URS

York Street Interchange

Vector Re Routing Proposal Assessment

November 2015

47037827

UNITED KINGDOM & IRELAND

Co-financed by the European Union
Trans-European Transport Network (TEN-T)

transportni
Department for Regional Development
www.drdni.gov.uk

THIS PAGE INTENTIONALLY BLANK

Rev	Date	Details	Prepared by	Checked by	Approved by
D1	13 Oct. 2015	Draft	Patrick Craig John McBride Glenn McKay Michael Megarry Fraser Kerr	Michael Megarry Gareth Coughlin Russell Bissland	Michael Megarry
Rev0	14 Oct. 2015	First issue	Patrick Craig John McBride Glenn McKay Michael Megarry Fraser Kerr	Michael Megarry Gareth Coughlin Russell Bissland	Michael Megarry
Rev1	27 Oct. 2015	Second issue	Patrick Craig John McBride Glenn McKay Michael Megarry Fraser Kerr	Michael Megarry Gareth Coughlin Russell Bissland	Michael Megarry
Rev2	6 Nov. 2015	Third issue	Patrick Craig John McBride Glenn McKay Michael Megarry Fraser Kerr Becky Jackson Richard Kilner	Michael Megarry Gareth Coughlin Russell Bissland	Michael Megarry

Prepared by:

URS
Beechill House
40 Beechill Road
Belfast
BT8 7RP
Telephone: +44(0)28 9070 5111
Fax: +44(0)28 9079 5651
www.ursglobal.com

Prepared for:

TransportNI
Eastern Division
Hydebank
4 Hospital Road
Belfast
BT8 8JL

Limitations

URS Infrastructure & Environment UK Limited ("URS") has prepared this Report for the sole use of **TransportNI** ("Client") in accordance with the Agreement under which our services were performed **[Major Works Planning, Assessment and Delivery Framework – Consultancy Services 2013]**. No other warranty, expressed or implied, is made as to the professional advice included in this Report or any other services provided by URS. This Report may not be relied upon by any person other than TransportNI without the prior and express written agreement of URS.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by URS has not been independently verified by URS, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between **September 2015** and **November 2015** and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

URS disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to URS' attention after the date of the Report.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. URS specifically does not guarantee or warrant any estimate or projections contained in this Report.

Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

Costs may vary outside the ranges quoted. Whilst cost estimates are provided for individual issues in this Report these are based upon information at the time which can be incomplete. Cost estimates for such issues may therefore vary from those provided. Where costs are supplied, these estimates should be considered in aggregate only. No reliance should be made in relation to any division of aggregate costs, including in relation to any issue, site or other subdivision.

No allowance has been made for changes in prices or exchange rates or changes in any other conditions which may result in price fluctuations in the future. Where assessments of works or costs necessary to achieve compliance have been made, these are based upon measures which, in URS' experience, could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.

EU Disclaimer

The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.

Copyright

URS Project Number

URS project number (up to 31 May 2011): S105296, URS project number (from 31 May 2011): 47037827

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Background

URS was commissioned by TransportNI to assess the validity of the Vector Re-Routing Proposal prepared as an alternative to the York Street Interchange (the Proposed Scheme) promoted by TransportNI.

The assessment completed by URS has been limited only to the information made available in relation to the Vector Proposal, as submitted to the Public Inquiry on 11 September 2015 and 14 October 2015.

The Vector Proposal claims that:

- it has used process improvement techniques to develop a re-route proposal which results in 30-40% reduction in waiting time of strategic traffic;
- it has anticipated costs of £1m to £5m;
- it can be implemented for a trialled period of one to two days following a four to six week design and communication period; and
- it can be employed as either a short to mid-term improvement or developed into a permanent solution.

The Vector Proposal identifies six routes for traffic movements which are intended to remove the requirement for the existing signalised gyratory junction. These routes are illustrated in Figure 1.

URS has completed high-level engineering, traffic and environmental assessments of the Vector Proposal. The following findings are highlighted:

Engineering

- The possible diversion of strategic traffic from the strategic road network to alternative routes on the local road network was considered in 2005. However, the merging of strategic and non-strategic traffic is considered contrary to good engineering practice on the grounds of the Government's five key criteria. Furthermore, the local roads network does not contain sufficient capacity to cope with the introduction of strategic traffic to the local road network.
- The Vector Proposal requires significant changes to several existing signalised junctions. A number of these junctions would adopt an unconventional layout and it is unclear how these changes can be introduced in line with the engineering standards of the Design Manual for Roads and Bridges.
- The Vector Proposal states that it can be implemented initially as a trial of one to two days following a four to six week design and communication period. It is considered that both these timescales are unrealistic for a proposal of this significance.
- Route 1 in the Vector Proposal states that other traffic signals at Queens Square, Queens Quay, Station Street and Middlepath Street would be changed to "ad-hoc pedestrian lights". These signals are currently used to manage road traffic conflicts that will still remain in the Vector Proposal and this is not considered feasible.
- It is considered that Route 1 would result in additional pressure on the weaving section on the Lagan Bridge (northbound) as traffic joining from Middlepath Street would be required to manoeuvre into the northbound lane for onward travel to the M2/M5. The implications for road safety are not quantified within the Vector Proposal.

- Due to concerns with regard to road user safety, the views of experienced Road Safety Auditors have been sought on the Vector Proposal. These have identified that the increased pressure on the weaving section is an area of concern with the Vector Proposal.

- Route 2 would require traffic reassignment onto Corporation Street / Garmoyle Street and Dock Street, with existing traffic signals along the route downgraded to "ad-hoc pedestrian lights". This is not considered feasible as the existing signals serve to manage conflicting traffic flows that will remain in the future layout.

- Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 8,400 vehicles on York Street would transfer to Corporation Street / Garmoyle Street in Route 2.

- Within the span arrangements of the existing road and rail bridges at Dock Street, there would appear to be insufficient width to accommodate enough traffic lanes to cater for the anticipated re-routed flows. It is considered that any loss of capacity would significantly increase congestion at these junctions on all approaches including, importantly, the main access from the M2 motorway to Belfast City Centre.

- The closure of York Street in Route 2 raises significant concerns over community severance that is likely to meet with objection from the local community. The "out-of-scope" development within the Vector Proposal to address this using pedestrian and cycling bridges is unlikely to address the concerns of the local community fully as there will still be an impact upon existing public transport services.

- The potential exists that Galway House and future developments at Yorkgate Business Park will in effect be blighted by Route 3 due to severe restrictions in access/egress.

- Route 3 will reduce access between Yorkgate train station and the new university campus for public transport.

- Access to the M2 and M3 motorways from North Belfast would be significantly impacted by Route 3 and would not satisfy the stated scheme-specific objective for the Proposed Scheme of maintaining access to existing properties, community facilities and commercial interests.

- The lane configuration on the M2 to Westlink movement in Route 5 is anticipated to create operational issues due to the effects of merging traffic.

- The scheme specific objective for the Proposed Scheme is to improve access to the regional gateways. Route 5 will change access arrangements from Belfast Harbour to the Westlink and therefore may not satisfy this objective.

- Jack Kirk Garage may potentially be blighted by Route 5 due to severe restrictions in access/egress.

- In Route 6 it would appear that only one lane can be provided in free-flow between M3 and Westlink, as with the Proposed Scheme. Vector has criticized similar provision within the Proposed Scheme as a flow constriction.

Traffic

- It appears that various extracts from the Design Manual for Roads and Bridges have been selected by Vector to support its view that a simplistic approach to the assessment of improvement options is reasonable. Although this can be true in some cases, the issues surrounding the York Street Interchange are particularly complex and require the development and application of industry standard computer models to quantify impacts prior to scheme implementation in a consistent and recognised manner to minimise adverse impacts on the road user and the public in general.

- No quantified assessment in line with industry standards has been made of the accident benefits, or disbenefits, of the Vector Proposal to determine if it delivers an improvement compared to the Proposed Scheme.

- Route 1 in the Vector Proposal would increase pressure on existing weaving sections on the Westlink and M3 motorway. Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 9,500 vehicles on York Street accessing the M2 would transfer via the Queen Elizabeth II Bridge to join the M3 at Middlepath Street on-slip then weaving on the Lagan Bridge to join the M2. This increased traffic would cause significant congestion and potential safety issues in the current layout

- Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 8,400 vehicles on York Street would redistribute to Corporation Street and North Queen Street.

- Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 14,000 vehicles on York Link accessing the M3 would transfer to York Street, Dock Street and Nelson Street.

Environment

- In general, there is no evidence that the environmental appraisal/assessment of the Vector Proposal has been undertaken in-line with industry standard guidance, such as the Design Manual for Roads and Bridges, or the vast range of other guidance and methodologies which are utilised to aid and support the EIA specialist topics/aspects for major infrastructure projects.

- **Air Quality:** Pollutant concentrations at sensitive receptors are likely to increase and potentially exceed national air quality objective values as a result of the Vector Proposal. This would be a significant environmental effect and likely to meet with opposition from Belfast City Council. In addition, the claimed improvements in specific CO_2 emissions appear unfounded as it is not evident the Vector Proposal's full area of influence has been considered.

- **Landscape and Visual Effects:** From a landscape perspective the 'short-term' elements associated with the Vector Proposal would have an adverse impact upon the cityscape, particularly as a result of the severance of York Street and Nelson Street. The longer-term ('out of scope') proposals, including a shared pedestrian/cyclist bridge over the abandoned section of York Street would certainly have a negative impact upon this environment.

- **Land Use:** The most significant adverse impact associated with the Vector Proposal would be the increased potential to further disconnect York Street, Westlink, the elevated M3 Lagan and Dargan bridges, the M2 and Dunbar Link by increasing the leftover space as a result of widening the footprint of strategic road infrastructure. This would likely contravene the objectives of BMAP 2015 and would not be supported.

- **Noise and Vibration:** The Vector Proposal would change [primarily negatively] the noise environment within an area much larger than that associated with the Proposed Scheme, and should be assessed in accordance with DMRB and Calculation of Road Traffic Noise (CRTN) to validate the findings.

- **Pedestrian, Cyclist, Equestrian and Community Effects:** The loss of York Street to non-motorised user through-movements and associated re-distribution would have a significant effect from a community severance and amenity perspective. This is not in line with TransportNI's scheme specific objective for the Proposed Scheme to maintain non-motorised user access. There are also much wider community implications associated with the Vector Proposal, which would require extensive community and stakeholder consultation. The statement that community severance would be 'Neutral' is unfounded, as the Vector Proposal fails to address the objectives set out in the BMTP. Cycling provision would not even be an enhancement over existing conditions, as cyclists would share road space on a more heavily-trafficked wider local road network and have their route options/desire lines

limited and changed. The Vector Proposal fails to improve the quality of public transport services in delivering a modern, integrated transport system for the Belfast Metropolitan Area, as identified within the BMTP.

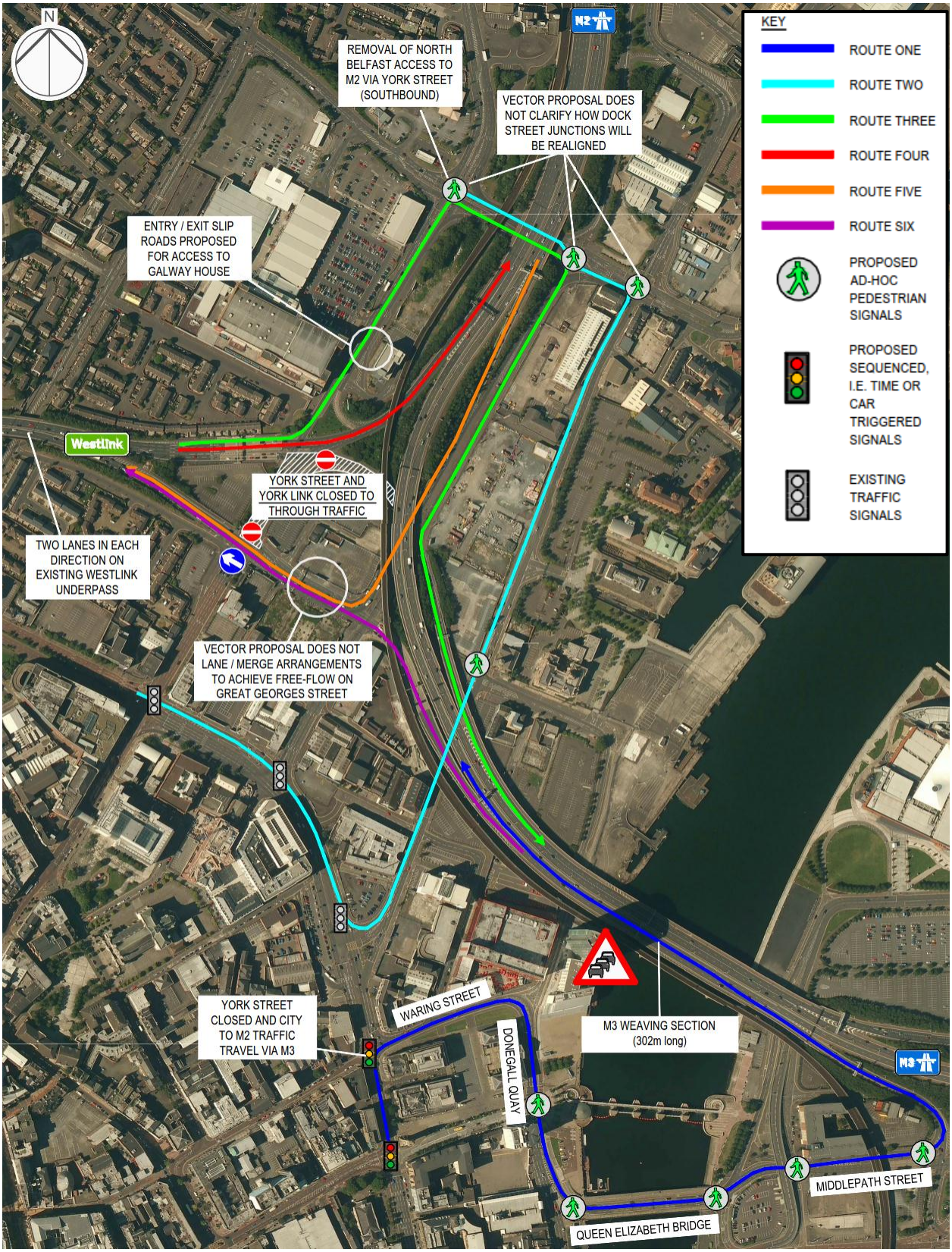
Summary Conclusions

Based on the conclusions from each of the completed engineering, traffic and environmental assessments, it is considered that the Vector Proposal fails to meet several of the stated scheme objectives for the Proposed Scheme in relation to improved access to the regional gateways, maintaining access for non-motorised users, and maintaining access to existing residential and businesses.

The Vector Proposal's changes to junctions and potential lane configurations raise concerns for road user safety, as they have not been designed in accordance with the Design Manual for Roads and Bridges and have not been subject to the Road Safety Audit process.

On the basis of the information provided, our assessment of the Vector Proposal is that its overall performance would provide a lower level of service than the existing arrangements and significantly inferior to that of the Proposed Scheme and therefore does not warrant further examination.

Figure 1: Vector Proposal



THIS PAGE INTENTIONALLY BLANK

1. INTRODUCTION

URS was commissioned by TransportNI to assess the validity of the Vector Re-Routing Proposal (hereafter referred to as the Vector Proposal) prepared as an alternative proposal to the York Street Interchange (the Proposed Scheme).

The Vector Proposal has been prepared by Vector Improvements Limited ("Vector") and it is claimed by Vector that:

- it has used process improvement techniques to develop a re-route proposal which results in 30-40% reduction in waiting time of strategic traffic;
- it has anticipated costs of £1m to £5m;
- it can be implemented for a trialled period of 1-2 days following a 4-6 week design and communication period; and
- it can be employed as either a short to mid-term improvement or developed into a permanent solution.

The Vector Proposal seeks to remove identified intersections between strategic roads enabling the removal of current traffic signal control systems. This is achieved via the re-routing of existing traffic onto alternate routes using minimal civils alteration works to the existing road network.

THIS PAGE INTENTIONALLY BLANK

2. LIMITATIONS OF ASSESSMENT

The assessment completed by URS has been limited only to the information made available in relation to the Vector Proposal by Vector, as submitted to the Public Inquiry on 11 September 2015 and 14 October 2015

Consultation has not been undertaken with Vector to address any identified gaps in information provided for assessment.

The documents provided by Vector for assessment are listed in Table 1.

Table 1: Reference Documents

Document Title	Dated
Vector Journey Time Analysis Summary	26 June 2015
Motorway Optimisation – Vector Re-Routing Proposal	15 June 2015
Motorway Optimisation Proposal	14 October 2015

THIS PAGE INTENTIONALLY BLANK

3. DESCRIPTION OF THE VECTOR PROPOSAL

3.1 Overview

The Vector Proposal is based on creating free-flow routes to allow traffic to move in a more efficient manner. There are six routes in particular which will see significant change and these are described below. The six routes are illustrated on Drawing 1 in Appendix A.

An engineering assessment of the Vector Proposal is reported in Section 4, with a traffic assessment reported in Section 5. The findings of an environmental assessment of the Vector Proposal are reported in Section 6.

3.2 Route 1

This route is intended for traffic travelling from the City Centre to the M2 northbound carriageway. The route re-directs northbound traffic on Victoria Street via Waring Street, Donegall Quay, over the Queen Elizabeth II Bridge to Middlepath Street and then onto the M3, using the existing on-slip.

3.3 Route 2

This route is intended for traffic travelling from the City Centre to North Belfast. This route will re-direct traffic travelling north on York Street from the City Centre. Under this proposal, York Street would be stopped up at its junction with Great Georges Street, with traffic diverted onto Corporation Street/Garmoyle Street and Dock Street.

3.4 Route 3

This route is intended for traffic travelling from the Westlink to the M3, with traffic re-directed via York Street, Dock Street, and Nelson Street before finally joining the M3 using the existing on-slip.

3.5 Route 4

This route is intended for traffic travelling from the Westlink to the M2. This route reflects what is currently operating and, with the other proposed re-routing in place, removes the requirement for signal control. It would therefore provide a potentially free-flowing connection from the Westlink to the M2.

