



FFORDD GYSWLLT
DWYRAIN Y BAE
EASTERN BAY LINK



Llywodraeth Cymru
Welsh Government



Eastern Bay Link Road Queens Gate Roundabout Road Safety Audit (Stage 2)

October 2016



CAPITA



CASS HAYWARD

PARSONS
BRINCKERHOFF



FFORDD GYSWLLT
DWYRAIN Y BAE
EASTERN BAY LINK



Llywodraeth Cymru
Welsh Government

Project No: CS/079772

Doc Ref: EBL-CAP-0000-QGR-SA-C-0205

Rev: P01

Issue Date: October 2016

Eastern Bay Link Road
Queens Gate Roundabout
Road Safety Audit (Stage 2)

	Name	Signature	Date
Author	K [REDACTED] E [REDACTED]	[REDACTED]	20/10/2016
Checker	H [REDACTED] K [REDACTED]	[REDACTED]	20/10/2016
Approver	P [REDACTED] G [REDACTED]	[REDACTED]	20/10/2016

Issue Record

Rev	Date	Description/Comments	Author/Prepared by:	Approved for Issue by:
P01	20/10/16	First issue	K [REDACTED] E [REDACTED]	P [REDACTED] G [REDACTED]

"The report shall be for the private and confidential use of the clients for whom the report is undertaken and should not be reproduced in whole or in part or relied upon by third parties for any use whatsoever without the express written authority of the Consultant"



CASS HAYWARD



Contents

1. Introduction	1
2. Road Safety Audit Team	2
3. Scope of the Road Safety Audit	3
4. Information forming the basis of the Audit	4
5. Declaration	6
6. Site Specific Comments and Recommendations	7

Appendices

Appendix A Reference Plan

1. Introduction

This Stage 2 Road Safety Audit forms part of the commission from the Welsh Government to design the Eastern Bay Link Road Queens Gate Roundabout Scheme which was instructed in the Road Safety Audit Brief dated 16th September 2016.

A Road Safety Audit is defined in Standard HD 19/15 as "The evaluation of Highway Improvement Schemes during design and at the end of construction (preferably before the scheme is open to traffic) to identify potential road safety problems that may affect any users of the highway and to suggest measures to eliminate or mitigate those problems. The audit process includes the accident monitoring of Highway Improvement Schemes to identify any road safety problems that may occur after opening."

The procedures and practices associated with Road Safety Audits are set out in Standard HD 19/15 and the CIHT Road Safety Audit Guidelines. The main procedural and practice features recommended in these documents include:

- Road Safety Audits should be undertaken at pre-set times in a schemes planning and implementation;
- Road Safety Audits should be performed by a team which is independent of the design team;
- The Audit Team should have specialist expertise in the fields of Road Safety Engineering and Accident Investigation and Prevention;
- Road Safety Audits should be carried out with the purpose of identifying design and/or construction features which should be modified in the interests of road safety and should seek to provide constructive recommendations as to how any design or construction difficulties can be resolved; and
- The Audit should be carried out on the basis of the information supplied to the Audit Team and should only address matters that have an adverse bearing on road safety in the context of the chosen design, with no attempt to comment on the justification or appropriateness of the chosen scheme.

In addition to the above features, Standard HD19/15 includes a model illustrating the recommended layout of the report document.

In view of the above points, no responsibility for the design or construction of the scheme can be accepted by the Auditors.

It is confirmed that the Road Safety Audit undertaken in respect of this particular scheme has been carried out in accordance with the procedures and practices detailed above. It is also confirmed that this is a Stage 2 Audit, i.e. one carried out on the completion of detailed design. The Road Safety Audit team is aware of previous Safety Audits (Stage 1 & 2 audits for the main link and access roads) carried out on the proposed scheme which have been referred to in this audit as appropriate.

