beneficial effect (not significant). This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

Hazardous Loads

7.7.90 The Proposed Development is not expected to generate or attract hazardous loads once complete and occupied; on this basis, negligible (not significant) effects associated with hazardous loads are anticipated. This is based on the impact being negligible, the sensitivity being negligible and therefore the effect is negligible.

7.8 Mitigation and Residual Effects

7.8.1 This section details the residual effects and mitigation measures required for the Proposed Development.

Construction Mitigation

Construction Traffic Vehicular Movements

7.8.2 As noted above, the construction vehicles would be managed in accordance with a CEMP and CTMP for the proposed Arena and Hotel, with similar plans to be developed with same strategies for future phases.

7.8.3 Construction compounds will be developed within the wider Site. The location of these will be based on operational logistics which will be set out within a CEMP.

7.8.4 The CEMP and CTMP would, as a minimum, include details of the following:

- routes for construction traffic;
- temporary signage including the proposed location of warning signs;
- delivery timetables;
- the location of wheel washing facilities on Site, and
- the location of the construction compound on the Site.

7.8.5 Measures would also be adopted during the construction of the Proposed Development to minimise the impact of construction traffic movements with potential measures set out as follows:

- The production of a plan detailing measures to reduce the contract duration and the number of trips made
- Techniques and measures will be implemented, where practical, to assist in minimising construction freight trips on the local highway network, particularly during peak times (such as a vehicle booking system).
- All construction worker vehicles would be accommodated on the Site to reduce the impact of overspill parking on the local highway network.
- Measures will be set out to encourage construction staff to reduce car use to the Site, particularly through car sharing and also where feasible by public transport, walking and cycling.

- Wheel washing and dust sheeting will be undertaken to reduce the impact of mud, dust and dirt on the local highway network.

Pedestrian and Cyclist Movement and Amenity

7.8.6 As indicated above, the CEMP and CTMP would be implemented to provide appropriate mitigation measures which will support the proposed Arena and Hotel development.

Public Transport (National Rail, Bus Network)

7.8.7 No mitigation measures are required.

Completed Development Mitigation

Traffic Flows and Highways

7.8.8 No mitigation is required in respect of traffic flows on the surrounding highway network as the effects of the completed and operational development were previously assessed as negligible. Whilst not required as mitigation, TPs for the Proposed Development is included in the TA – this is a standard planning requirement. The Travel Plans aim to encourage public transport use, walking and cycling amongst occupants of the Proposed Development with the aim of reducing private car use. Detailed Travel Plans to be secured through a planning condition.

7.8.9 The changes to the highway network would involve:

- A new junction to access the Hotel, and Cardiff County Hall, built in Phase 1,
- The stopping up of Hemingway Road;
- The pick-up drop-off zone to use by the Arena;
- an enhancement to the taxi rank provision, and
- Park and ride -pick up-drop off on Hemingway Road on the southern carriageway.

Parking and Servicing

7.8.10 An Outline Delivery and Servicing Plan (DSP) has been produced for the Arena and Hotel Proposed Development and is included in the TA. A detailed Deliveries and Servicing Plan to be secured through a planning condition. The DSP provides a management framework to improve the safety, efficiency and reliability of deliveries and servicing at the Site. The benefits of the DSP include improved reliability of

deliveries and servicing, less noise and disruption and time-savings through the identification of unnecessary deliveries.

7.8.11 In accordance with the aspirations of the Cardiff Council, A 1,300 space multi-storey car park is proposed on Site as part of Phase 2. This phase is committed to come forward at the same time as Phase 1 and is currently out for procurement and will be dealt with via a reserved matters application. The 1,300 spaces will incorporate blue badge parking and electric vehicle parking in line with the relevant standards. It is proposed to provide no additional car parking to what is currently in place.

7.8.12 The multi-storey car park will be built out as part of Phase 1 of the Proposed Development and will be available to all users of the Arena as well as visitors and residents of the masterplan area. The Hotel will provide a total of 51 parking spaces both in and immediately west of the undercroft car park (inclusive of 1 white van space and 9 disabled car parking spaces – the latter in accordance with Cardiff Council's SPG requirement).

7.8.13 It is noted that electric charging points will be available in line with Cardiff Council guidelines Policy. Cycle parking would also be provided in line with Cardiff Council guidelines and designed in line with the Design Guidelines.

Pedestrian and Cyclist Facilities and Conditions

7.8.14 No mitigation is required as the effects were considered to be either negligible. The likely residual effects would therefore remain negligible. It should however be noted that cycle parking facilities would be provided in line with current guidance and promoted through the Travel Plan.

7.8.15 In respect of pedestrian movement and capacity, pedestrian severance, pedestrian fear and intimidation and cycling, long-term, local, beneficial and of negligible significance in respect of pedestrian delay and long-term, local, beneficial and of negligible significance in respect of pedestrian amenity.

7.8.16 However, active travel improvements will include improved cycle parking facilities, sustainable travel enhancement, a new NextBike station, an active travel corridor linking Schooner Way to Lloyd George Avenue and Fford Garthorne, a new bus gate between Schooner Way and the Waterfront Quarter providing a link to Hemingway Road, and general improved public realm permeability.

Public Transport Network and Accessibility

7.8.17 No mitigation is required as the effects upon public transport were considered to be negligible.

Residual Effects

7.8.18 All of the residual effects resulting from the Proposed Development, are presented in Table 7.20 identifying whether the effect is significant or not.