3.6 Route 5

This route is intended for traffic travelling from the M2 to the Westlink. This route is shown as carrying traffic in free-flow around Nelson Street and Great Georges Street before joining the Westlink.

3.7 Route 6

This route is intended for traffic travelling from the M3 to the Westlink. Traffic continues to use the existing M3 off-slip to Nelson Street, continuing along Great Georges Street before joining the Westlink.

THIS PAGE INTENTIONALLY BLANK

4. ENGINEERING ASSESSMENT

4.1 Basis of Assessment

The assessment of each route has been based upon the identified scheme-specific objectives for the Proposed Scheme, which are:

- to remove a bottleneck on the strategic road network;
- to deliver an affordable solution to reduce congestion on the strategic road network;
- to improve reliability of strategic journey times for the travelling public;
- to improve access to the regional gateways from the Eastern Seaboard Key Transport Corridor;
- to maintain access to existing properties, community facilities and commercial interests;
- to maintain access for pedestrians and cyclists; and
- to improve separation between strategic and local traffic.

Where the assessment has identified specific road safety or operational management issues associated with the Vector Proposal, these are highlighted.

4.2 General Considerations

4.2.1 *Compliance with Government Transport objectives*

The possible diversion of strategic traffic from the strategic road network to alternative routes on the local road network was considered in 2005. However, the merging of strategic and non-strategic traffic is considered contrary to good engineering practice on the grounds of the Government's five key criteria. Furthermore, the local roads network does not contain sufficient capacity to cope with the introduction of strategic traffic to the local road network.

4.2.2 *Road Safety*

Due to concerns with regard to road user safety, the views of experienced Road Safety Auditors have been sought on the Vector Proposal. A summary report has been prepared and is included in Appendix B.

The Road Safety Auditors have concurred with the views of the design team on the potential risks to road users under the proposed junction arrangements. As noted by the auditors, the vast majority of safety issues on schemes generally arise not from the main links themselves, but at the junction and conflict points that are affected by a scheme and how vehicular traffic will interact with Non-Motorised Users (NMUs).

The Vector Proposal claims to reduce collisions but no collision savings data is provided.

The Vector Proposal states it results in a 'broadly neutral impact' on accessibility. A number of controlled non-motorised users routes are lost but it is not identified what revised routes for non-motorised users will be provided. The Vector Proposal states that non-motorised user access will be maintained but does not detail how, particularly where free-flow is introduced.

The report refers to 'chamfering of kerbs'. If this means increasing the radius of carriageway corners by extending into pedestrian footpaths to provide for all turning movements it may lead to a reduced width of pedestrian pavement which may be below standard in areas.

4.2.3 *Miscellaneous*

No programme or bill of quantities has been appended to give quantifiable evidence of the budget and time scales referenced in the Vector Proposal. The budget estimate may not include prices for all civil works, Statutory Undertakers diversions, non-motorised user bridges and signage strategy.

It is unclear what the extents of the new signage strategy will be as vehicles will need to be aware of the new routes as early as possible.

Vector has indicated that the Vector Proposal could be implemented initially as a trial of one to two days following a four to six week design and communication period. It is considered that both these timescales are unrealistic for a proposal of this significance.

4.3 Route 1 Evaluation

In Route 1, traffic intending to travel to the M2 from the City Centre is redirected onto surface streets (Waring Street, Donegall Quay, Queen Elizabeth II Bridge and Middlepath Street) before joining the M3 motorway on-slip at Middlepath Street.

The information assessed does not provide details of lane provision on this alternate route. Further comment with regard to the resultant traffic impacts on the route are provided in Section 5. It may be a requirement to implement infrastructure changes along the route to improve, or attain, continuous lane provision between Waring Street and Middlepath Street. This may be especially important at Waring Street, where narrow lanes are currently signed.

Drawing 2 in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes. The following points are noted.

- Conflicts with traffic flows on other surface streets are currently managed by signalised junctions at Waring Street, Queens Square, Queens Quay, Station Street and MIddlepath Street. Pedestrian controlled crossings are also currently provided on the route at Donegall Quay.

- In the Vector Proposal, Vector has indicated that the traffic signals at Waring Street will remain, with all other traffic signals being downgraded to "ad-hoc pedestrian lights". As the remaining traffic signals on the route at Queens Square, Queens Quay, Station Street and Middlepath Street serve to manage conflicting traffic flows that will remain in the Vector Proposal, this is not considered feasible.

- It is considered that Route 1 would result in additional pressure on the weaving section on the Lagan Bridge (northbound) as traffic joining from Middlepath Street would be required to manoeuvre into the northbound lane for onward travel to the M2/M5. The implications for road safety are not quantified within the Vector Proposal. The views of experienced Road Safety Auditors have highlighted the increased pressure on the weaving section as an area of concern with the Vector Proposal.

4.4 Route 2 Evaluation

Route 2 is intended for traffic travelling from the City Centre to North Belfast. This route will re-direct traffic travelling on Great Patrick Street and Frederick Street into Corporation Street /

Garmoyle Street before turning into Dock Street and continuing under the existing Dock Street road and rail bridges. Traffic can then continue to North Belfast via either of York Road or Brougham Street at the existing signalised junction on Dock Street.

Drawing 3 in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes.

If Route 2 is intended to operate "free-flow" this would raise several issues in relation to its operation, described for each of the affected routes below.

Corporation Street / Garmoyle Street

- Details of lane configurations on Corporation Street and Garmoyle Street have not been provided for consideration.
- It is not specified if the existing traffic signals at the junction of Corporation Street and Dunbar Link are intended to remain.
- Traffic flows on Corporation Street would appear to only be controlled via ad-hoc pedestrian signals at the existing signalised junctions with Corporation Square, Dock Street and Brougham Street. As the existing signals at these junctions serve to manage conflicting traffic flows that will remain with the Vector Proposal, this is not considered feasible.
- It would appear that the northbound bus lane between Clarendon Dock and the junction with Garmoyle Street would be removed to make way for at least one new northbound lane for general traffic. The loss of bus priority would have an impact on public transport services to North Belfast and the Docks areas.
- The re-routing of additional traffic volumes past residential properties at Garmoyle Street and a sensitive community receptor (Stella Maris) are likely to meet with objection from the affected local communities.
- With the future plans to develop City Quays, the re-routing of additional traffic flows onto Corporation Street are likely to have a detrimental impact on access to new residential and commercial properties.

Dock Street

- Details of lane configurations on Dock Street have not been provided for consideration.
- Swept path analysis of the existing junction between Garmoyle Street and Dock Street confirms that only one northbound lane at Garmoyle Street can turn left into Dock Street without the loss of the right-turning movement from Dock Street into Garmoyle Street/Corporation Street.
- Within the span arrangements of the existing road and rail bridges at Dock Street, there would appear to be insufficient width to accommodate enough traffic lanes to cater for the anticipated re-routed flows. This is illustrated in Drawing 4 in Appendix A. It is considered that any loss of capacity would significantly increase congestion at these junctions on all approaches including, importantly, the main access from the M2 motorway to Belfast City Centre.
- If additional width is required on Dock Street to accommodate all traffic movements, it would be necessary to demolish both the existing bridges and replace these with new structures with longer span arrangements.

Great Georges Street / North Queen Street

- Despite the revision to Route 2 proposed by Vector it is noted that traffic that will continue to use York Street for access to existing commercial properties would be required to turn into Great Georges Street and use North Queen Street.

York Street

- The severance of York Street in the Vector Proposal will also sever links for non-motorised users from North Belfast to the City Centre. Furthermore, the stopping-up of York Street will also remove the potential to improve public transport links on York Street to facilitate changes in travel patterns, including access to Yorkgate train station, following the university relocation. This is in direct contrast to the two-way running proposals on York Street included in the Proposed Scheme.

- For these reasons, it is expected that the Vector Proposal is likely to meet with objection from the local community on the grounds of increased community severance. The Vector Proposal includes “out of scope” developments to maintain connections for non-motorised users using pedestrian and cycling bridges, but it is unclear how these can be accommodated. The Vector Proposal cites the Milewater Road footbridge as an example. A photograph of the bridge is included for reference as Figure 1. It is considered that facilities of this type result in inherent concerns with respect to user personal security/safety.

Figure 1 Milewater Road Footbridge

Image reproduced from Google Maps © Google 2015

4.5 Route 3 Evaluation

In Route 3, traffic intending to travel to the M3 from the Westlink is redirected onto York Street, Dock Street and Nelson Street before joining the M3 motorway using the existing on-slip from Nelson Street.

Drawings 5A and 5B in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes.

The Vector Proposal also does not provide details of lane configurations on York Street, except to note that the strategic flow should be *'encapsulated (Armco/barrier) away from local traffic and non-motorised users as much as possible'*. Given this statement, it is unclear how access/egress arrangements for both motorised and non-motorised road users to Galway House and the wider Yorkgate Business Park development can be facilitated. Potentially the existing and future developments will in effect be blighted by the Vector Proposal due to severe restrictions in access/egress.

The Vector Proposal indicates a free-flow right turn from York Street onto Dock Street and from Dock Street onto Nelson Street. It is indicated that this could be achieved with an unconventional road and junction layout on Dock Street, whereby traffic runs on the southern side of the current central reserve, i.e. the current westbound carriageway. The Vector Proposal outlines the concept but offers no indication of how the various junctions at each end of Dock Street are intended to operate. It is expected that such a proposal would require the removal of existing crossing points for pedestrians along the westbound carriageway of Dock Street.

Similarly, for the existing eastbound carriageway on Dock Street, traffic movements will be impacted by the relocation of running lanes and overall operational capacity will be reduced by the resultant reduction in lane provision.

The free-flow re-routing of the Westlink to M3 movement will also remove the potential to improve public transport links on York Street to facilitate changes in travel patterns, including access to Yorkgate train station, following the university relocation. This is in direct contrast to the two-way running proposals on York Street included in the Proposed Scheme.

The Vector Proposal's changes to Dock Street and its junctions are unconventional and have raised concerns over road user safety by experienced Road Safety Auditors.

Regardless of the infrastructure changes required to facilitate the proposed free-flow arrangement, it is clear that access to the M2 and M3 motorways from North Belfast would be significantly impacted and as such would not satisfy the stated scheme-specific objective of maintaining access to existing properties, community facilities and commercial interests.

4.6 Route 4 Evaluation

Route 4 is intended for vehicles travelling from the Westlink to M2 northbound.

Drawing 6 in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes.

With the removal of traffic signals at the junction of the Westlink and York Street, the associated traffic movement onto the M2 motorway can operate in a free-flow manner as suggested.

4.7 Route 5 Evaluation

In Route 5, traffic intending to travel to the Westlink from the M2 continues to use the existing Nelson Street off-slip, Nelson Street and Great Georges Street before joining the Westlink.

Drawing 7 in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes.

The Vector Proposal does not provide sufficient details of lane configurations on Nelson Street and Great Georges Street. Based on the downstream capacity of the Westlink adjacent to York Street, only a maximum of three lanes can join the Westlink from Great Georges Street, reducing to two lanes at North Queen Street Bridge. With the adjacent Route 6 providing a free-flow connection from the M3 to Westlink, it follows that only two lanes can be provided from Route 5, with lane two on the M2 to Westlink movement lost on approach to North Queen Street bridge. This lane reduction on the larger flows joining the Westlink from the M2 would likely create operational issues due to the effects of merging traffic.

Currently, traffic exiting Belfast Harbour intending to travel to the Westlink has a lane gain facility from the Dock Street junction. With the anticipated provision of a maximum of two lanes between M2 and the Westlink, is unclear how the Vector Proposal intends to address the merging flows from the regional gateway.

It is noted that Jack Kirk Garage is located at Shipbuoy Street and is currently serviced by access from Great Georges Street. With the introduction of Routes 5 and 6, access to the premises will only be via the M2 and M3 motorways. The Vector Proposal would therefore not satisfy the stated scheme-specific objective of maintaining access to existing properties, community facilities and commercial interests in this regard. The potential exists that the existing development will in effect be blighted by the Vector Proposal due to severe restrictions in access/egress.

4.8 Route 6 Evaluation

In Route 6, traffic intending to travel to the Westlink from the M3 continues to use the existing off-slip and Great Georges Street before joining the Westlink.

Drawing 7 in Appendix A illustrates the Vector Proposal, along with a schematic diagram illustrating existing lane provision on the original and diversion routes.

In a similar manner to Route 5, the Vector Proposal does not provide sufficient details of lane configurations on the off-slip and Great Georges Street. This is particularly relevant given the downstream capacity of the Westlink away from York Street. With the adjacent Route 5 providing a free-flow connection from the M2 to the Westlink, with two lanes anticipated, it follows that only one lane can be provided from Route 6.

With reference to their Motorway Optimisation - Vector Re-Routing Proposal report, Vector criticizes the provision on the M3 to Westlink link in the Proposed Scheme. In its view the provision of a single free-flow lane between the M3 and Westlink creates “flow constriction”. It is noted that, on the basis of the information provided, the Vector Proposal may match this provision and so, any criticism made of the Proposed Scheme in this regard would apply equally to the Vector Proposal.

It would therefore follow that on the existing off-slip from the M3, the lane configuration would require alteration to reduce the number of lanes, similar to the Proposed Scheme. The Vector Proposal does not clarify the configuration but it could be reasonably assumed that the revised lane configuration on the off-slip would reflect that of the Proposed Scheme, with two lanes and a nearside auxiliary lane diverge. Of the two lanes, lane two would become the free-flow

link to the Westlink and lane one would be designated for onward travel to Great Georges Street. The auxiliary lane diverge would be used to maintain the connection for City Centre via Nelson Street.

The Vector Proposal fails to explain how the connection from the M3 motorway to Great Georges Street would operate, if it is indeed provided at all.

Whilst the Vector Proposal may retain connection to Nelson Street from the M3, it does not offer details on how access to existing properties would be maintained. As it stands, the implementation of Routes 5 and 6 would render Nelson Street inaccessible to any traffic other than those arriving from the M3 motorway. With the loss of the straight ahead movement on Nelson Street past the M3 off-slip, there would be no facility for non-motorway traffic or indeed, traffic from the Westlink to connect to Nelson Street.

The significant reduction in access that this would create for Nelson Street is in direct conflict with the scheme specific objective of maintaining access to existing properties. As an example, we would highlight the impacts that this would have on the occupants of the Nelson Trade Centre, who have previously expressed concerns over access arrangements in the Proposed Scheme. TransportNI were however able to address these concerns to their satisfaction in the Proposed Scheme.

An identified scheme specific objective for the Proposed Scheme is to improve access to the regional gateways from the strategic road network. For traffic on the M3 motorway intending to travel to the Docks, the information provided does not confirm how these flows are re-routed along the existing city streets.

5. TRAFFIC ASSESSMENT

5.1 Introduction

Overall, the Vector Proposal appears to be at the conceptual stage and lacks any significant detail or assessment.

As a consequence of removing the strategic road intersections, a significant volume of traffic, including strategic traffic between Westlink and the M3, would be diverted around the local road network. The Vector Proposal does not include any consideration of the effects of this traffic diversion nor the specific impacts on the local community or other road users, including public transport services, pedestrians and cyclists.

The supporting Journey Time Analysis states that 'other routes can be ignored due to small changes or local/non-strategic nature', however within an urban network even smaller changes can have a significant impact on all road users and the local community, which needs to be fully considered.

The Vector Proposal focuses exclusively on the removal of strategic road intersections, but does not consider the associated consequences in any detail. In general, the Vector Proposal:

- does not consider the adverse effects of diverted traffic for all affected routes on to the local road network;
- does not accommodate bus improvement measures;
- does not accommodate cyclists;
- does not accommodate pedestrian movements;
- does not recognise that traffic signals facilitate safe pedestrian crossings;
- does not provide sufficient information on adverse effects of changes in journey times for all affected routes, especially local movements;
- does not consider the capacity and suitability of affected local roads to accommodate increased demand;
- does not consider the capacity of existing priority or signalised junctions on affected local routes;
- does not consider the environmental impacts of diverted traffic;
- does not consider the impact of Belfast Harbour traffic which would require re-routing around the York Street junction using the local road network with consequential impacts for other road users, the local community and harbour operations; and
- does not consider the impact on local businesses in the area including Cityside Retail Park.

5.2 Route 1 Assessment

Route: City to M2

- Current Route: Via York Street
- Vector Proposal Route: Diverted via the Queen Elizabeth II Bridge to join M3 at Middlepath Street on-slip then M2

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on local roads due to increased demand;
- an adverse impact at traffic signals along the proposed route due to increased demand;
- an adverse impact on the operating conditions at the Middlepath Street on-slip;
- an adverse impact on traffic conditions on the M3 Motorway between Middlepath Street and Nelson Street due to re-routing of all 'City to M2' traffic via the Middlepath Street on-slip which would significantly increase weaving and conflicting vehicle movements on the M3 with associated implications for road safety; and
- an adverse impact on pedestrian movements along the local roads due to increased traffic flows.

Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 9,500 vehicles on York Street accessing the M2 would transfer via the Queen Elizabeth II Bridge to join the M3 at Middlepath Street on-slip then join the M2.

5.3 Route 2 Assessment

Route: City to North Shore

- Current Route: Via York Street
- Vector Proposal Route: Diverted along Great Patrick Street, Corporation Street and Dock Street

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on traffic along Corporation Street and the adjacent businesses;
- an adverse impact on public transport services assuming the removal of the existing bus lane;
- an adverse impact on conditions along Corporation Street due to the effects of diverted traffic; and
- an adverse impact on the operating conditions at the signalised junction at Great Patrick Street / Corporation Street and Corporation Street / Garmoyle Street / Dock Street.

In addition, it is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on traffic along Great Georges Street and the adjacent residential areas;
- an adverse impact on conditions along North Queen Street due to the effects of diverted traffic, with associated adverse impacts for pedestrian safety and environmental conditions; and
- an adverse impact on the operating conditions at the signalised junction at North Queen Street / Brougham Street.

Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 8,400 vehicles on York Street would redistribute to Corporation Street and North Queen Street.