2. Road Safety Audit Team

2.1 The Audit Team consisted of:

K E [REDACTED] BSc (Hons), MSc, CEng, MCIHT, MSoRSA (Team Leader)
Associate
Road Safety Engineering, Capita

H K [REDACTED] MCIHT, MSoRSA
Road Safety Engineer, Capita

3. Scope of the Road Safety Audit

- 3.1 This Audit reviews, from the Road Safety aspect, the Eastern Bay Link Road Scheme, including its interfaces with contiguous lengths of road and abutting side roads. At this stage of the scheme development the Stage 2 Road Safety Audit is required for Queens Gate roundabout only. The proposals are shown on the documents listed in the section entitled "Information Forming the Basis of the Audit" and broadly consist of:
- (a) The roundabout will be subject to a 30mph speed limit. Queens Gate Roundabout improvements include a segregated left turn lane, circulatory widening, full signalisation, and upgrade of a controlled crossing at Pierhead St junction.
 - (b) Provision of a separate shared use cycleway/footway linking into existing facility; and
 - (c) Provision of new drainage, vehicle restraint systems, signing, carriageway markings, and street lighting.
- 3.2 No Departures from Standards have been declared by the Designer
- 3.3 Speed limits of 50mph & 40 mph have been adopted for the main link road and 30 mph for Queens Gate and Ocean Way roundabouts.
- 3.4 The site was visited on Tuesday 22nd September 2015 for the Stage 1 Road Safety Audit when the weather was fine and the road surface was dry.

4. Information Forming the Basis of the Audit

- 4.1 This Road Safety Audit was undertaken on the proposals detailed in the following documentation:

Drawings No.

Queens Gate Roundabout

EBL-CAP-0100-QGR-DR-C-0151	QUEENS GATE ROUNDABOUT - GENERAL ARRANGEMENT
EBL-CAP-0100-QGR-DR-C-0153	QUEENS GATE ROUNDABOUT - CROSS SECTION LOCATION PLAN
EBL-CAP-0100-QGR-DR-C-0154	QUEENS GATE ROUNDABOUT - MAIN LINE CROSS SECTIONS Ch 520 - 580
EBL-CAP-0100-QGR-DR-C-0155	QUEENS GATE ROUNDABOUT - CROSS SECTIONS AT SEGREGATED LEFT TURN Sheet 1
EBL-CAP-0100-QGR-DR-C-0156	QUEENS GATE ROUNDABOUT - CROSS SECTIONS AT SEGREGATED LEFT TURN Sheet 2
EBL-CAP-0100-QGR-DR-C-0157	QUEENS GATE ROUNDABOUT - CROSS SECTIONS AT ROUNDABOUT Sheet 1
EBL-CAP-0100-QGR-DR-C-0158	QUEENS GATE ROUNDABOUT - CROSS SECTIONS AT ROUNDABOUT Sheet 2
EBL-CAP-0200-QGR-DR-C-0251	QUEENS GATE ROUNDABOUT – SITE CLEARANCE
EBL-CAP-0200-MLR-DR-C-0221	QUEENS GATE ROUNDABOUT – SITE CLEARANCE
EBL-CAP-0300-QGR-DR-C-0351	QUEENS GATE ROUNDABOUT – FENCING
EBL-CAP-0400-MLR-DR-C-0451	QUEENS GATE ROUNDABOUT – ROAD RESTRAINT
EBL-CAP-0500-QGR-DR-C-0551	QUEENS GATE ROUNDABOUT – DRAINAGE
EBL-CAP-0600-QGR-DR-C-0651	QUEENS GATE ROUNDABOUT – EARTHWORKS
EBL-CAP-0600-QGR-DR-C-0654	QUEENS GATE ROUNDABOUT – TYPICAL CROSS SECTIONS
EBL-CAP-0700-QGR-DR-C-0751	QUEENS GATE ROUNDABOUT – CARRIAGEWAY CONSTRUCTION
EBL-CAP-1100-QGR-DR-C-1151	QUEENS GATE ROUNDABOUT – FOOTWAYS AND PAVED AREAS
EBL-CAP-1100-PJW-DR-C-1153	QUEENS GATE ROUNDABOUT AND OCEAN WAY ROUNDABOUT KERB LAYOUTS AT SIGNAL CROSSING CENTRAL ISLANDS
EBL-CAP-1200-QGR-DR-C-1251	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNS AND ROAD MARKINGS
EBL-CAP-1200-QGR-DR-C-1257	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNALS AND FOUNDATION DETAILS SHEET 1
EBL-CAP-1200-QGR-DR-C-1258	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNALS AND FOUNDATION DETAILS SHEET 2
EBL-CAP-1200-QGR-DR-C-1259	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNALS AND FOUNDATION DETAILS SHEET 3
EBL-CAP-1200-QGR-DR-C-1260	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNS LOCATIONS (RPS)