Table 7.20 - Residual Effects resulting from the Proposed Development

Receptor (and Sensitivity)	Description of Residual Effect	Classification of Residual Effect*					
		Nature and Scale**	+ -	D I	P T	R IR	St Mt Lt
Construction							
Pedestrians	Severance	Negligible Adverse	-	D	T	R	St-Mt
Car Drivers	Driver Delay	Negligible Adverse	-	D	T	R	St-Mt
Pedestrians and Cyclists	Delay and Amenity	Negligible Adverse	-	D	T	R	St-Mt
	Fear and Intimidation	Negligible Adverse	-	D	T	R	St-Mt
Bus and Rail Passengers	Public Transport Delay	Negligible Adverse	-	D	T	R	St-Mt
All Users of the Highway Network	Accidents and Safety	Negligible Adverse	-	D	T	R	St-Mt
Phase 1 Completed and Occupied Development							
Pedestrians	Severance	Negligible	-/+	D	P	IR	Lt
Car Driver	Delay	Negligible	-/+	D	P	IR	Lt
Pedestrians	Delay	Minor beneficial	+	D	P	IR	Lt
	Amenity	Minor beneficial	+	D	P	IR	Lt
Pedestrians and cyclists	Fear and Intimidation	Moderate beneficial	+	D	P	IR	Lt
Pedestrians and cyclists	Delay and Amenity	Minor beneficial	+	D	P	IR	Lt
All Users of the Highway Network	Accidents and Safety	Negligible Beneficial	+	D	P	IR	Lt
All Users of the Highway Network	Hazardous Loads	Negligible	-/+	D	P	IR	Lt
Phase 2 Completed and Occupied Development							

Table 7.20 - Residual Effects resulting from the Proposed Development							
Receptor (and Sensitivity)	**Description of Residual Effect**	**Classification of Residual Effect***					
		Nature and Scale**	**+ -**	**D I**	**P T**	**R IR**	**St Mt Lt**
Pedestrians	Severance	Negligible	-/+	D	P	IR	Lt
Car Driver	Delay	Negligible	-/+	D	P	IR	Lt
Pedestrians	Delay	Minor beneficial	+	D	P	IR	Lt
	Amenity	Minor beneficial	+	D	P	IR	Lt
Pedestrians and cyclists	Fear and Intimidation	Moderate beneficial	+	D	P	IR	Lt
Pedestrians and cyclists	Delay and Amenity	Minor beneficial	+	D	P	IR	Lt
All Users of the Highway Network	Accidents and Safety	Negligible Beneficial	+	D	P	IR	Lt
All Users of the Highway Network	Hazardous Loads	Negligible	-/+	D	P	IR	Lt

Notes:

** - = Adverse/ + = Beneficial; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term;*

***Nature = Beneficial or Adverse; Scale = Negligible/Minor/Moderate/Major*

Climate Change

7.8.19 Of the receptors considered, the residual effects on severance, accidents and safety and hazardous loads would be unaffected by climate change. The large majority of movements will be undertaken by pedestrians walking, cycling or using public transport and therefore the impacts of climate change are unlikely to have a direct impact on them. Road surfaces may change due to the increases in summer temperatures and therefore could potentially impact vehicles or cyclists using the local roads; however, this is expected to be a negligible issue in the short or medium term.

7.8.20 Similarly, climate change would not have a direct effect on delay and stress or amenity, fear and intimidation. However, changing travel behaviour in response to climate change concerns is expected to result in a switch to more sustainable modes of travel, lower emission vehicles and encourage advances in technology, which in turn would support improved telecommuting and flexible working, reducing the scale of peak hour travel. These changes would indirectly reduce delay and stress for drivers, pedestrians and cyclists, and a reduction in vehicle emissions and traffic

volumes would have a benefit for pedestrian and cyclist amenity, fear and intimidation.

7.8.21 The Proposed Development, designed based on Cardiff Council future aspirations, is therefore considered to be resilient. Any future changes in travel patterns would serve to increase benefits to users of the Site as well as residents, visitors and employees of the local area, although this benefit is not expected to be of a scale that would change the overall residual effects outlined in Table 7.20. The vulnerability of the receptors is summarised in Table 7.21.

Table 7.21 - Potential Climate Change Effects and Mitigation	
Potential Effects Identified	**Effect Classification**
Severance	Negligible
Driver Delay & Stress	Low
Pedestrian and Cyclist Delay, Amenity, Fear and Intimidation	Low
Public Transport Passenger Delay	Low
Accidents and Safety	Negligible
Hazardous Loads	Negligible

7.9 Cumulative Effects Assessment

Construction

7.9.1 It should be noted that each cumulative scheme will need to provide a Construction Environmental Management Plan/ Construction Traffic Management Plan setting out impacts and any required mitigation measures. This, therefore, should go some way to making the cumulative impact of construction from these schemes negligible.

Likely Significant Effects

7.9.2 There will be no significant effects during construction of the Proposed Development on its own, or cumulatively.

7.9.3 There will be significant beneficial effects on perceptions of amenity, fear and intimidation during operation.

7.9.4 The only significant effect on the local highway network which will be experienced is on the approach to the proposed Multi-Storey Car Park. This is due to the amalgamation of various surrounding car parks into one location.

7.9.5 The use of this approach for vehicular movements will be reflected within the design of the approach and the surrounding pedestrian environment.

7.9.6 There will be no other significant effects during operation of the Proposed Development either cumulatively or on its own.