5.4 Route 3 Assessment

Route: Westlink to M3

- Current Route: Via York Link
- Vector Proposal Route: Via York Street, Dock Street and Nelson Street on a segregated route, with removal of all traffic signals along the route

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on existing northbound traffic movements along York Street to Dock Street, which would be prohibited;
- an adverse impact on local businesses along York Street, including Cityside Retail Park and Galway House, by prohibiting southbound traffic on York Street;
- an adverse impact on two-way traffic under the northern span of the railway and road bridges at Dock Street for local traffic movement;
- an adverse impact on existing southbound traffic movements along Nelson Street travelling towards Westlink, including traffic from Belfast Harbour, which would be prohibited;
- an adverse impact on additional travel distance, approximately 600m; and
- an adverse impact on local movements due to removal of traffic signals along the proposed York Street/ Dock Street/ Nelson Street route which would effectively sever these routes for pedestrians, cyclists and public transport. This is also likely to have a significant impact on pedestrian and cyclist movements associated with new Ulster University development and the sustainable transport initiatives being developed for the city.

The capacity to retain existing southbound traffic on Nelson Street to access the M3 would need to be assessed in detail.

Based on the observed 2012 12-hour traffic flows, it is estimated that approximately 14,000 vehicles on York Link accessing the M3 would transfer to York Street, Dock Street and Nelson Street.

5.5 Route 4 Assessment

Route: Westlink to M2

- Current Route: Via York Street signalised junction
- Vector Proposal Route: Direct access with removal of signalised junction

It is likely that the re-routing associated with the Vector Proposal will:

- provide direct flow of traffic between Westlink and M2 with no intermediate signalised junction.

There is no change in the traffic redistribution under the Vector Proposal.

5.6 Route 5 Assessment

Route: M2 to Westlink

- Current Route: Via Nelson Street off-slip and Great Georges Street through three signalised junctions
- Vector Proposal Route: Via Nelson Street off-slip and Great Georges Street with removal of signalised junctions

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on the merging of traffic from the M2 and M3 on Great Georges Street on the approach to Westlink.

It should be noted that the Vector Proposal does not include any improvements to Westlink which currently reduces from three lanes to two lanes.

There is no change in the traffic redistribution under the Vector Proposal.

5.7 Route 6 Assessment

Route: M3 to Westlink

- Current Route: Via Great Georges Street and two signalised junctions
- Vector Proposal Route: Direct access with removal of signalised junctions

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on the merging of traffic from the M3 and M2 on Great Georges Street (as noted above) on the approach to Westlink.

It should be noted that the Vector Proposal does not include any improvements to Westlink which currently reduces from three lanes to two lanes.

There is no change in the traffic redistribution under the Vector Proposal.

5.8 Local / Strategic Routes

Route: York Street / Dock Street Area to M2

- Current Route: Via southbound on York Street
- Vector Proposal Route: *Not Defined*

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on existing southbound traffic flows on York Street by prohibiting southbound movements which would result in traffic diversion across the local road network to access the M2 via Fortwilliam or Clifton Street, which are both significant diversions and would require detailed assessment including secondary impacts on traffic currently using these routes.

Route: M3/Sydenham Bypass to York Street / Dock Street Area

- Current Route: Via Great Georges Street and northbound on York Street
- Vector Proposal Route: *Not Defined*

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on existing northbound traffic flows on York Street by prohibiting access to York Street from Great Georges Street, which would result in traffic diversion across the local road network via Fortwilliam, Clifton Street or Middlepath Street from the Sydenham Bypass westbound off-slip, which are all significant diversions and would require detailed assessment including secondary impacts on traffic currently using these routes.

Route: York Street / Frederick Street Area to M3/Sydenham Bypass

- Current Route: Current Route: Via York Link
- Vector Proposal Route: *Not Defined*

It is likely that the re-routing associated with the Vector Proposal will have:

- an adverse impact on existing northbound traffic which currently uses York Link to access the M3 by prohibiting this movement which would result in traffic diversion across the local road network to access the M3/Sydenham Bypass via the proposed Westlink/Dock Street/Nelson Street route or the eastbound on-slip to the Sydenham Bypass.

5.9 Journey Time Analysis

In the supporting Journey Time Analysis Summary dated 26 June 2015, Vector Ltd has provided various extracts from the Design Manual for Roads and Bridges (DMRB) Volume 12 Traffic Appraisals of Road Schemes.

It appears that the various extracts have been selected to support the view that a simplistic approach to the assessment of improvement options is reasonable. Although this can be true in some cases, the issues surrounding the York Street Interchange are particularly complex and require the development and application of industry standard computer models to quantify impacts prior to scheme implementation in a consistent and recognised manner to minimise adverse impacts on the road user and the public in general.

In the case of the Proposed Scheme and the Vector Proposal, a simple approach to assessment is not considered sufficient.

5.10 Value for Money

It is not possible to assess the economic effects of the Vector Proposal based on the information presented to date.

However through the development and application of detailed computer models, the economic effects of the Proposed Scheme have been examined and confirm that the benefits significantly outweigh the costs by a factor of 2.334. This includes the costs associated with delays during the construction process.

Given the uncertainty in predicting future traffic conditions over the economic life of the scheme, a range of sensitivity tests was also undertaken. The results of these tests confirm that the Proposed Scheme represents good value for money.

5.11 Road Safety Accident Disbenefits

It is not possible to assess the changes in road safety associated with the Vector Proposal based on the information presented to date.

However through the development and application of detailed computer models, the road safety effects of the Proposed Scheme have been examined. Although the results from the model indicate that the Proposed Scheme would lead to an increase in accidents over the 60-year economic life of the scheme, this is based on the application of default accident rates.

However, it is recognised that this increase in accidents and road safety costs is a characteristic of the default accident rates in the COBA model and it is expected that the Proposed Scheme will contribute positively to road safety.

5.12 Summary of Main Issues

All of the issues described above will need to be fully considered, however the following issues are unlikely to be acceptable.

- The impact on local movements due to removal of traffic signals along the proposed York Street/ Dock Street/ Nelson Street route which would effectively sever these routes for pedestrians, cyclists and public transport. This is also likely to have a significant impact on pedestrian and cyclist movements associated with new Ulster University development and the sustainable transport initiatives being developed for the city.

- The impact of Belfast Harbour traffic which would require re-routing of traffic around the York Street junction using the local road network with consequential impacts for other road users, the local community and harbour operations.

- The impact on traffic conditions on the M3 Motorway between Middlepath Street and Nelson Street due to re-routing of all ‘City to M2’ traffic via the Middlepath Street on-slip which would significantly increase weaving and conflicting vehicle movements on the M3 with associated implications for road safety.

- As a consequence of removing the strategic road intersections, a significant volume of traffic, including strategic traffic between Westlink and the M3, would be diverted around the local road network. The Vector Proposal does not include any consideration of the effects of this traffic diversion nor the specific impacts on the local community or other road users, including public transport services, pedestrians and cyclists.

THIS PAGE INTENTIONALLY BLANK

6. ENVIRONMENTAL ASSESSMENT

6.1 Legal Basis for an Environmental Impact Assessment

It is likely that there would be a requirement to carry out a statutory Environmental Impact Assessment (EIA) and publish a formal Environmental Statement (ES) for the Vector Proposal, therefore delaying the programme for implementation, and subjecting it to the same rigours of the statutory procedures as the Proposed Scheme**.**

Whilst modifications to the existing road network may not categorise the Vector Proposal as an Annex I project under the EIA Directive (as is the case with the Proposed Scheme), it is likely to be a relevant project under Annex II of the EIA Directive.

In general, a relevant Annex II project is defined as:

> *"a project for constructing or improving a highway where the area of the completed works together with any area occupied during the period of construction or improvement by requisite apparatus, machinery, materials, plant, spoil heaps or other such facilities exceeds 1 hectare or where any such area is situated in whole or in part in a sensitive area".*

It is unclear at this stage whether the area of completed works would exceed 1 hectare, however to determine whether the Vector Proposal would be an Annex II project and should be subject to an EIA, the relationship between it and its location is a crucial consideration.

In determining whether the Vector Proposal would be a 'Relevant Project', the characteristics of the project must be considered, with particular regard to:

a) the size and design of the whole project;

b) cumulation with other existing and/or approved projects;

c) the use of natural resources, in particular land, soil, water and biodiversity;

d) the production of waste;

e) pollution and nuisances;

f) the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge;

g) the risks to human health (for example due to water contamination or air pollution).

Moreover, the environmental sensitivity of the area likely to be affected by the Vector Proposal must be considered, with particular regard to:

a) the existing and approved land use;

b) the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;

c) the absorption capacity of the natural environment, paying particular attention to the following areas:

   i. wetlands, riparian areas, river mouths;

   ii. coastal zones and the marine environment;

iii. mountain and forest areas;

iv. nature reserves and parks;

v. areas classified or protected under national legislation; Natura 2000 areas designated by Member States pursuant to Directive 92/43/EEC and Directive 2009/147/EC;

vi. **areas in which there has already been a failure to meet the environmental quality standards**, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure;

vii. densely populated areas;

Whilst the Vector Proposal would need to be appropriately screened, it is likely, based on its characteristics and environmental sensitivity, that it would potentially have a significant environmental effect, thus the justified determination would be to undertake a formal EIA and publish an Environmental Statement.

On this basis, the 4-6 week design and communication period, and 1-2 day implementation time, is far from realistic. A one to two year delivery would be more realistic when factoring in the statutory procedure process and likely required Public Inquiry.

6.2 Consultations

In line with TransportNI's communications guidelines for major projects and statutory requirements, the Vector Proposal would also need to be subject to a programme of consultation with a range of key stakeholders (statutory and non-statutory bodies). Additionally, TransportNI recognises the importance of community involvement in its activities and decision-making. As TransportNI is committed to upholding its responsibilities in an open, consultative and inclusive manner, the Vector Proposal could not be excluded from this process.

The comments and views obtained from the consultees for the Proposed Scheme have been used to identify baseline conditions over the area, and considered in the decision making process. Where possible, the comments obtained have been used to refine the Proposed Scheme and to form mitigation proposals to minimise scheme effects. The same opportunity would need to be afforded to the consultees regarding the Vector Proposal.

Community Information Events have provided an improved understanding of the community's view, as an essential counterbalance to quantitative influences on decision making. They have also allowed an opportunity for different views to be expressed and taken into account in decision-making, and ensured the study processes and decision-making are open and clearly understood by all. The Vector Proposal does not allow for this, based on its implementation timescales, and thus would not be in conformance with TransportNI's communications guidelines nor the statutory requirements for consulting on major projects**.**

6.3 Environmental Evaluation

6.3.1 *High Level Message Review*

It is stated in the *'Motorway Optimisation Vector Re-Routing Proposal Report'* that the Vector Proposal meets or exceeds the expectations of the scheme criteria. This statement of fact should be based on assessing performance in relation to the five high-level Government objectives for transport. From an environmental perspective:

- Environmental impact involves reducing the direct and indirect impacts of transport facilities on the environment of both users and non-users. There are ten sub-objectives:
  - reduce noise;
  - improve local air quality;
  - reduce greenhouse gases;
  - protect and enhance the landscape;
  - protect and enhance the townscape;
  - protect the heritage of historic resources;
  - support biodiversity;
  - to protect the water environment;
  - encourage physical fitness; and
  - improve journey ambience.

To put into context the environmental review of the Vector Proposal, it is at minimum essential to consider not just the Proposed Scheme but also the Vector Proposal in light of the strategic policy and guidance documentation in which Strategic Road Improvements (SRIs) are delivered in Northern Ireland.

As set out in the Regional Strategic Transport Network Transport Plan (RSTNTP) 2015, four Strategic Planning Guidelines (SPGs) are presented that outline long-term policy direction with regard to developing a Regional Transportation System.

Tran 1.2 of SPG-TRAN 1 (to develop a Regional Strategic Transport Network based on key transport corridors, to enhance accessibility to regional facilities and services) aims to develop and maintain the identified RSTN to enhance accessibility on an integrated basis for all users including freight. To achieve this, the aims are to:

- incorporate quality public transport elements along the corridor routes with multi-modal interchange facilities, including provision for walking and cycling;
- target improvements to upgrade the network, road and rail, giving priority to the Key, Link and Metropolitan Transport Corridors;
- upgrade Westlink as a priority to reduce impacts of congestion and facilitate through traffic and freight movement, particularly that associated with the Ports of Belfast and Larne;
- introduce local improvements at significant traffic bottlenecks to relieve congestion and facilitate transport efficiency for all road users;
- plan investment across transport modes in an integrated way to achieve better co-ordination between regional and local needs; and
- minimise environmental impacts of any infrastructure schemes.

Table 1 of the *'Motorway Optimisation Vector Re-Routing Proposal Report'* summarises the Vector Proposal's performance against the scheme criteria for the current state and the

Proposed Scheme, stating that it meets or exceeds the expectations of the scheme criteria as it:

> *"Minimises construction and maximises flow. This improves the specific CO_2 emissions and avoids the embodied energy expenditure associated with construction. There is also a time related energy savings by keeping traffic flowing i.e. the sooner the flow is fixed the more energy is saved."*
>
> and
>
> *"Improves pedestrian and cyclist safety in the short to medium term by removing the risk of non-motorised users mixing with strategic traffic. The long-term safety implications can be mitigated with several options e.g. cycle & pedestrian bridges"*

This summary provides a limited appraisal in relation to the Environment objective and provides no supporting evidence to substantiate its conclusions. In general, there is no evidence that the environmental appraisal/assessment of the Vector Proposal has been undertaken in-line with industry standard guidance, such as the Design Manual for Roads and Bridges (DMRB), or the vast range of other guidance and methodologies which are utilised to aid and support the EIA specialist topics/aspects for major infrastructure projects.

Nevertheless, the overall environmental evaluation of the Vector Proposal on Air Quality, Cultural Heritage, Ecology & Nature Conservation, Landscape Effects, Land Use, Noise & Vibration, Vehicle Travellers, Road Drainage & the Water Environment, Geology and Soils has been critiqued in the following sub-sections.

6.3.2 *Air Quality*

6.3.2.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that a performance strength of the Vector Proposal is minimising construction and maximising flow. This would improve the specific CO_2 emissions and avoid embodied energy expenditure associated with construction. There is also time related energy savings by keeping traffic flowing (i.e. the sooner the flow is fixed the more energy is saved). With specific regard to air quality, it goes on to state that:

- *increased net traffic speed will increase the combustion efficiency of engines and hence reduce the specific air pollution*.

6.3.2.2 *Assessment*

- The strength of the conclusions on air quality effects (which seems to focus more on regional rather than local effects) is based upon freer flowing traffic which increases net speed, thus aiding the combustion efficiency of engines. This presents a limited view of the factors that influence vehicle emissions and effects upon air quality. It does not factor in the effects of speed variation, road geometry, changes in route length and the distribution of flows. These conclusions appear to be formulated on the effects of traffic flowing through the existing junction only and do not consider the combined effects on local air quality of redistributing traffic (local and strategic) throughout the wider city road network. The regional air quality assessment method in HA207/07 is based on the effect of changes to emissions across the wider road network. A detailed emissions model would be required as an absolute minimum to validate findings. No evidence of this has been presented, however the increase in the total km travelled is likely to have a greater influence on the total mass of emissions than the potential benefits to average vehicle speeds.

- As stated in Intersection #2 – Strategic Traffic Fixed of the '*Motorway Optimisation Vector Re-Routing Proposal Report*', due to the limited access options proposed at York Street with the Vector Proposal, it is acknowledged that the impact upon strategic traffic movements would extend to Millfield (A501), Clifton Street, Bridge End/Queens Bridge (A2), Stockman's Lane, Broadway. As quite rightly stated, this will reduce the demand on one central exit to replace York Street flow. It will increase demand at all of the other entry/exit points, which would have associated local air quality impacts and change the contribution road traffic emissions back to background pollutant concentrations across the wider city, including areas within designated Air Quality Management Areas (AQMAs).

- In the absence of a detailed model, it is unclear whether any receptors would be exposed to annual mean concentrations higher than the national air quality objective values for nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) as a result of the Vector Proposal. Moreover, the report provides no information with regards to these.

- The Vector Proposal does not focus on minimising impacts that have the potential to interfere with the City Council's efforts to achieve compliance with local air quality limit values. No consideration has been given to a number of potentially affected receptors, the existing Belfast Air Quality Management Area No.1 within the area of the Westlink, or other receptors within AQMAs adjacent to the affected road network throughout the City.

- The premise of the Vector Proposal is understood to be, to re–route traffic, remove traffic lights and increase flow without major civils work. This results in the loss of York Street and Nelson Street to through movements, the re-opening of Corporation Street to two-way movements, assumed significant re-configuration of the Dock Street / Brougham Street junction, and diversion / change to a plethora of routes from various directions due to the limitations of access associated with these changes. Although it would need to be demonstrated through a robust traffic model and a detailed air quality model to validate findings, this would result in changes to traffic conditions throughout the wider road network, including roads such as North Queen Street, that are currently locations at risk of exceeding the air quality limit values. Belfast City Council would likely take significant interest in this aspect as it has potential implications for the Council's wider efforts to improve the city's air quality in line with their Air Quality Action Plan.

- With respect to the Proposed Scheme, other than along North Queen Street, the predicted effects would largely be contained in close proximity to the existing junction arrangement. The Vector Proposal would extend the area of potentially significant local air quality effects across a wider portion of the city. The Vector Proposal could however result in beneficial air quality impacts along Dunbar Link, Great Patrick Street and York Street, as M2 bound traffic would instead be directed towards east Belfast. The number of receptors (particularly educational or residential properties) that would experience an improvement in local air pollutant concentrations is likely to be less than the number that would experience associated adverse impacts with the Vector Proposal.

- The premise of both schemes is to create freer flowing traffic conditions. The Proposed Scheme does this by providing a fully grade-separated interchange to replace the existing signalised gyratory junction. The Vector Proposal seeks to create freer flowing traffic conditions by utilising the wider road network and removing the signal controlled intersections within the existing gyratory junction. On this basis alone, the improvements in specific CO_2 emissions (as stated in Table 1 of the *'Motorway Optimisation Vector Re-Routing Proposal Report'*) are unfounded from a Regional air quality perspective and may not even be a betterment over the existing situation (an assessment would be required to validate findings). Whilst this is not a challenge to the stated achievable traffic flow conditions, it is concluded on the basis that as the Regional assessment considers all of the project's area of influence, the increases in link lengths with the Vector Proposal would

be a major influencing factor in the predicted total emissions and forms an intrinsic part of the calculation. The Vector Proposal makes no reference nor does it address this matter. Simply put, increased distance **=** increased emissions.