EBL-CAP-1200-PJW-DR-C-1261	QUEENS GATE ROUNDABOUT OCEAN WAY ROUNDABOUT PEDESTRIAN AND CYCLIST MONITORING
EBL-CAP-1200-QGR-DR-C-1271	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNALS
EBL-CAP-1200-QGR-DR-C-1273	QUEENS GATE ROUNDABOUT – TRAFFIC SIGNALS MODIFICATIONS PIERHEAD ST JUNC
EBL-CAP-1300-QGR-DR-C-1351	QUEENS GATE ROUNDABOUT – STREET LIGHTING
EBL-CAP-1300-QGR-DR-C-1354	QUEENS GATE ROUNDABOUT – STREET LIGHTING DETAILS
EBL-CAP-3000-QGR-DR-L-3151	QUEENS GATE ROUNDABOUT – ENVIRONMENTAL MASTERPLAN
EBL-CAP-3000-QGR-DR-L-3153	QUEENS GATE ROUNDABOUT – TREE PROTECTION PLAN SITE1

Other Documents

Road Safety Audit Brief (EBL-CAP-0000-QGR-SA-C-0204).

Road Safety Audit Stage 1 Junctions (EBL-CAP-0000-PJW-SA-C-184) June 2016

5. Declaration

We confirm that this Road Safety Audit has been undertaken on the documents listed in the section entitled "Information Forming the Basis of the Audit" in accordance with the recommended procedures and represents an independent assessment of the road safety implications at this stage of this scheme's design.

No member of the Road Safety Audit team has been involved in scheme design.

Audit Team Leader

K E [REDACTED] BSc(Hons), MSc, CEng
MCIHT, MSoRSA
Associate
Road Safety Engineering
Capita
St David's House
Pascal Close
St Mellons
Cardiff
CF3 0LW



Signed

20th October 2016

Date

Audit Team Member

H K [REDACTED] MCIHT, MSoRSA
Road Safety Engineer, Capita
St David's House
Pascal Close
St Mellons
Cardiff
CF3 0LW

6. Site Specific Comments and Recommendations

For the locations of the points raised in this section, see the Reference Plan (Figure 1).

6.1 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-0500-QGR-DR-C-0551).

On the A4234 eastbound approach to the roundabout from the City centre there is a kerb build out on the offside and road levels fall towards this kerbline where no drainage is provided. Flooding in the vicinity of the signal Stop line may result in skid related collisions.

Recommendation

Provide adequate drainage.

6.2 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-0400-MLR-DR-C-0451).

P1 terminal provided on the central island on the offside of the eastbound carriageway exiting from Queens Gate roundabout towards EBL Main Line may launch an errant vehicle, leading to overturning collisions.

Recommendation

Provide a P4 terminal instead of P1.

6.3 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-0100-QGR-DR-C-0151).

The exit taper to the segregated left turning lane runs in parallel to the eastbound exit from the roundabout to EBL Main Line where two lanes merge into one. In view of the multitude of merging manoeuvres, drivers merging on the roundabout exit may fail to notice vehicles changing lane from the segregated left turning lane to the offside lane, leading to potential side impact collisions.

Recommendation

Provide straight ahead lane destination arrows on both lanes and extend hatched markings, separating the segregated lane from the roundabout exit further south to minimise the likelihood of conflicts during the lane changing manoeuvres.

6.4 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-0100-QGR-DR-C-0151).

In the north western circulatory carriageway at the tightest radii, the circulatory carriageway width is 8m and this arrangement may lead to larger vehicles encroaching into the adjacent lane in conflict with other vehicles. This problem was originally raised during the Stage 1 Road Safety Audit, but has not been addressed.

Recommendation

Check swept paths and widen lanes if necessary.

6.5 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-0100-QGR-DR-C-0151).

There is a potential for conflict between eastbound vehicles exiting the roundabout towards the A4234 City centre while undertaking merging manoeuvres into one lane and vehicles coming from the A4232 Tunnels in the segregated left turn lane and heading towards the City centre. Potentially vehicles from the three lanes could merge into one offside lane on the approach to the Central Link roundabout. Subsequent side impact collisions may occur.

Recommendation

Provide a merge on the exit from the segregated left turn lane with associated markings giving the traffic exiting the Queens Gate roundabout priority.

6.6 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1100-QGR-DR-C-1151).

On the north-western side of the roundabout circulatory carriageway a Splay type kerb is proposed on the nearside along the central island of the A4234 arm. Vehicles will negotiate a tight curvature on the two lane approach to the signals at this location and, if they mount this kerb, they could overrun the verge colliding with traffic signal posts positioned in the adjacent verge.