- The Vector Proposal could significantly reduce the scale and duration of construction works (i.e. assumed no demolition work, earthworks or transfer of dust-making materials from the site onto the local road network due to track-out). The Proposed Scheme would not give rise to significant effects on health due to emissions of particulate matter (including dust) from construction-related activities and therefore the Vector Proposal is unlikely to deliver any air pollution related amenity benefits in practice, although it would reduce the potential for adverse impacts to occur.

- The Vector Proposal would minimise the amount of construction plant required onsite and duration. This could also be beneficial as a result of comparatively less emissions from plant due to the significantly shorter construction phase duration. However this does not consider longer-term ('out of scope') developments, which could increase plant required and construction time.

6.3.3 *Cultural Heritage*

6.3.3.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the impacts upon cultural heritage would "*be broadly similar to current state*".

6.3.3.2 *Assessment*

- The loss of York Street as a continuous route would have adverse implications from a Cultural Heritage perspective, as it is one of Belfast's main thoroughfares, dating from the early 19th Century.

- The effects of the Proposed Scheme on the Cultural Heritage assets were assessed as being 'Slight Adverse' at worst, and thus is not a key factor in the decision making process. This is likely to be the same for the Vector Proposal.

- As the Vector Proposal would simply require a reconfiguration of the existing road network, it is assumed there would be no potential for disturbing archaeological remains during the construction phase unless existing roads need to be modified/upgraded to cope with the re-routing proposals.

- It was noted that the Proposed Scheme does offer an opportunity to increase archaeological knowledge from the results of the archaeological mitigation works. This would not be possible with the Vector Proposal, however this alone cannot offset the negative impacts of the Proposed Scheme, even though they are not significant.

6.3.4 *Ecology & Nature Conservation*

6.3.4.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the Vector Proposal would result in "*no direct impact upon designated ecological sites*" and would have a "*low impact on foraging areas for bats and nesting sites for breeding birds*".

6.3.4.2 *Assessment*

- The Vector Proposal would minimise the potential for disturbance of designated sites and habitats (flora and fauna) due to the reconfiguration of the existing road network, though the significantly increased traffic loading onto Nelson Street and conflicting movements due to lane changing between M3 and A12 Westlink bound traffic along this section of road would further conflict with existing foraging routes of the Leisler's and Pipistrelle bats.

- The Proposed Scheme would also have a relatively low effect on the ecological value and conservation status of the area, its habitats and its species. However, it is worth noting that the Vector Proposal would not result in the loss of several common habitats and loss of locally important features, such as scrub and trees. Nevertheless, overall ecological effects associated with the Proposed Scheme (with mitigation measures in place) are Minor Adverse/Negligible, and would not be a key factor in the decision making process.

- As a longer-term 'out of scope' proposal, the park located within the centre of the existing gyratory system would enhance biodiversity within the scheme area, as the newly planted vegetation would improve connectivity and increase the area of natural habitat present. It would however be a hostile environment for fauna, as it would be largely contained at-grade by very high volumes of passing strategic traffic. It is also worth noting that with the Proposed Scheme, biodiversity enhancement measures have been proposed with the creation of new habitats throughout the site, tree-lined road links, retention of mature trees where possible, and the provision of boxes for birds and bats.

- As the Vector Proposal would simply require a reconfiguration of the existing road network, the footprint of the construction works would be minimised, thus limiting the potential for disturbance of habitats.

6.3.5 *Landscape and Visual Effects*

6.3.5.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the impacts upon landscape would be "*broadly similar to current state*". The report does not address visual effects.

6.3.5.2 *Assessment*

- From a landscape perspective, the Vector Proposal would be worse than current state on the basis that the required road reconfiguration would work against the pattern of settlement which has been established by the existing road layout. This is in combination with required directional signage, road safety and containment infrastructure/barriers, possible alteration to site boundaries (as it is unclear whether the horizontal geometry of the Vector Proposal would be within standards), kerbs, footways, etc. which would further fragment the landscape of the area. Impacts on cityscape quality can result from a road cutting across the urban fabric, from the severance of visually and architecturally harmonious or homogenous areas or buildings, and from the disruption of spaces designed to be seen in sequence.

- The Vector Proposal has considered some possible improvements that could be further developed as longer-term ('out of scope') proposals, including a shared pedestrian/cyclist bridge over the abandoned section of York Street. To achieve suitable clearance and gradient standards, this would likely be a significant structure, increasing the mass of transport infrastructure in this area. This would possibly be even worse than the proposed York Street overbridges (Link No. 11) from a visual perspective, as it is reasonable to

assume it could be as high as the M3 Lagan Bridge to achieve necessary clearance and is also likely to be caged (as is the case with all other similar crossings of the strategic road network in this area).

- The longer-term ('out of scope') proposal to include a park would create a 'Green Space' within the centre of the existing gyratory system, which would soften and reduce visual impact within the 'box' of the existing junction.

- The Vector Proposal does not factor in the effects of visual traffic impacts as a result of redistribution throughout the wider road network. The magnitude of effect would be dependent upon the openness of view and proximity to traffic but also upon flow conditions.

- The longer-term ('out of scope') proposal for a shared pedestrian/cyclist bridge would have adverse visual impacts upon the properties that would have a view of it. Conversely, the provision of the park would soften the visual impact of the Vector Proposal.

- The works associated with the Vector Proposal would have limited landscape and visual construction impacts in terms of both duration and footprint when compared with the Proposed Scheme.

6.3.6 *Land Use*

6.3.6.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that land area losses would be improved when compared against the Proposed Scheme. From a land use planning perspective, it is also claimed (under 'Integration') that the Vector Proposal would be:

- *an improvement due to reclaiming land on Corporation Street; and*

- *Neutral in relation to BMAP*.

6.3.6.2 *Assessment*

- Taking the Vector Proposal at face value, it is agreed that a lower number of properties would be at risk of demolition (i.e. along Garmoyle Street/Corporation Street) in order to accommodate reconfiguration of the existing road layout. However, to accommodate two-way running along Garmoyle Street/Corporation Street and the tie-in with Dock Street with respect to design standards, it is unclear whether localised widening or road/lane reconfiguration would be required. This may result in properties (i.e. Stella Maris) being at risk of demolition.

- The Vector Proposal would still result in the loss or blight of property, including Jack Kirk Automobile Engineer on Shipbuoy Street. However, what has not been considered or presented in the Vector Proposal is the potential for demolition/loss of property due to other direct or indirect impacts associated with the scheme (which would naturally be borne out under normal assessment parameters through a thorough consultation strategy and iterative design process).

- The most obvious and potentially significant indirect loss of property would be Galway House (Yorkgate Business Park) with the Vector Proposal. There is potential for this property to be lost on the basis of limited access (as the only access route to this property would be via Westlink). All other routes to the property would be lost, including from the north (i.e. via York Street). This property could potentially be acquired by agreement or

via the blight process, as there would be a case for either. This would also likely sterilise the undeveloped lands to the rear [north] of this property, which includes the planning application to complete the development of Yorkgate Business Park.

- The requirement to stop-up Nelson Street at its junction with Great Georges Street would also reduce access to such an extent that it may result in the loss of Nelson Street Trade Centre on the basis of limited access. This issue would also affect significant planning applications for housing developments in this area, particularly as it is assumed the access to Little York Street would also be lost.

- The Vector Proposal acknowledges (within the Implementation Trial Notes section of the '*Motorway Optimisation Vector Re-Routing Proposal Report*') the potential for sub-standard geometry of the reconfigured road layout due to the need for 'chamfering' in places. The desire to achieve minimum design standards may potentially result in further demolition of property, or more likely private land loss.

- The long-term ('out of scope') proposals, such as the York Street shared pedestrian/cyclist bridge, and the extension to the Lagan pedestrian/cyclist overbridge towards Custom House Square, would increase the potential for private land loss or possibly demolition of property (more likely on York Street depending on the position and layout of the structure proposed).

- In terms of private land loss, the areas in the vicinity of Corporation Street would be unaffected by the Vector Proposal (unlike the Proposed Scheme). However, there may also be disbenefits to this, as TransportNI may still need to retain its land reserve in this area, if it is unclear as to whether the Vector Proposal can truly be a long-term solution to relieving the bottleneck.

- As detailed within the Belfast Metropolitan Area Plan (BMAP) 2015, the area bounded by York Street, Westlink, the elevated M3 Lagan and Dargan bridges, the M2 and Dunbar Link has essentially disconnected these areas from each other, contributing to widespread blight, leaving many sites either vacant or under-used. The Vector Proposal would do little to address this issue; in fact, it would exacerbate with the limited opportunity for developing land on Corporation Street and the likely addition of blighted land along York Street (at Yorkgate Business Park) and Nelson Street. On this basis, the conclusion that the Vector Proposal would have a Neutral impact upon BMAP (under Integration) is questionable.

- In terms of the specific concerns raised by TransportNI in relation to the Vector Proposal, Vector has responded that with regards to '*maintaining access to existing properties and businesses*' the impacts of the Vector Proposal is a '**Non-issue**' as '*less land is used, properties affected are the same as the DRD scheme (r.e. Nelson Street), less properties affected on Corporation Street*'. This is a very short-sighted response and biased view of the potential for direct and indirect impacts associated with the Vector Proposal. Though normally a local effect, the loss of access, land and demolition of any property is significant and such impacts cannot be considered as a 'non-issue' in light of the implications for the affected parties.

6.3.7 *Noise & Vibration*

6.3.7.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the noise impacts would be "*broadly similar to current state*" as the "*reduction in vehicle traffic waiting will be offset by faster traffic speeds*".

6.3.7.2 *Assessment*

- Within the high level message of the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, the Vector Proposal makes reference to the two key components of traffic noise (i.e. generated by the engine exhaust system and transmission, which is the dominant source when traffic is not free-flowing and the interaction of tyres with the road surface, which is the dominant noise source under free-flow traffic conditions at moderate to high road speeds). As the Vector Proposal is supposedly achieving 'freer flowing' conditions, it is changing the noise environment of this area, and should be assessed in accordance with DMRB and Calculation of Road Traffic Noise (CRTN) to validate the findings. No evidence of this has been presented.

- The high level message also seem to focus on the noise effects associated with the strategic links and not the wider road network, which would be affected by the redistributed traffic. Essentially, a modelled network should be developed to include those areas where there is likely to be significant changes in traffic flows. It is not evident that this has been considered.

- The effects can only be assessed when it is clear as to what would be the expected traffic flows, speeds, etc., which roads would be reconfigured, and which roads will be stopped-up. The works associated with the Vector Proposal would have limited Noise & Vibration construction impacts in terms of both duration and footprint when compared with the Proposed Scheme.

6.3.8 *Pedestrian, Cyclist, Equestrian and Community Effects*

6.3.8.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, in terms of Pedestrians, Cyclists & Equestrians, Community Severance, and Access to Public Transport it is claimed that the Vector Proposal would have "*a broadly Neutral impact*" based on the following high level messages for Environment, Accessibility and Integration.

- *"Pedestrians, Cyclists & Equestrians:*
  - *Pedestrian and cyclist safety in the short to medium term would be improved by removing the risk of non-motorised users mixing with strategic traffic.*
  - *The provision of access for pedestrians and cyclists will be maintained however the routes will change. The main link routes to the City Centre will be along Corporation Street and North Queen Street instead of through York Street. (Pedestrians are approx. 1% of the junction users).*
  - *Displacement of pedestrians may increase localised risk e.g. Great Georges Street and North Queen Street Intersection. This could be mitigated by traffic signalling or if the risk is perceived large then walkways and cycleway could be introduced.*
  - *Longer term plans (out of scope) could provide an over-bridge access similar to the M2 over-bridge between Ivan Street and Milewater Road or a ramped bridge for cyclists. This should be considered as a parallel activity to rerouting and link in to safety and community severance issues.*
- *Community Severance*
  - *Community severance will be neutral with the exception of houses along Henry Street. Henry Street is already closed at one end to vehicle traffic so the severance will only extend to pedestrian and cyclists. The new level of severance is approximately equal to other areas of Belfast located along the A12.*
- *Access to Public Transport*
  - *The effect on rail infrastructure and provision of services would be Neutral. Provision of bus routes can be service via Corporation Street or North Queen Street.*
  - *Creates options and reduces restriction on Rapid Transit due to removal of build constrictions."*

6.3.8.2 *Assessment*

- Pedestrian and cyclist safety in the short to medium term would be improved by removing the risk of non-motorised users mixing with strategic traffic. However, this is achieved by simply eliminating the non-motorised users, rather than accommodating them on the most heavily-trafficked non-motorised user route through the study area. This is the absolute last consideration in the hierarchy of Provision for Pedestrians and Cyclists, as per DMRB 5.2.4 (TA 91/05). This is not in line with TransportNI's specific scheme objective to maintain non-motorised user access or Tran 1.2 of SPG-TRAN 1.
- The *'Motorway Optimisation Vector Re-Routing Proposal Report'* weights the importance of York Street for non-motorised users on the basis that they are only 1% of users, and thus their needs are inferior to strategic needs. This does not align with the high-level Government objectives for transport. The importance of this route to non-motorised users cannot be established simply through statistical analysis alone and conflicts with the approach to be followed within DMRB 5.2.4. Considering the volume of traffic that passes through this junction, 1% of users equates to well over 1,000 non-motorised users, which is not insignificant and who continue to use this road, in light of the accident figures quoted in Table 1 of the *'Motorway Optimisation Vector Re-Routing Proposal Report'*.

- The Vector Proposal does not fully address or understand community needs within this area. There is an existing interface at the bottom of Henry Street to manage inter-community tensions within this part of North Belfast. Due to existing severance, Corporation Street does not serve the needs of the community to the west of the M2. Therefore, the other viable alternative is to channel non-motorised user movements through North Queen Street. For example, channelling an Orange Order parade through New Lodge and past the McGurk's Bar bombing memorial is likely to be met with some tension. It is expected that consultation with the PSNI would strongly support this view and would want to see York Street maintained as a through route for the sake of community relations, even from a day-to-day usage perspective.

- The Vector Proposal acknowledges the problems associated with eliminating York Street as a non-motorised user through route by promoting a long-term ('out of scope') shared pedestrian/cyclist bridge over the abandoned section of York Street. This would be significantly beneficial from a non-motorised user perspective and an improvement over the Proposed Scheme, however the needs of non-motorised users are current, they are not long-term. Thus, such an accommodation should not be considered 'out of scope' and would need to be implemented immediately to alleviate potential amenity, journey time and severance issues.

- The Vector Proposal assumes that the displacement of pedestrians may increase localised risk (e.g. Great Georges Street and North Queen Street Intersection), though could be mitigated by traffic signalling or if the risk is perceived large, then walkways and cycleways could be introduced. Again, this is a very limited appraisal of the effects associated with the Vector Proposal. The traffic redistributional effects as a result of proposed changes to other parts of the existing road network would result in an increased volume of traffic utilising the wider road network. This would potentially hinder movements, reduce amenity and increase the perception of severance and the time taken to complete journeys (particularly when crossing). A Road Safety and Non-Motorised User Audit would be a necessity for the Vector Proposal to consider these effects.

- Cycling provision would not even be an enhancement over existing conditions, as cyclists would share road space on a more heavily-trafficked wider local road network and have their route options/desire lines limited.

- The statement that community severance would be 'Neutral' is unfounded as the Vector Proposal fails to address the objectives of Tran 1.2 of SPG-TRAN 1 and those set out in the Belfast Metropolitan Transport Plan (BMTP). Essentially the strategic network needs to be enhanced such that it can:

  - *safely and efficiently cater for longer distance movements to, from and between different parts of the Belfast Metropolitan Area (BMA); and*

  - *support the reduction of traffic and the negative impacts of traffic on the non-strategic road network with capacity enhancement schemes to address key bottlenecks and provide a consistent standard of road.*

- With regards to the latter, the Vector Proposal fails to support the reduction of traffic and the negative impacts of traffic on the non-strategic road network through traffic redistribution, to an extent that is much more significant than the Proposed Scheme. As such, local vehicle movements would be significantly inhibited, new severance created throughout the wider area and most significantly within the local communities in close proximity to the existing junction who have suffered as a result of the historical development of strategic road infrastructure in this area.

- In terms of community facility losses, the Vector Proposal would also result in the loss of Northside Park & Ride, Great Georges Street Car Park, and Jack Kirk Automobile Engineer. It is unclear how limiting the accessibility of Cityside Retail Park would be beneficial from a passing trade perspective (particularly as it is not directly accessible to vehicular traffic from North Queen Street) and the impacts upon Galway House have previously been documented.

- It is unclear whether the long-term ('out of scope') proposal to provide a park in the centre of the Vector Proposal would be a valuable community asset. Anti-Social behaviour is likely to be a risk. Consultation with PSNI for the Proposed Scheme determined that residual land below and between overbridges has been a magnet for youths engaged in anti-social behaviour. The PSNI stress that 'dead areas' associated with the project could create potential problems if not addressed at the outset. It is also unclear how this park would be accessed without the use of at-grade crossings on the strategic links, or a spur off the shared pedestrian/cyclist bridge over the abandoned section of York Street.

- It is agreed that the direct effect on rail infrastructure and provision of services would be Neutral, however indirectly, the Vector Proposal, through the loss of York Street to through movements for example, would sever the new Ulster University Campus from Yorkgate Train Station, which is expected to be heavily utilised by students when the campus opens.

- The Vector Proposal fails to improve the quality of public transport services in delivering a modern, integrated transport system for the BMA, as identified within the BMTP and Tran 1.2 of SPG-TRAN 1. The bus provision associated with the Proposed Scheme (in particular the bus lane provision on York Street overbridge) has been supported by Translink. Whilst Translink should be afforded the opportunity to comment on the Vector Proposal, it is expected it would not be favourable in light of traffic redistributional effects on the wider road network, which would obviously affect connectivity, servicing needs and journey time reliability. The Vector Proposal would also result in the loss of the bus lane on Corporation Street and it is unclear how northbound bus services would connect to the Nelson Street bus lane with the necessary re-configuration of the Dock Street junction.