Recommendation

Replace SP splay kerb with BN3 type along the central island.

6.7 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1100-QGR-DR-C-1151).

Vehicles will negotiate a tight curvature on the two lane approach to the signals on the A4232 eastbound approach from the Tunnel to the roundabout. There is a Splay type kerb proposed on the offside, as a result, vehicles approaching in two lanes may overrun the splay kerb and collide with traffic signals on the island.

Recommendation

Replace SP splay kerb with BN3 type along the central island.

6.8 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1100-QGR-DR-C-1151).

The kerb upstand is shown at 125 mm (Splay type kerb) at the access to the CCTV maintenance layby on the north western side of the roundabout central island. This kerb upstand will force maintenance vehicles to slow down to a stop to access the layby, leading to potential rear end shunt collisions with following vehicles.

Recommendation

Provide BN2 type kerb at the layby.

6.9 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Chevron boards QGR2-WS facing westbound traffic on the EBL Main Link approach and QGR3-WS facing northbound traffic on Caspian Way approach to the roundabout are offset to the left from the line of sight of approaching drivers. Incorrect positioning of chevron boards on the central island of the roundabout may cause drivers to misjudge the roundabout and turn right on the entry against the movement, particularly in view of the traffic signals on the approaches.

Recommendations

Relocate chevron boards to the right to be in line with the driver's sight on the approach.

6.10 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1258).

'Wicket' lane destination direction signs throughout the scheme indicate Cardiff Bay by a 'Theatre' symbol, although, numerous journeys will be made towards residential areas in Cardiff Bay. Some drivers unfamiliar with the area may be confused by this symbol, leading to lane changes and side impact collisions.

Recommendation

Provide abbreviated Cardiff Bay wording instead of the 'Theatre' symbol.

6.11 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Right turn arrow is proposed on the A4232 eastbound approach to the traffic signals at Queens Gate roundabout. The right turn arrows on the roundabout approach may be misinterpreted by users, particularly foreign lorry drivers who may turn at the junction in collision with head on vehicles. This problem was originally raised during the Stage 1 Road Safety Audit, but has not been addressed for this roundabout approach.

Recommendation

Do not provide right turn lane arrow and replace with straight on arrow.

6.12 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Numerous signs are positioned in the nearside of the Caspian Way approach to the roundabout which may interfere with visibility toward the nearside primary traffic signals. The direction signs 28 RPS and QGR4-DS are of substantial dimensions and may obscure forward visibility toward the signal heads. The sign clutter may cause drivers to misjudge the approach, brake sharply, leading to rear end shunt collisions.

Recommendation

Position the signs outside the visibility splay and remove the proposed warning sign of Traffic Signals Ahead QGR8-WS, as it is positioned too close to the signal heads and could attribute to sign clutter.

6.13 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Proposed hatched markings on approaches to traffic islands may lead road users into the kerbs if these are not offset from the kerblines. This marking layout may cause collisions with the islands, particularly in dark conditions.

Recommendation

Ensure markings are offset and deflect vehicles from the island kerbs.

6.14 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Hatched markings on the approach to the central island alongside the A4232 westbound exit towards the Tunnel is shown incorrectly and may confuse drivers, who could be guided to the roundabout exit instead of staying on the circulatory carriageway. This layout may lead to sudden lane changes and side impact collisions.

Recommendation

Correct the hatched markings introducing chevron markings deflecting traffic from the island on both sides.

6.15 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251 and EBL-CAP-1200-QGR-DR-C-1258).

The proposed map type advance direction sign 21-RPS facing eastbound traffic on the A4234 approach to the roundabout could give a misleading message to drivers. It indicates that vehicles travelling towards the M4E/A48 will be turning left and those proceeding towards Cardiff Bay will be continuing straight on. This layout does not correspond with the true layout of the junction and its exits. As a result, drivers intending to travel to Cardiff Bay may exit towards the M4E/A48 and drivers travelling towards the A4232/M4W may exit towards Cardiff Bay. The sign layout may cause confusion, sharp braking, sudden lane changes and subsequent rear end shunt and side impact collisions.

Recommendations

The proposed ADS should be modified to depict a true layout of the roundabout with the straight on arm towards the M4E/A48 and right hand arm leading to Cardiff Bay.

6.16 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251 and EBL-CAP-1200-QGR-DR-C-1258).

The proposed 'wicket' sign QGR 4-DS does not correspond with the lane destination carriageway markings on Caspian Way approach to the junction. Inconsistency in signing and markings may cause driver confusion, sudden lane changes and subsequent side impact collisions.

Recommendations

It is recommended that the lane destination sign QGR 4 – DS corresponds with the lane destination markings on the approach to the junction.

6.17 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Numerous signs in the nearside verge of the A4234 eastbound approach to the roundabout, e.g. OGR 3-RS, QGR1-TMP, 21 RPS and QGR 1 –DS, may overlap one another, causing drivers to miss the information indicated by the signs. This layout may cause late lane changes and side impact collisions.

Recommendations

Position the signs on site so that they do not mask one another.

6.18 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

Proposed 'elephant foot' markings on the circulatory carriageway leading from the traffic signals Stop line at the intersection with the A4234 entry marked as follows: A4232 E in the outside lane and A4232E/Cardiff Bay in the inside lane. However, 'elephant foot' markings will lead motorists into incorrect lanes and could result in lane swapping and side impact collisions.

Recommendations

Re-align the 'elephant foot' markings to ensure that vehicles in the inside lane are guided into the middle lane on the circulatory carriageway and vehicles in the outside lane continue in the outside lane.

6.19 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1251).

The width of the segregated left turn lane from the tunnel (A4232) direction is below 8m for 2 lanes taken around a tight curvature. Larger vehicles may encroach into adjacent lane and hit the island. This problem was originally raised during the Stage 1 Road Safety Audit, but has not been addressed.

Recommendations

Check swept paths, particularly larger HGV's.

6.20 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1271).

Proposed traffic signal controller area on the southern side of the central island could obstruct forward visibility for circulating vehicles and lead to sudden braking and rear end shunt collisions with vehicles stopping at the signals.

Recommendations

Relocate the controller area outside the visibility splay

6.21 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1271).

Proposed signal head SP12 on the segregation island facing eastbound traffic on the A4234 approach to the roundabout may be confusing to drivers in the segregated left turn lane. Drivers may brake sharply on seeing a red signal leading to rear end shunt collisions with following vehicles.

Recommendations

Provide hoods/louvres to the traffic signal head to make it less visible to drivers in the segregated left turn lane.

6.22 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1271).

Proposed signal head SP8 on the segregation island facing eastbound traffic on the A4232 approach from the Tunnel may be confusing to drivers in the segregated left turn

lane. Drivers in the segregated left turn lane may brake sharply on seeing a red signal leading to rear end shunt collisions with following vehicles.

Recommendations

Provide hoods/louvres to the traffic signal head to make it less visible to drivers in the segregated left turn lane.

6.23 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1271).

Nearside primary traffic signal head SP17 is located in the middle of the shared footway/cycleway and may become an object of collision for pedestrians and cyclists.

Recommendations

Relocate the traffic signal to the back of the shared route.

6.24 Problem

Location: Queens Gate roundabout (Drawing No. EBL-CAP-1200-QGR-DR-C-1273).