- It is unclear how the Vector Proposal creates options and reduces restriction on Belfast Rapid Transit (BRT) due to the removal of build constrictions. Clarification may be required with regards to this. There is currently no proposal for BRT to service the study area to the north of the City Centre, however if in the future it was proposed to extend the BRT network through this area, the Proposed Scheme would not prejudice the possibility of this happening and it could utilise York Street Overbridge. The Vector Proposal in fact conflicts with the route of BRT at Bridge End/Queen Elizabeth Bridge through traffic redistribution, which is likely to affect efficiency of service. With the Vector Proposal, the only viable BRT route would be via Corporation Street, which will likely be used as a non-service route to store the BRT vehicles at Milewater Road. With the likely re-introduction of two-way running, the bus lane on Corporation Street would be lost and it is therefore unclear whether Corporation Street would have sufficient width to accommodate all traffic needs, without localised widening.

- The works associated with the Vector Proposal would have limited Pedestrians, Cyclists & Equestrians, Community Severance, and Access to Public Transport construction impacts in terms of both duration and footprint when compared with the Proposed Scheme.

- The Belfast City Centre Regeneration Strategy and Investment Plan (December 2014) has been developed to provide a framework for change at a critical time for Belfast, in light of Belfast City Council's new powers to shape the city as part of the ongoing Reform of Local Government. With respect to the Proposed Scheme area, it states; "*The northern edge of*

the city centre is the least permeable, defined by the major highway infrastructure of the Westlink and M3. There is a danger that with the construction of the York Street Interchange the barrier between the city centre and the communities to the north will become even more pronounced. Innovative and interesting ways must be found to penetrate this barrier and foster connections through the concrete of the interchange.". As part of the Proposed Scheme, measures have been taken to address this danger as part of the design process, however with the Vector Proposal, it is obvious that the barrier between the city centre and the communities to the north will become even more pronounced.

- With respect to the specific concerns raised by TransportNI in relation to the Vector Proposal, Vector has responded that with regards '*maintaining access for non–motorised users*' it is a '**Non-issue**' as Corporation Street and North Queen Street still provide access for non–motorised users and the 'out of scope' discussion around parks and bridge links would improve this further. The Vector claim that reducing the four 'North/South' links currently available to NMUs to two links (by removing the two central links), is neither rational nor rationalised. Furthermore, by stating that the 'out of scope' discussion around parks and bridge links would improve this further, indicates that Vector actually view the removal of York Street and Nelson Street to NMU movements as a benefit. This demonstrates the lack of holistic / inclusive thinking with the proposal.

6.3.9 *Vehicle Travellers*

6.3.9.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that there would be an "*improvement in vehicle traveller's stress due to faster average speed compared to current state. Large improvement compared to future state DRD proposal on 38 months of construction which will reduce construction stress*".

6.3.9.2 *Assessment*

- The Vector Proposal is likely to result in an improvement [reduction] in vehicle traveller's stress due to faster average speeds compared to current state. However this conclusion again seems to focus on the effects associated with the strategic links and not the wider road network, which would be affected by the redistributed traffic. In terms of the driver stress assessment process as per DMRB, this is non-compliant and should address the wider strategic and non-strategic road network implications.

- It is accepted that the Vector Proposal would be betterment with regards to construction phase driver stress when compared to the Proposed Scheme.

6.3.10 *Road Drainage & the Water Environment*

6.3.10.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the impacts upon Road Drainage & the Water Environment would be "*broadly similar to current state*". The Vector Proposal would also "*result in running cost saving vs. future state DRD proposal by removing the need for Pumping Station*" (pumped drainage).

6.3.10.2 *Assessment*

- The claim that the Vector Proposal would be broadly similar to current state is unfounded, particularly from a spillage risk perspective. Whilst a DMRB assessment would be required to validate findings, the risk of accidents occurring, and those accidents resulting

in a serious spillage may be increased as a result of the traffic redistribution effectively increasing the footprint of the scheme within the Belfast Harbour and River Lagan Catchment. The effects of this are however unlikely to be significant.

- The environmental benefits of requiring no pumped drainage with the Vector Proposal may be outweighed by the provision of stormwater separation from the sewerage system with the Proposed Scheme. This approach has been promoted by NI Water and NIEA - Water Management Unit and would lessen the frequency of surcharging within the existing NI Water sewerage network. Further consultation with these bodies would be required for the optimum drainage solution with the Vector Proposal.

- Water Quality is unlikely to be an issue with the Vector Proposal, as is the case with the Proposed Scheme.

- The Proposed Scheme would have built-in flood resilience measures to protect its underpasses for coastal flood events with an Annual Exceedance Probability (AEP) of greater than or equal to 0.5% (i.e. a 1 in 200 year return period). This is further described in the completed Flood Risk Assessment for the Proposed Scheme included as Appendix 16, Annex C in Volume 2 of the published Environmental Statement.

- The Vector Proposal factors in no flood resilience measures, reflective of the existing situation.

- Based on the findings from the Proposed Scheme's Flood Risk Assessment, several of the surface streets forming part of the existing York Street junction would therefore remain at risk of flooding during coastal flood events with an AEP of greater than or equal to 0.5%. Furthermore, Nelson Street and Great Georges Street would also remain susceptible to flooding from smaller coastal flood events, with coastal flood events with an AEP of less than 2% (i.e. a greater than 1-in-50 year return period) presenting a flood risk.

- The absence of flood resilience measures within the Vector Proposal would require the closure of the existing York Street junction for periods in advance of, during and after certain flood events to minimise the risks to road users and to perform clean-up operations. For the larger flood events, such closures would not be beneficial to the development and implementation of emergency response plans, in contrast to the benefits presented by the flood resilience measures of the Proposed Scheme.

6.3.11 *Geology & Soils*

6.3.11.1 *Performance Claim*

With reference to the *'Motorway Optimisation Vector Re-Routing Proposal Report'*, it is claimed that the impacts upon Geology & Soils would be "*broadly similar to current state*". The Vector Proposal would also "*remove the risk of unearthing areas of contaminated land*" which is a requirement within the Proposed Scheme.

6.3.11.2 *Assessment*

- It is agreed that the impacts upon Geology & Soils would be broadly similar to current state with the Vector Proposal.

- As this is an environmental evaluation, the risk of unearthing areas of contaminated land adverse risk to human health and the environment would be reduced by either removing or capping any contaminated ground, thus the residual effect with the Proposed Scheme could be deemed 'Slight/Moderate Beneficial'.

6.3.12 *Cumulative Effects*

The *'Motorway Optimisation Vector Re-Routing Proposal Report'* does not address what the likely significant cumulative effects are. It is vitally important that they are considered, bearing in mind the legislative requirements to do so and the much greater geographical extent of what is proposed.

Cumulative effects are the total effect caused by the sum of past, present and reasonably foreseeable future actions. They can result from incremental changes caused by interactions between effects arising from a scheme and/or interaction with the effects from other developments. With regard to road improvement schemes, cumulative effects are considered in the following ways:

- Multiple effects from the scheme, and from different schemes (of similar or different types), upon the same resource; such as the effect on a single community of noise from several transport sources or landtake and damage due to hydrological change, affecting several sites of the same habitat; and

- Incremental effects arising from a number of small actions, including ongoing maintenance operations, having developed or developing over time.

7. CONCLUSIONS

7.1 Overview

The Vector Proposal outlines a concept for the re-routing of traffic around the city streets of Belfast. However, in several key areas, the Vector Proposal omits important details necessary to fully understand the concept and its impacts on travel patterns.

Nonetheless, on the basis of the information provided, it is apparent that the Vector Proposal has several key deficiencies, as summarised for the completed engineering, traffic and environmental assessments in sections 7.2 to 7.4.

7.2 Engineering Assessment

7.2.1 *General*

When considering the Vector Proposal, the following issues are noted.

- The Vector Proposal requires significant changes to several existing signalised junctions and fails to demonstrate that these changes can be introduced in line with the engineering standards of Volume 6 of the Design Manual for Roads and Bridges.
- The Vector Proposal creates several unconventional junction arrangements and would increase pressure on existing weaving sections on the Westlink and M3 motorway. The Vector Proposal has not considered the potential issues for road user safety in line with the requirements of Volume 4 of the Design Manual for Roads and Bridges.
- Higher speeds and free-flow traffic may lead to greater risks for the safety of road users, particularly where free-flow is being introduced at junctions, such as Dock Street, where the existing road geometry may not be sufficient to deal with free-flow turning movements.
- Vector has indicated that the Vector Proposal could be implemented initially as a trial of one to two days following a four to six week design and communication period. It is considered that both these timescales are unrealistic for a proposal of this significance.

7.2.2 *Route 1*

When considering the Vector Proposal, the following issues are noted.

- In the Vector Proposal, it is indicated that the traffic signals at Waring Street will remain, with all other traffic signals being downgraded to “ad-hoc pedestrian lights”. As the remaining traffic signals on the route at Queens Square, Queens Quay, Station Street and Middlepath Street serve to manage conflicting traffic flows, this is not considered feasible.
- It is considered that Route 1 would result in additional pressure on the weaving section on the Lagan Bridge (northbound) as traffic joining from Middlepath Street would be required to manoeuvre into the northbound lane for onward travel to the M2/M5. The implications for road safety are not quantified by within the Vector Proposal and should be considered by an experienced Road Safety Auditor.

7.2.3 *Route 2*

When considering the Vector Proposal, the following issues are noted.

- Traffic flows on Corporation Street would appear to only be controlled via ad-hoc pedestrian signals at the existing signalised junctions with Corporation Square, Garmoyle

Street and Brougham Street. As the existing signals at these junctions serve to manage conflicting traffic flows that will remain with the Vector Proposal, this is not considered feasible.

- It would appear that the northbound bus lane between Clarendon Dock and the junction with Garmoyle Street would be removed to make way for at least one new northbound lane for general traffic. The loss of bus priority would have an impact on public transport services to North Belfast and the Docks areas.

- The re-routing of additional traffic volumes past residential properties at Garmoyle Street and a sensitive community receptor (Stella Maris) are likely to meet with objection from the affected local communities.

- With the future plans to develop City Quays, the re-routing of additional traffic flows onto Corporation Street are likely to have a detrimental impact on access to new residential and commercial properties.

- Within the span arrangements of the existing road and rail bridges at Dock Street, there would appear to be insufficient width to accommodate enough traffic lanes to cater for the anticipated re-routed flows. It is considered that any loss of capacity would significantly increase congestion at these junctions on all approaches including, importantly, the main access from the M2 motorway to Belfast City Centre.

- The severance of York Street as part of Route 2 will impact upon existing public transport services for the area.

- The closure of York Street in Route 2 raises significant concerns over community severance that is likely to meet with objection from the local community. The identified "out-of-scope "development within the Vector Proposal to address this using pedestrian and cycling bridges is unlikely to address the concerns of the local community.

7.2.4 *Route 3*

When considering the Vector Proposal, the following issues are noted.

- The potential exists that Galway House and future developments at Yorkgate Business Park will in effect be blighted by the Vector Proposal due to severe restrictions in access/egress.

- The Vector Proposal's changes to Dock Street and its junctions are unconventional and raise significant concerns over road user safety.

- The scheme specific objective for the Proposed Scheme is to maintain access for non-motorised users. The Vector Proposal will however reduce access for non-motorised users across Dock Street, particularly along the westbound carriageway.

- The Vector Proposal will reduce access between Yorkgate train station and the new university campus for public transport.

- Access to the M2 and M3 motorways from North Belfast would be significantly impacted and would not satisfy the stated scheme-specific objective of maintaining access to existing properties, community facilities and commercial interests.

7.2.5 *Route 4*

When considering the Vector Proposal, the following is noted.

- The movement between the Westlink and M2 motorway can operate in a free-flow manner as suggested.

7.2.6 *Route 5*

When considering the Vector Proposal, the following issues are noted.

- The lane configuration on the M2 to Westlink movement within the Vector Proposal is anticipated to create operational issues due to the effects of merging traffic.
- The scheme specific objective for the Proposed Scheme is to improve access to the regional gateways. The Vector Proposal will change access arrangements from Belfast Harbour to the Westlink and therefore may not satisfy this objective.
- Jack Kirk Garage may potentially be blighted by the Vector Proposal due to severe restrictions in access/egress.

7.2.7 *Route 6*

When considering the Vector Proposal, the following issues are noted.

- It would appear that only one lane can be provided in free-flow between M3 and Westlink, as with the Proposed Scheme. Vector has criticized this provision within the Proposed Scheme as a flow constriction, but appears to only offer similar provision in their Proposal.
- The provision of access from the M3 onwards to the Docks is unclear and would potentially require a signalised junction at York Street which would detract from the Vector Proposal's economic performance.

7.3 Traffic Assessment

When considering the Vector Proposal, the following issues are unlikely to be acceptable.

- The impact on local movements due to removal of traffic signals along the proposed York Street/ Dock Street/ Nelson Street route which would effectively sever these routes for pedestrians, cyclists and public transport. This is also likely to have a significant impact on pedestrian and cyclist movements associated with new Ulster University development and the sustainable transport initiatives being developed for the city.
- The impact of Belfast Harbour traffic which would require re-routing of traffic around the York Street junction using the local road network with consequential impacts for other road users, the local community and harbour operations.
- The impact on traffic conditions on the M3 Motorway between Middlepath Street and Nelson Street due to re-routing of all 'City to M2' traffic via the Middlepath Street on-slip which would significantly increase weaving and conflicting vehicle movements on the M3 with associated implications for road safety.
- As a consequence of removing the strategic road intersections, a significant volume of traffic, including strategic traffic between Westlink and the M3, would be diverted around the local road network. The Vector Proposal does not include any consideration of the

effects of this traffic diversion nor the specific impacts on the local community or other road users, including public transport services, pedestrians and cyclists.

7.4 Environmental Assessment

7.4.1 *Overview*

The '*Motorway Optimisation Vector Re-Routing Proposal Report*' provides a limited appraisal in relation to the Environment objective and provides no supporting evidence to substantiate its conclusions. In general, there is no evidence that the environmental appraisal/assessment of the Vector Proposal has been undertaken in-line with industry standard guidance such as the Design Manual for Roads and Bridges (DMRB), or the vast range of other guidance and methodologies which are utilised to aid and support the EIA specialist topics/aspects for major infrastructure projects.

7.4.2 *Air Quality*

With regards to local air quality, the Vector Proposal is unlikely to be preferred from an operational perspective as a much higher number of receptors [in proximity] would be exposed to increases in concentration of airborne contaminants than with the Proposed Scheme. There would also be a risk of certain receptors being exposed to pollutant concentrations in excess of national air quality objective values with the Vector Proposal as a result of the changing traffic flow conditions. This in itself would be a significant environmental effect (subject to validation).

From a regional air quality perspective, the improvements in specific CO_2 emissions (as stated in Table 1 of the '*Motorway Optimisation Vector Re-Routing Proposal Report*') are unfounded as it is not evident that the project's area of influence has been fully considered. The increases in link lengths with the Vector Proposal would result in an increased contribution to regional emissions.

The Vector Proposal would significantly minimise the potential for receptors to be exposed to emissions from construction-related activities and plant when compared to the Proposed Scheme.

7.4.3 *Cultural Heritage*

With regards to cultural heritage, the Vector Proposal is likely to be preferred from an operational and construction perspective, however impacts upon cultural heritage assets as a result of either proposal would not be significant, and not a key factor in the decision making process.

7.4.4 *Ecology & Nature Conservation*

With regards to ecology & nature conservation, the Vector Proposal is likely to be marginally preferred from an operational and construction perspective, however impacts upon local flora and fauna as a result of either proposal would not be significant, and not a key factor in the decision making process.

7.4.5 *Landscape & Visual Effects*

There are many variables associated with the Vector Proposal which would have adverse landscape and visual effects.

From a landscape perspective the 'short-term' elements associated with the Vector Proposal would have an adverse impact upon the townscape, particularly as a result of the severance of

York Street and Nelson Street, which would fragment this node further and only serve to increase the footprint of the leftover space within this so-called 'shatter zone'. The longer-term ('out of scope') proposals, including a shared pedestrian/cyclist bridge over the abandoned section of York Street would certainly have a negative impact upon this environment.

The visual impact of the Vector Proposal is likely to be preferred over the Proposed Scheme, however again, longer-term proposals such as the overbridge would be an adverse visual element within this environment.

The Vector Proposal would significantly minimise the transient visual effects associated with construction-related activities.

7.4.6 *Land Use*

The Vector Proposal would significantly reduce the required number of demolitions when compared to the Proposed Scheme; however, the potential for demolition/loss of property due to other direct or indirect impacts associated with the scheme cannot be ruled out. Most notably, Galway House (Yorkgate Business Park) and Nelson Street Trade Centre.

From a land use perspective, the most significant adverse impact associated with the Vector Proposal would be the increased potential to further disconnect York Street, Westlink, the elevated M3 Lagan and Dargan bridges, the M2 and Dunbar Link by increasing the so-called 'shatter zone' of leftover space as a result of widening the footprint of strategic road infrastructure. This would likely contravene the objectives of BMAP 2015 and would not be supported.

7.4.7 *Noise & Vibration*

The Vector Proposal would change [primarily negatively] the noise environment within an area much larger than that associated with the Proposed Scheme, and should be assessed in accordance with DMRB and Calculation of Road Traffic Noise (CRTN) to validate the findings.

The works associated with the Vector Proposal would have limited Noise & Vibration construction impacts in terms of both duration and footprint when compared with the Proposed Scheme.

7.4.8 *Pedestrian, Cyclist, Equestrian and Community Effects*

In particular, the loss of York Street to non-motorised users through-movements and associated redistributional effects would have a significant effect from a community severance and amenity perspective. This is the absolute last consideration in the hierarchy of Provision for Pedestrians and Cyclists, as per DMRB 5.2.4 (TA 91/05). This is not in line with TransportNI's specific scheme objective to maintain non-motorised user access. There are also much wider community implications associated with the change to the existing road layout as part of the Vector Proposal, which would require extensive community and stakeholder consultation. The statement that community severance would be 'Neutral' is unfounded, as the Vector Proposal fails to address the objectives set out in the BMTP and Tran 1.2 of SPG-TRAN 1.

Cycling provision would not even be an enhancement over existing conditions, as cyclists would share road space on a more heavily trafficked wider local road network and have their route options/desire lines limited and changed.

The Vector Proposal fails to improve the quality of public transport services in delivering a modern, integrated transport system for the BMA, as identified within the BMTP and Tran 1.2 of SPG-TRAN 1.

The works associated with the Vector Proposal would have limited Pedestrians, Cyclists & Equestrians, Community Severance, and Access to Public Transport construction impacts in terms of both duration and footprint when compared with the Proposed Scheme.

7.4.9 *Vehicle Travellers*

The Vector Proposal is likely to result in an improvement [reduction] in driver stress, due to faster average speeds compared to current state. However, this conclusion again seems to focus on the effects associated with the strategic links and not the wider road network, which would be affected by the redistributed traffic (particularly along Great Georges Street/North Queen Street).

It is accepted that the Vector Proposal would be a betterment with regards to construction phase driver stress when compared to the Proposed Scheme.

7.4.10 *Road Drainage & the Water Environment*

With regards to Road Drainage & the Water Environment, the Vector Proposal is likely to be marginally preferred from an operational and construction perspective. However, impacts upon water quality as a result of either proposal would not be significant, and not a key factor in the decision making process.

7.4.11 *Geology & Soils*

With regards to Geology & Soils, the Vector Proposal is likely to be marginally preferred from an operational and construction perspective. However, impacts as a result of either proposal would not be significant, and not a key factor in the decision making process.

7.5 Summary Assessment

Based on the conclusions from each of the completed engineering, traffic and environmental assessments, it is considered that the Vector Proposal fails to meet several of the stated scheme objectives in relation to improved access to the regional gateways, maintaining access for non-motorised users, and maintaining access to existing residential and businesses.

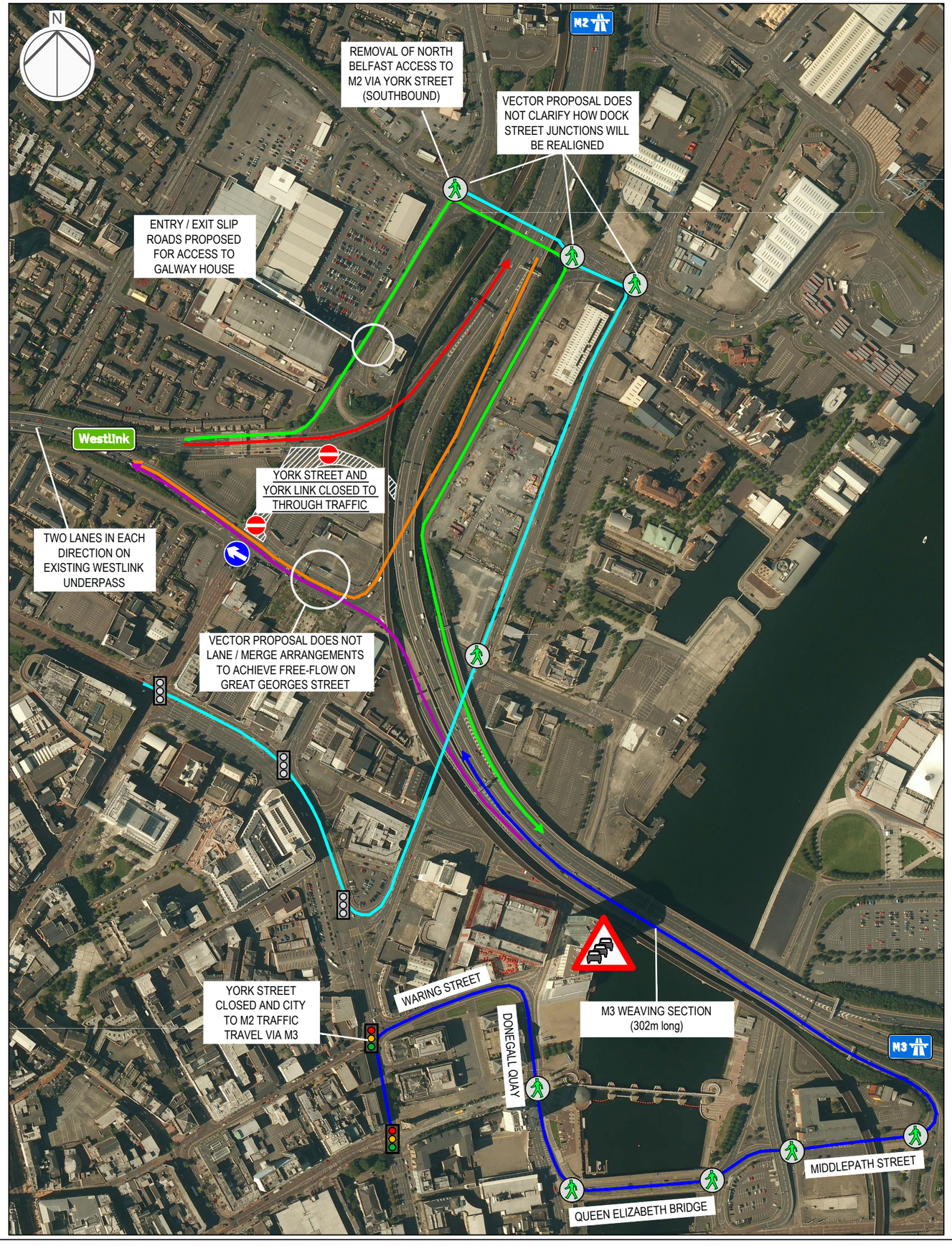
The Vector Proposal's changes to junctions and potential lane configurations raise concerns for road user safety, as they have not been designed in accordance with the Design Manual for Roads and Bridges and have not been subject to the Road Safety Audit process.

On the basis of the information provided, our assessment of the Vector Proposal is that its overall performance would be inferior to that of the Proposed Scheme and does not warrant further examination.

APPENDIX A DRAWINGS

Drawing No.	Title
Drawing 1	Vector Re-Routing Proposal Assessment: Proposed Routes (Revision P02)
Drawing 2	Vector Re-Routing Proposal Assessment: Route 1 (Revision P01)
Drawing 3	Vector Re-Routing Proposal Assessment: Route 2 (Revision P02)
Drawing 4	Vector Re-Routing Proposal Assessment: Route 2 Existing Dock Street Junction (Revision P01)
Drawing 5A	Vector Re-Routing Proposal Assessment: Route 3 (Sheet 1 of 2) (Revision P01)
Drawing 5B	Vector Re-Routing Proposal Assessment: Route 3 (Sheet 2 of 2) (Revision P01)
Drawing 6	Vector Re-Routing Proposal Assessment: Route 4 (Revision P01)
Drawing 7	Vector Re-Routing Proposal Assessment: Routes 5 and 6 (Revision P01)

THIS PAGE INTENTIONALLY BLANK



KEY

- ROUTE ONE
- ROUTE TWO
- ROUTE THREE
- ROUTE FOUR
- ROUTE FIVE
- ROUTE SIX
- PROPOSED AD-HOC PEDESTRIAN SIGNALS
- PROPOSED SEQUENCED, I.E. TIME OR CAR TRIGGERED SIGNALS
- EXISTING TRAFFIC SIGNALS

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

Revision Details	By / Check	Date	Suffix
Proposed Route Two Updated		Oct 15	A

Purpose of issue: INFORMATION

Client: TRANSPORTNI

Project Title: YORK STREET INTERCHANGE

Drawing Title: VECTOR RE-ROUTING PROPOSAL ASSESSMENT: PROPOSED ROUTES

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

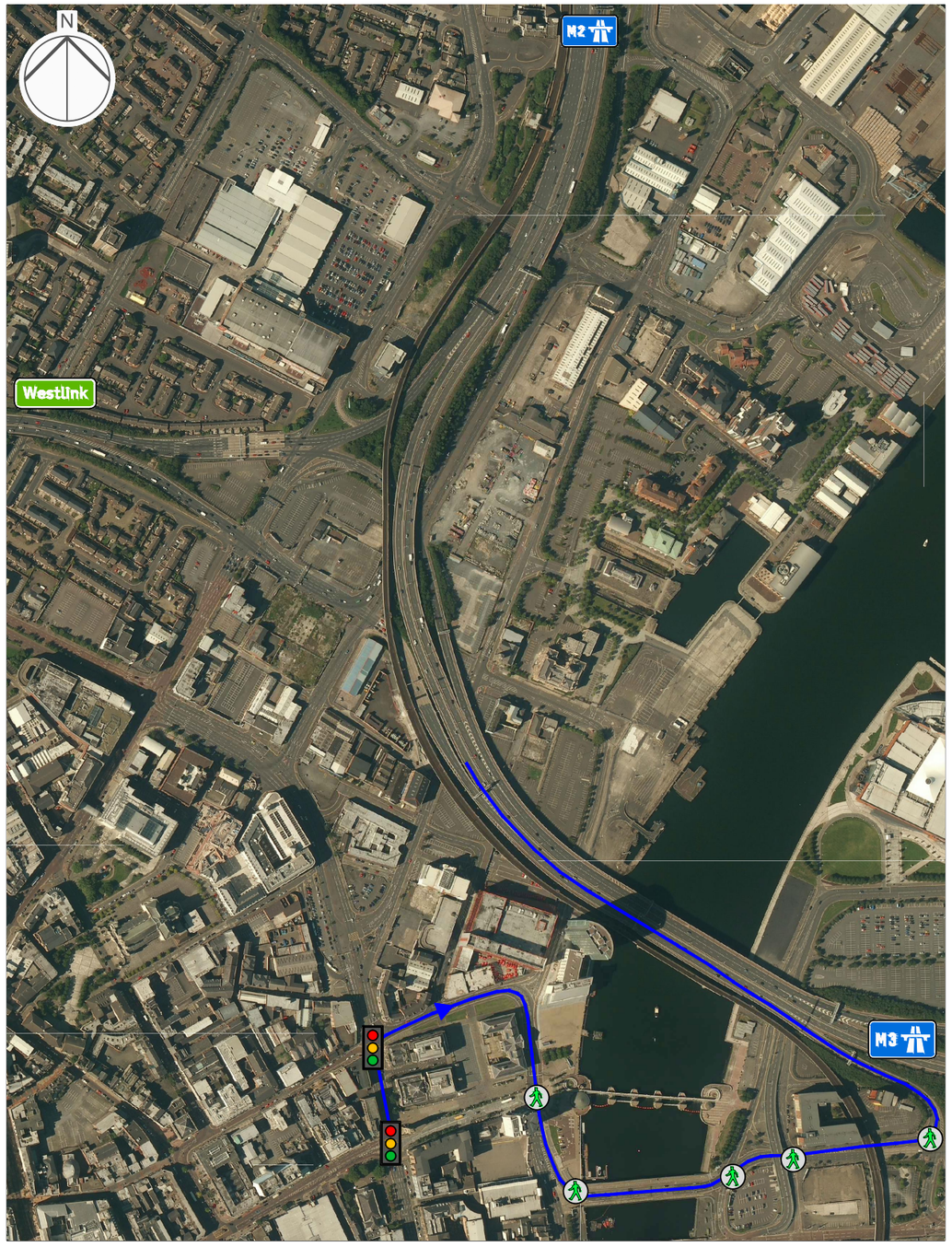
URS Internal Project No.: 47037827
Suitability:
Scale @ A1: NTS
Zone:

URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)28 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

Drawing Number: DRAWING 1
Rev: P02

KEY

PROPOSED ROUTE ONE



PLAN

KEY

EXISTING ROUTE

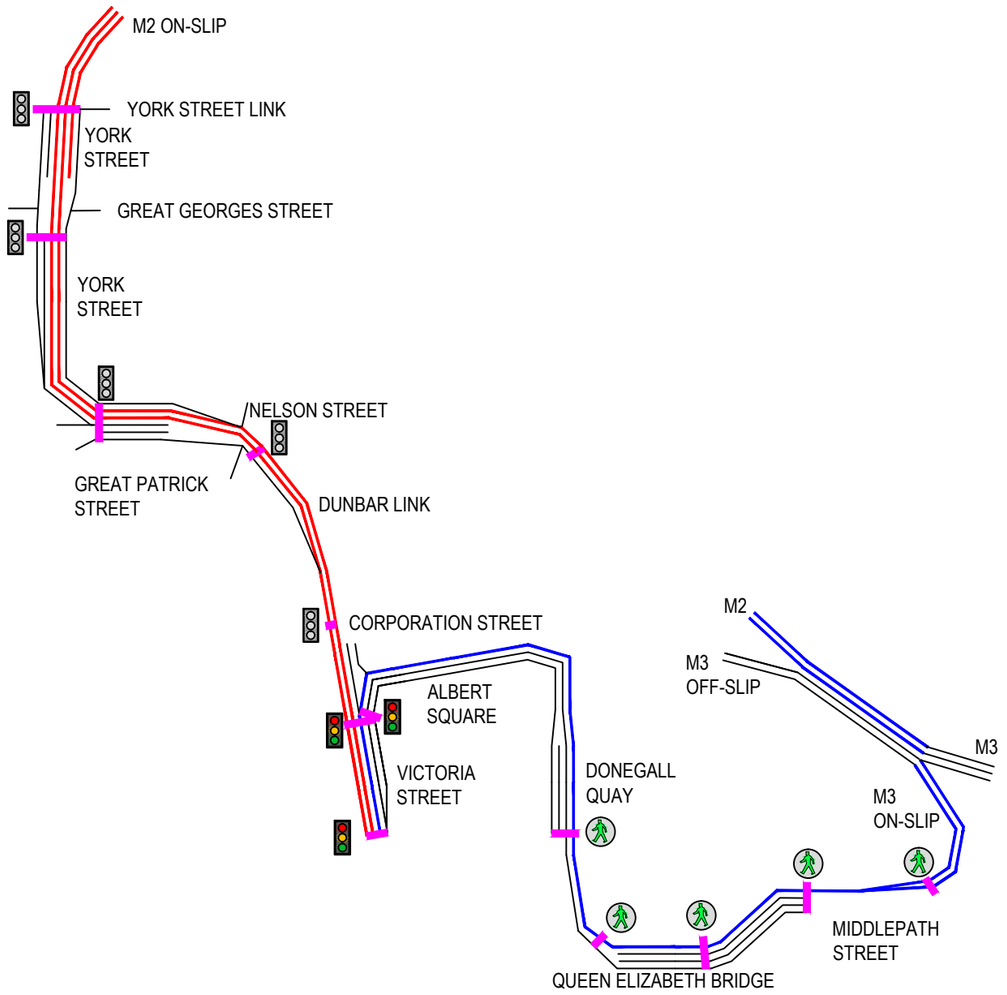
PROPOSED ROUTE ONE

EXISTING CONTROLLED NMU CROSSING POINT

EXISTING JUNCTION CONTROL TRAFFIC SIGNALS

PROPOSED AD HOC PEDESTRIAN SIGNALS

PROPOSED SEQUENCED (I.E. TIME OR CAR TRIGGERED SIGNALS)



SCHEMATIC

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

Revision Details	By / Check	Date	Suffix

Purpose of issue: INFORMATION

Client: TRANSPORTNI

Project Title: YORK STREET INTERCHANGE

Drawing Title: VECTOR RE-ROUTING PROPOSAL ASSESSMENT: ROUTE 1

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.	Suitability
47037827	
Scale @ A1	Zone
NTS	

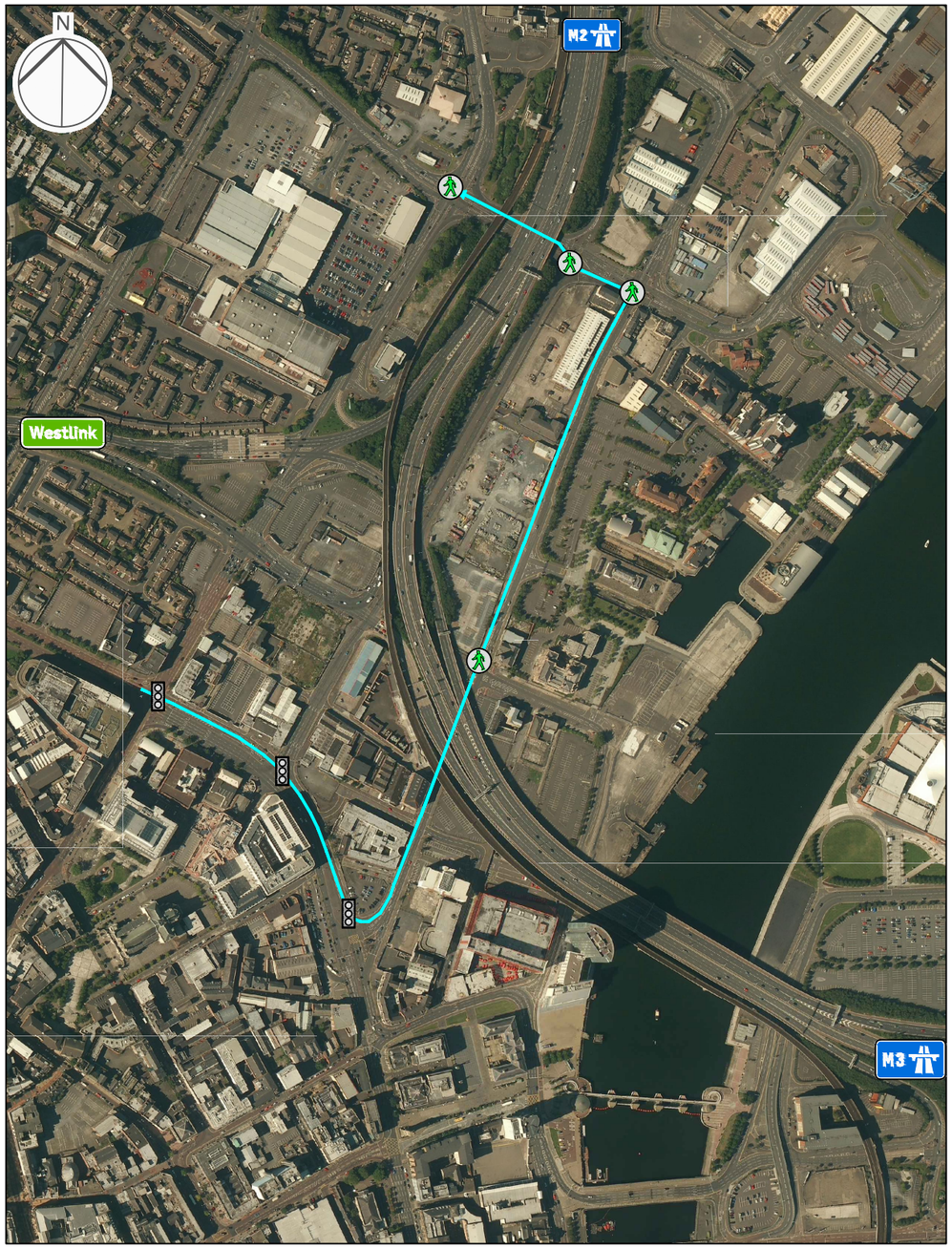
URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)28 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