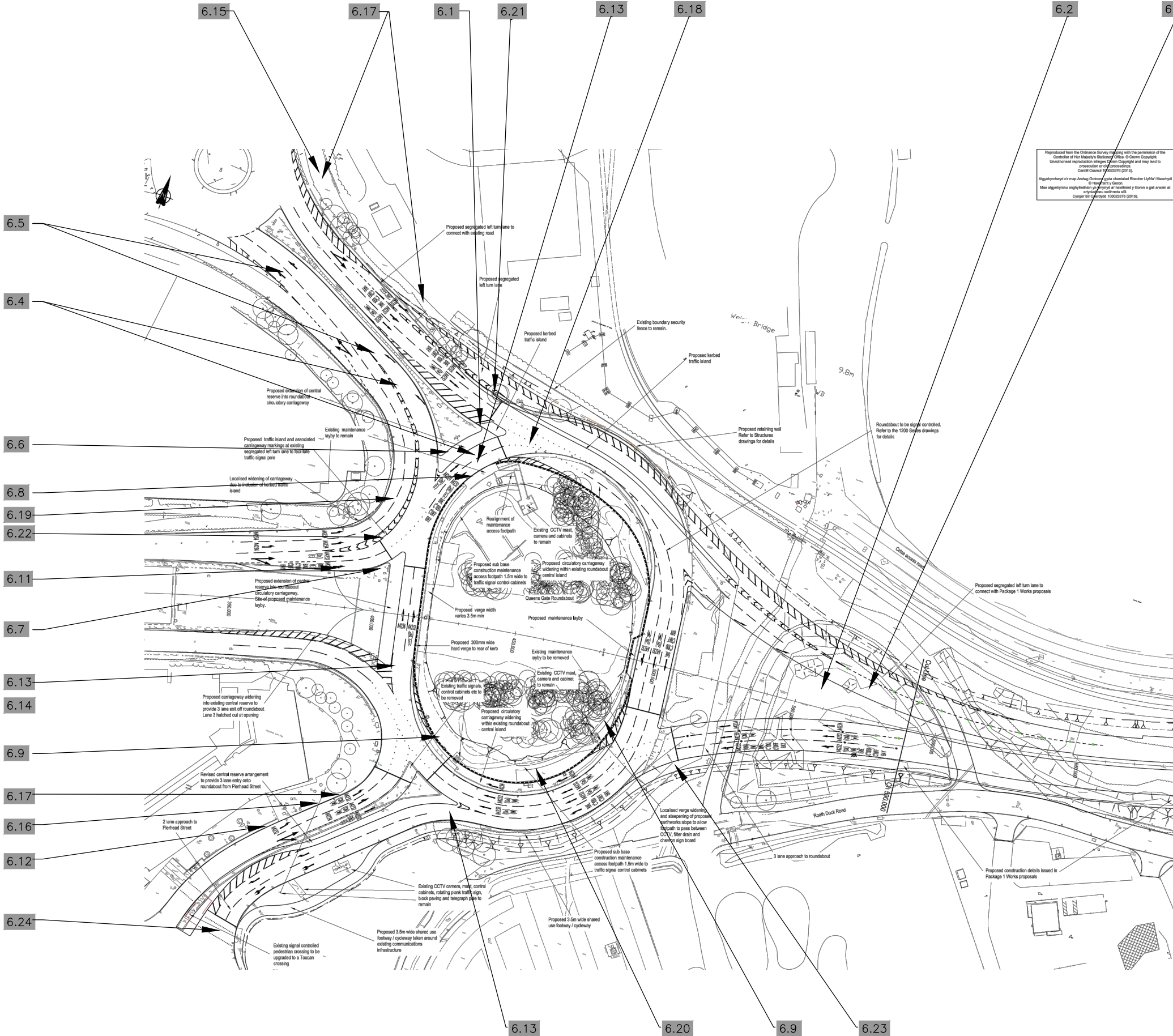
There is a possibility of pedestrians cutting across the proposed staggered Toucan crossing in the absence of guard railing. If traffic moves on separate phases along Caspian Way pedestrians may be in conflict with vehicles.

Recommendations

This location should be monitored by Cardiff County Council for the 12 month period following scheme construction and, if problems occur, either guard railing or mini-planters should be provided on desire lines to prevent pedestrians from walking across the carriageway.

Appendix A Reference Plan

Print Date: 04/10/2016 16:40:39



NOTE
FOR CLARITY POINT 6.10, ARE NOT SHOWN ON THE
DRAWING

SAFETY, HEALTH AND
ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE
TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING

NO SHE HAZARD IDENTIFIED

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A
COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE,
TO AN APPROVED METHOD STATEMENT

Rev	Dwn	Chkd	App'd	Description	Date
Purpose of Issue					
Reference Plan					
Classification					
Commercial in Confidence					
Client					

Project
Eastern Bay
Queensgate Roundabout

Drawing
Road Safety Audit
Stage 2

Scale @ A3	Drawn	Checked	Approved
NTS	HK	PJG	KE
Project No.		Date	
CS79772		03/10/2016	
Drawing Identifier		BS1192 Compliant	
Project - Originator - Zone - Level - File Type - Role - Number		rev	
Figure 1		P00	

CAPITA

Civil Engineering

St David's House, Pascal Close, St Mellons, Cardiff, CF3 0LW
029 2080 3500
www.capitaproperty.co.uk
Capita Property and infrastructure Ltd.



FFORDD GYSWLLT
DWYRAIN Y BAE
EASTERN BAY LINK



Llywodraeth Cymru
Welsh Government



CAPITA



CASS HAYWARD

**PARSONS
BRINCKERHOFF**