Drawing Number: DRAWING 2

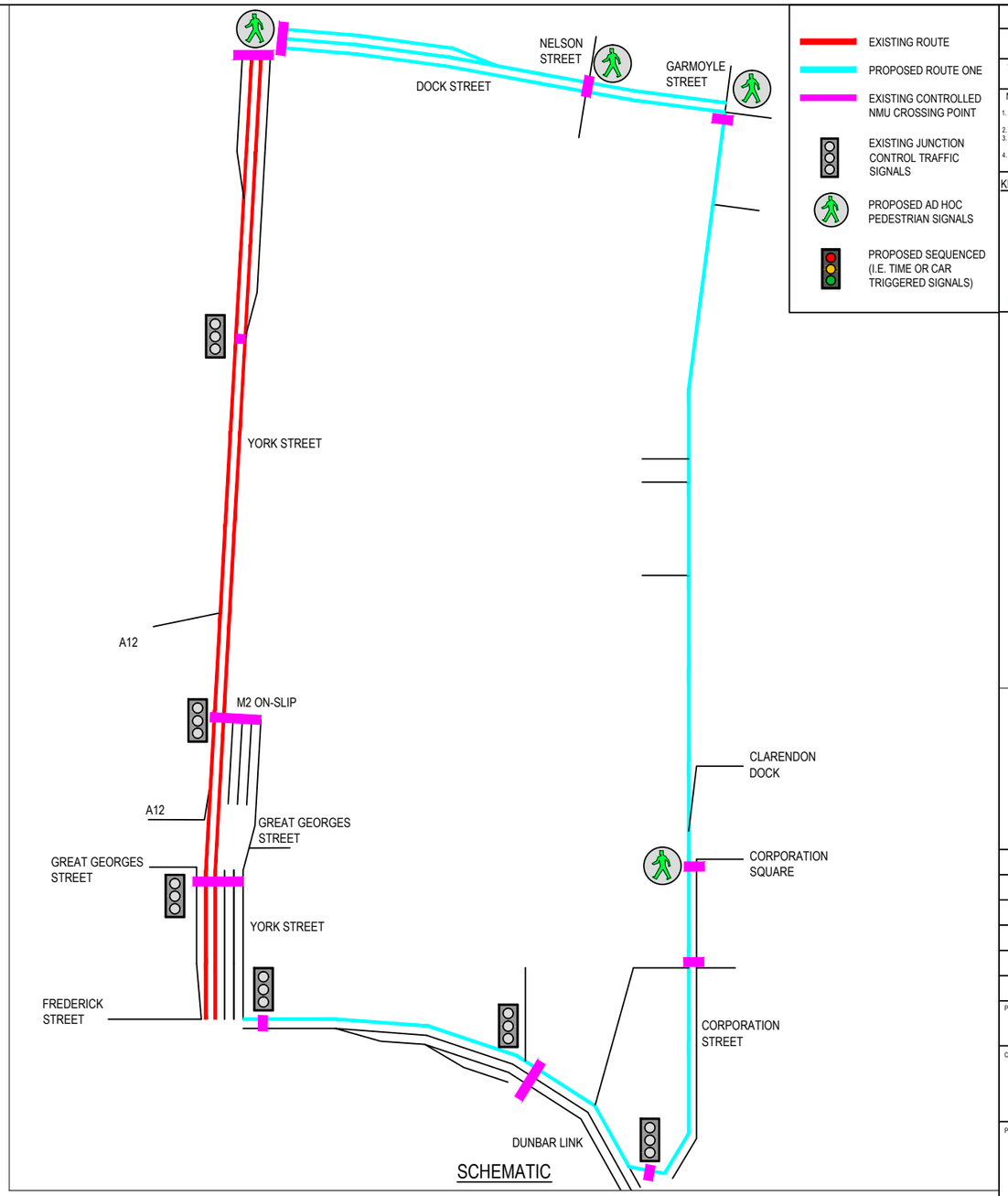
Rev: P01

KEY

PROPOSED ROUTE TWO



PLAN



SCHEMATIC

EXISTING ROUTE

PROPOSED ROUTE ONE

EXISTING CONTROLLED NMU CROSSING POINT

EXISTING JUNCTION CONTROL TRAFFIC SIGNALS

PROPOSED AD HOC PEDESTRIAN SIGNALS

PROPOSED SEQUENCED (I.E. TIME OR CAR TRIGGERED SIGNALS)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

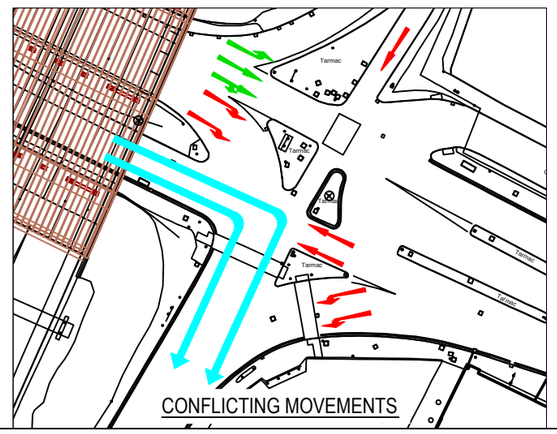
KEY

BLOCKED ROUTE

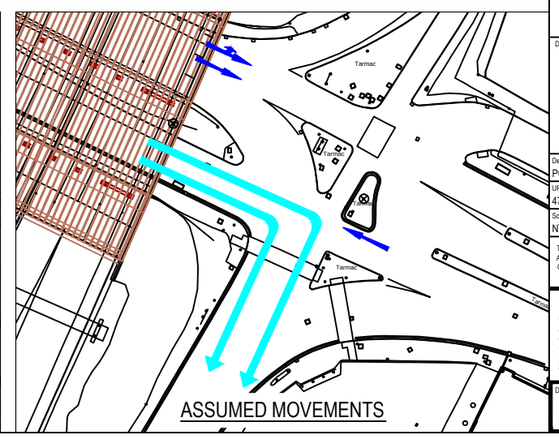
ALLOWED ROUTE

ASSUMED ROUTE

FREE FLOW



CONFLICTING MOVEMENTS



ASSUMED MOVEMENTS

Revision Details	By / Check	Date	Suffix
Proposed Route Two Updated		Oct 15	P02

Purpose of issue: INFORMATION

Client: TRANSPORTNI

Project Title: YORK STREET INTERCHANGE

Drawing Title: VECTOR RE-ROUTING PROPOSAL ASSESSMENT: ROUTE 2

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.: 47037827

Suitability:

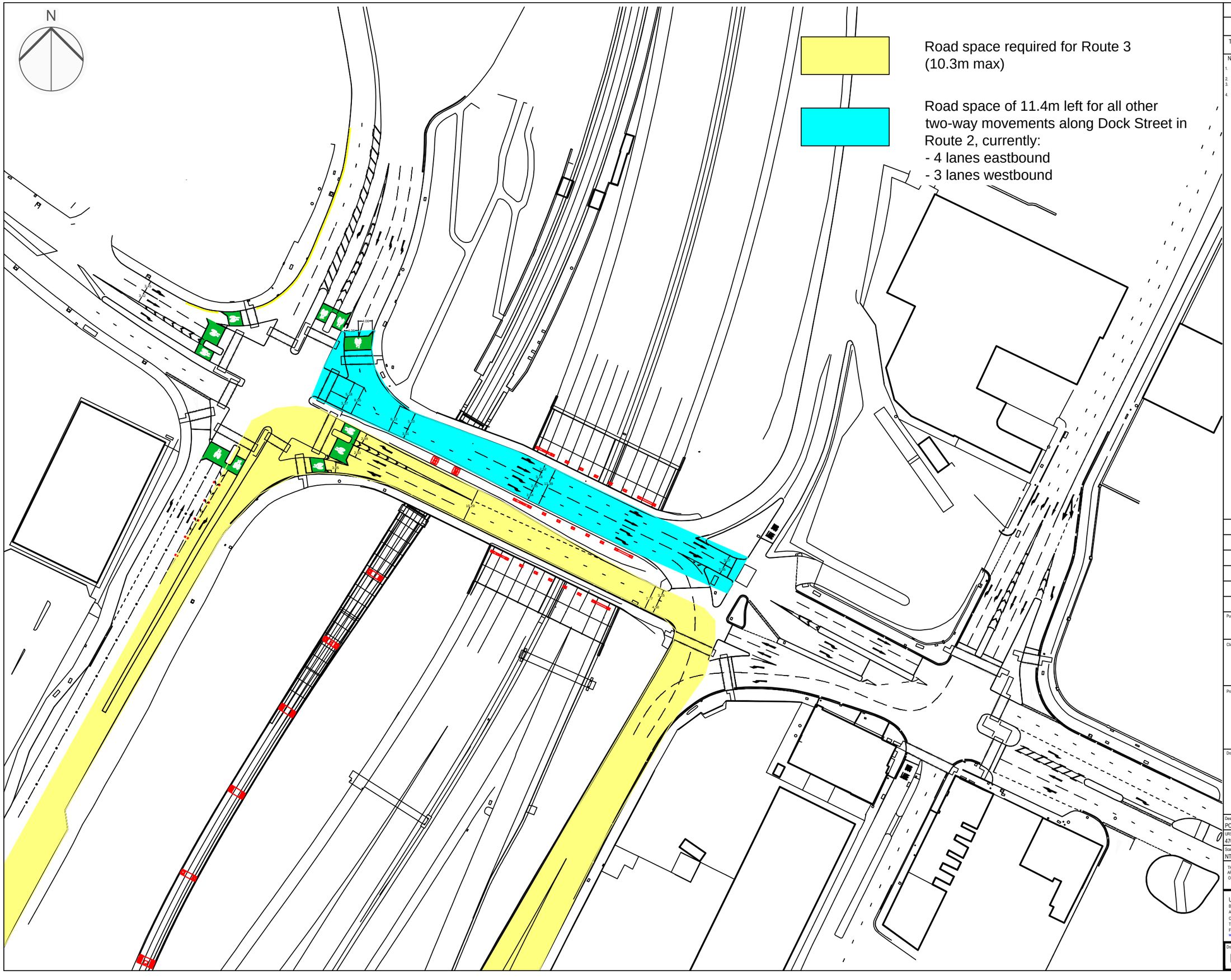
Scale @ A1: NTS

Zone:

URS Infrastructure & Environment UK Limited
Building name
Address, part 1
County, Post Code
Tel:+44 (0)8888 888 888
Fax:+44 (0)8888 888 888
www.ursglobal.com

Drawing Number: DRAWING 3

Rev: P02



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING. USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

Revision Details	By / Check	Date	Suffix

Purpose of issue

INFORMATION

Client

TRANSPORTNI

Project Title

YORK STREET INTERCHANGE

Drawing Title

VECTOR RE-ROUTING
PROPOSAL ASSESSMENT:
ROUTE 2
EXISTING DOCK ST JUNCTION

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.	Suitability
47037827	
Scale @ A1	Zone
NTS	

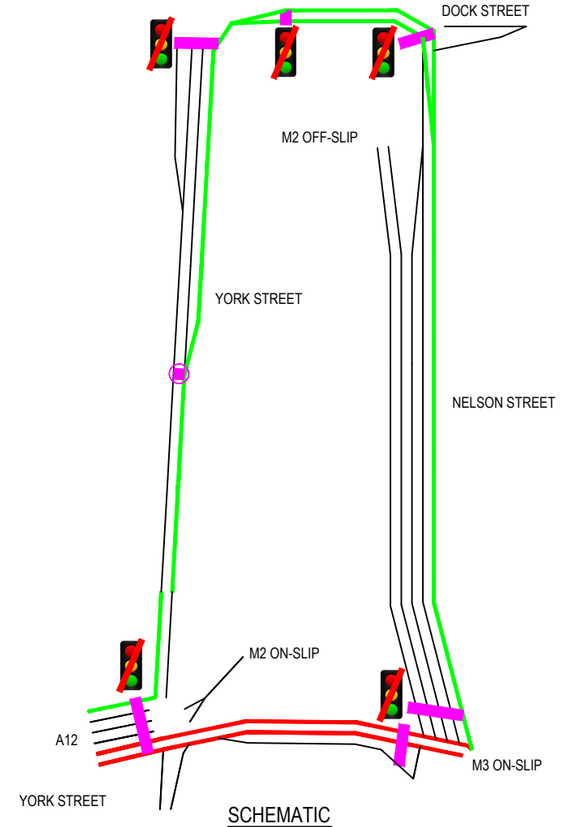
URS Infrastructure & Environment UK Limited
Building name
Address, part 1
County, Post Code
Tel:+44 (0)8888 888 888
Fax:+44 (0)8888 888 888
www.ursglobal.com

Drawing Number	Rev
DRAWING 4	P01

KEY

PROPOSED ROUTE THREE

PLAN



SCHEMATIC

KEY

- EXISTING ROUTE
- PROPOSED ROUTE THREE
- EXISTING CONTROLLED NMU CROSSING POINT
- EXISTING UNCONTROLLED NMU CROSSING POINT
- EXISTING JUNCTION CONTROL TRAFFIC SIGNALS TO BE REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

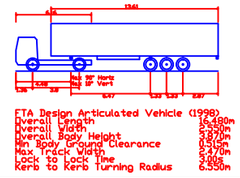
THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

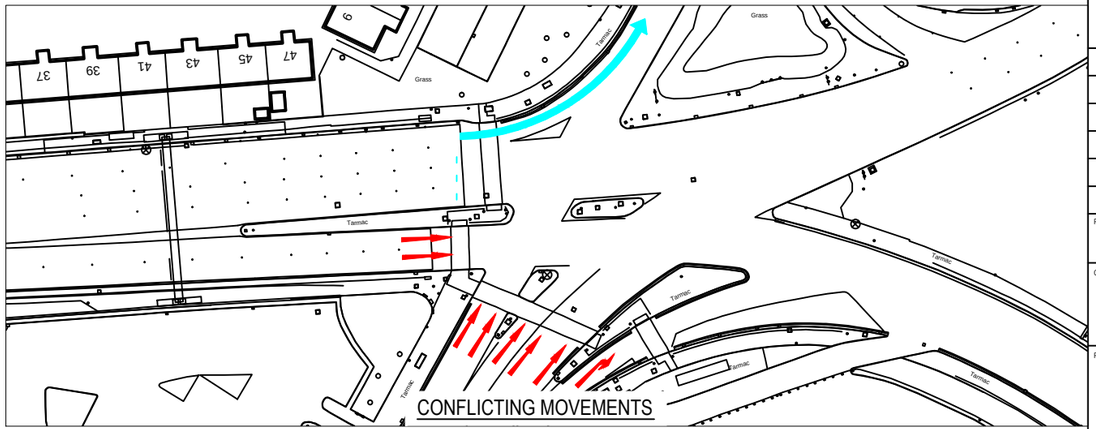
NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

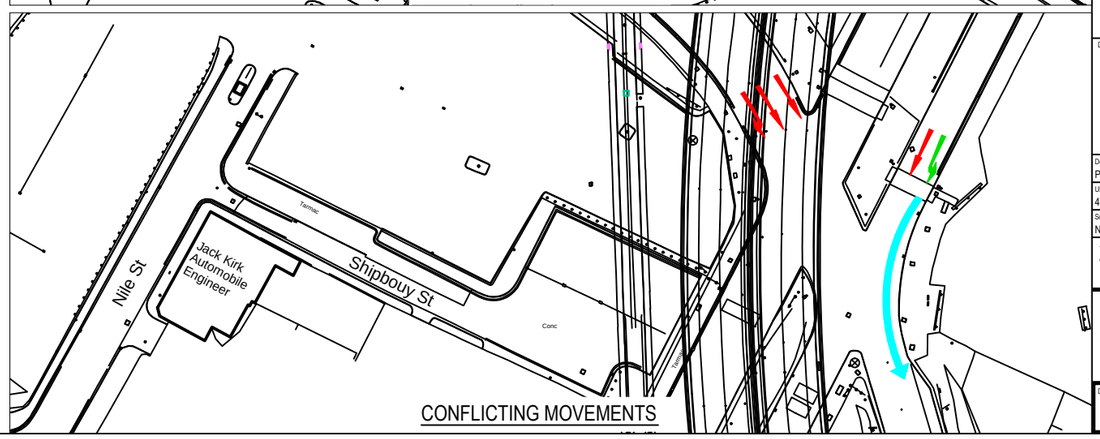
KEY

- BLOCKED ROUTE
- ALLOWED ROUTE
- FREE FLOW





CONFLICTING MOVEMENTS



CONFLICTING MOVEMENTS

Revision Details	By / Check	Date	Suffix

Purpose of issue: INFORMATION

Client: TRANSPORTNI

Project Title: YORK STREET INTERCHANGE

Drawing Title: VECTOR RE-ROUTE PROPOSAL ASSESSMENT: ROUTE THREE (SHEET 1 OF 2)

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.	Suitability
47037827	
Scale @ A1	Zone
NTS	

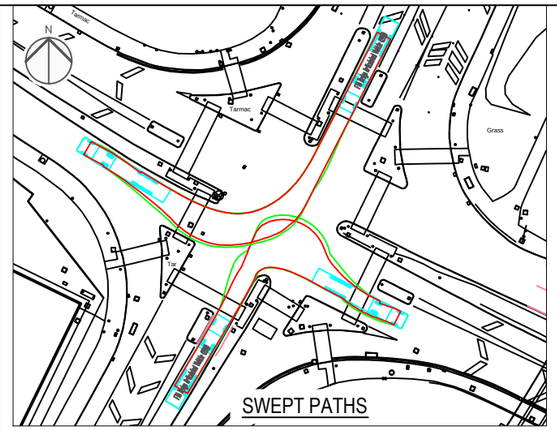
URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)028 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

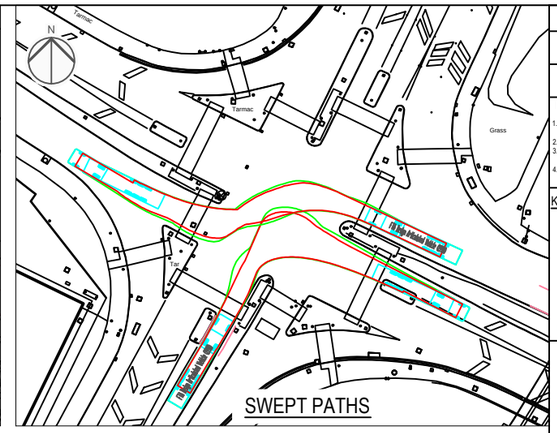
Drawing Number	Rev.
DRAWING 5A	P01

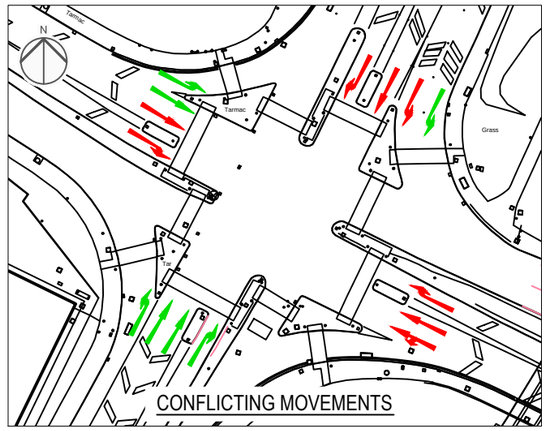
KEY

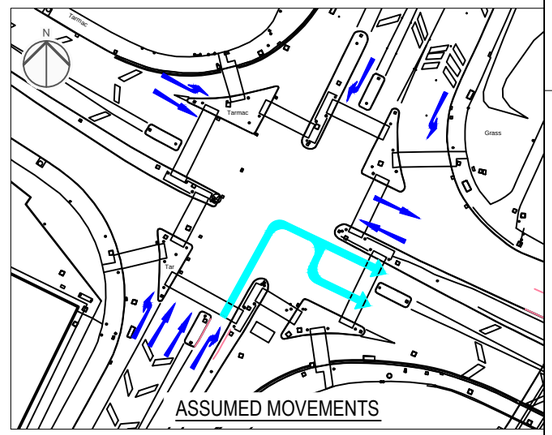
PROPOSED ROUTE THREE

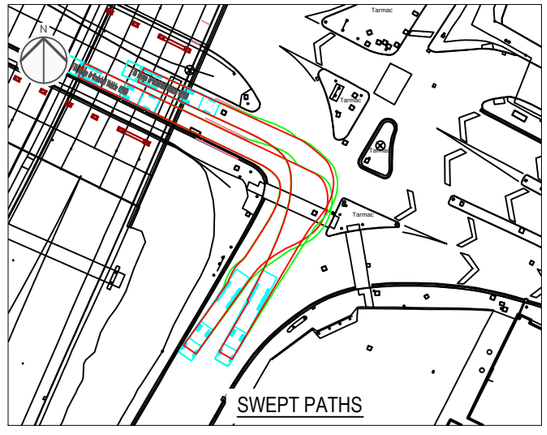
PLAN

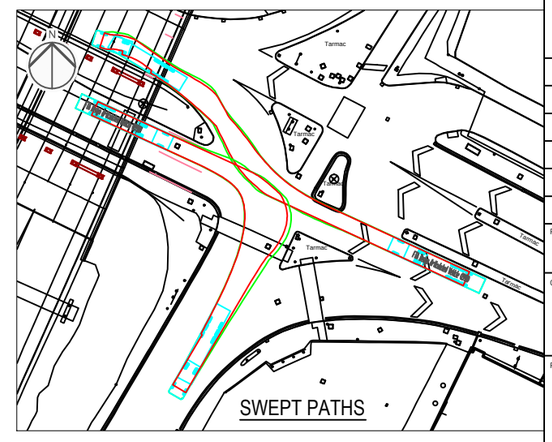


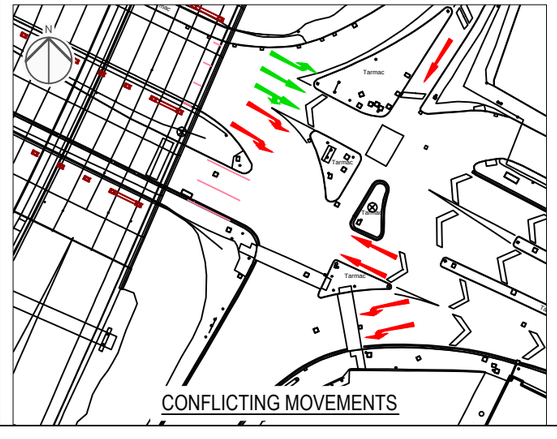


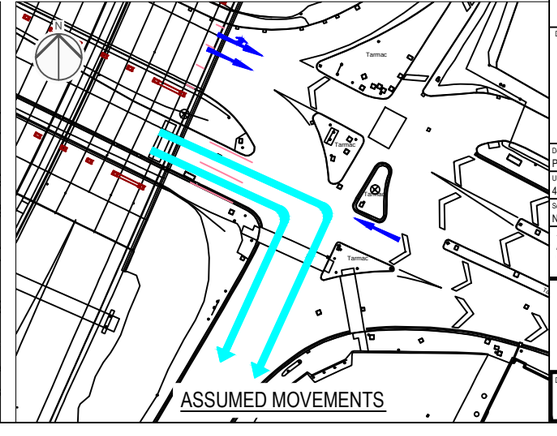












SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

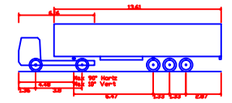
THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES. ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

KEY

- BLOCKED ROUTE
- ALLOWED ROUTE
- ASSUMED ROUTE
- FREE FLOW



ETA Design Articulated Vehicle (1998)

Overall Length	16.480m
Overall Width	2.500m
Overall Body Height	3.870m
Min Body Ground Clearance	0.450m
Max Track Width	2.470m
Lock to Lock time	6.0sec
Kerb to Kerb Turning Radius	6.500m

Revision Details	By / Check	Date	Suffix

Purpose of issue: INFORMATION

Client: TRANSPORTNI

Project Title: YORK STREET INTERCHANGE

Drawing Title: VECTOR RE-ROUTE PROPOSAL ASSESSMENT: ROUTE THREE (SHEET 1 OF 2)

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.: 47037827

Suitability:

Scale @ A1: NTS

Zone:

URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)28 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

Drawing Number: DRAWING 5B

Rev: P01

KEY

PROPOSED ROUTE FOUR

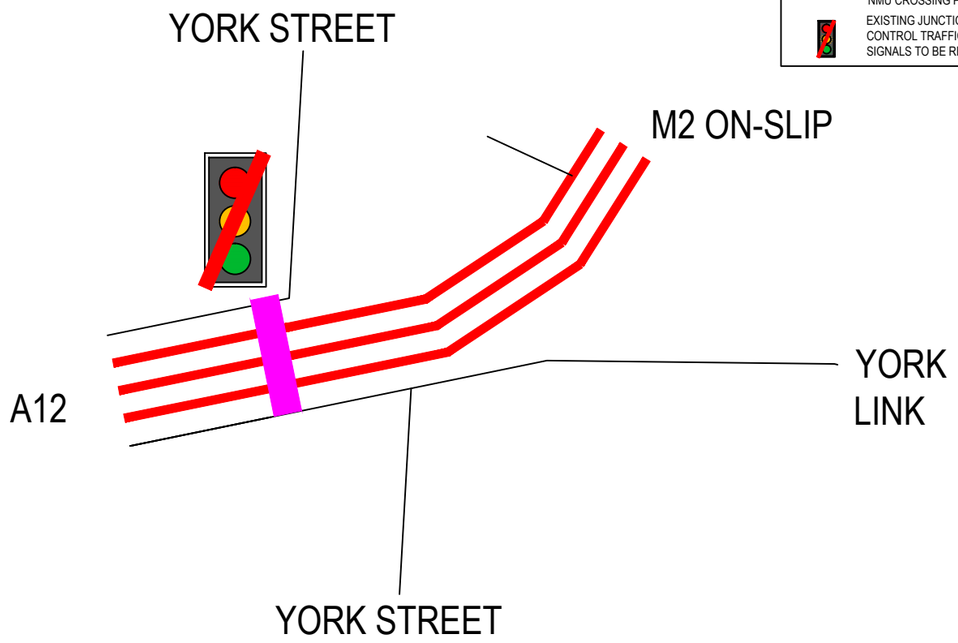
PLAN

KEY

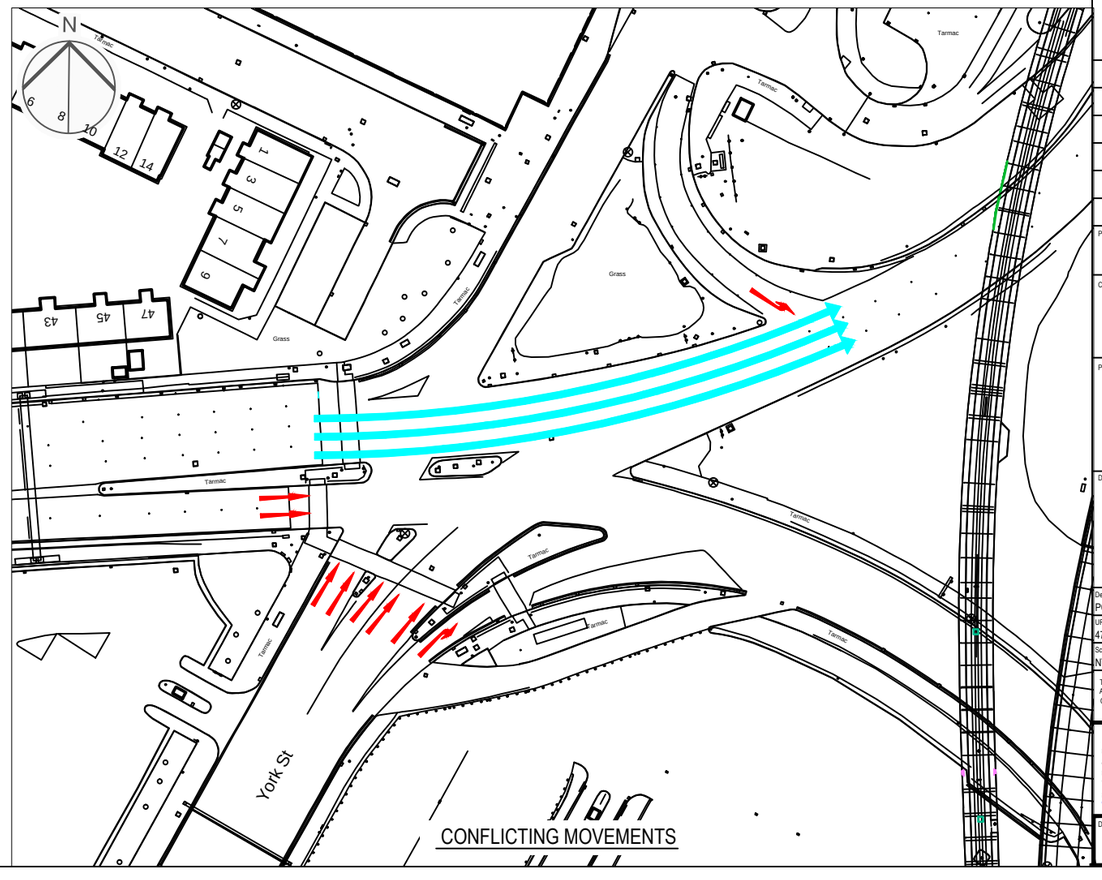
PROPOSED ROUTE

EXISTING CONTROLLED NMU CROSSING POINT

EXISTING JUNCTION CONTROL TRAFFIC SIGNALS TO BE REMOVED



SCHEMATIC



CONFLICTING MOVEMENTS

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES, ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

KEY

BLOCKED ROUTE

ALLOWED ROUTE

FREE FLOW

Revision Details	By / Check	Date	Suffix

Purpose of issue

INFORMATION

Client

TRANSPORTNI

Project Title

YORK STREET INTERCHANGE

Drawing Title

VECTOR RE-ROUTING PROPOSAL ASSESSMENT: ROUTE 4

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.	Suitability
47037827	
Scale @ A1	Zone
NTS	

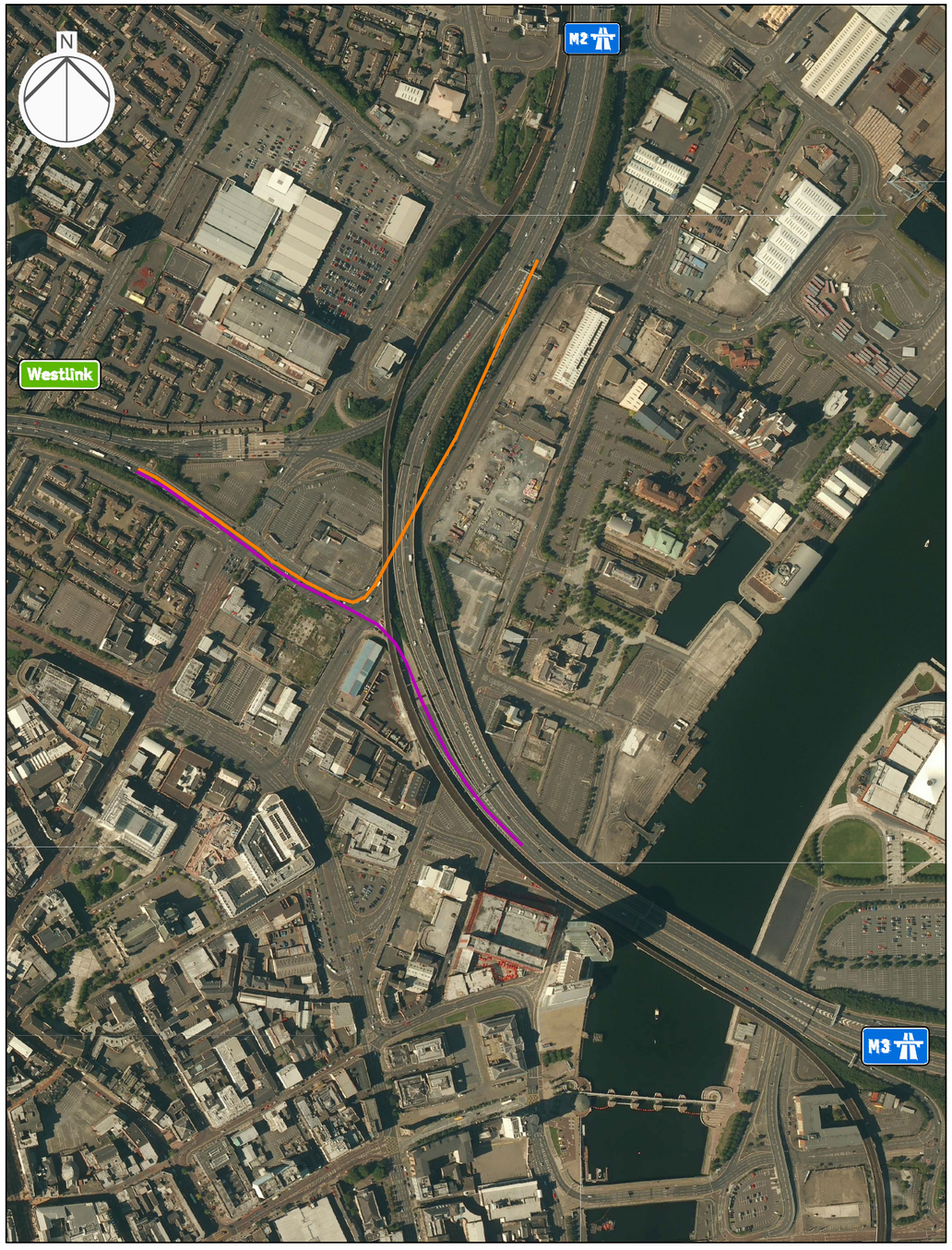
URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)28 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

Drawing Number	Rev
DRAWING 6	P01

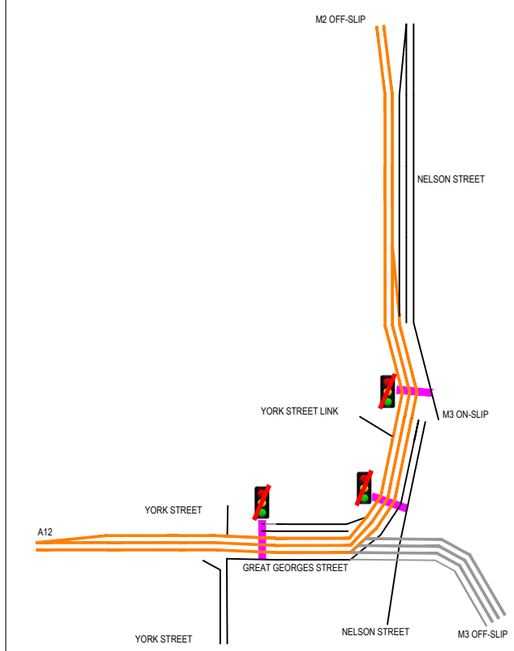
KEY

PROPOSED ROUTE FIVE

PROPOSED ROUTE SIX



PLAN



SCHEMATIC ROUTE 5

KEY

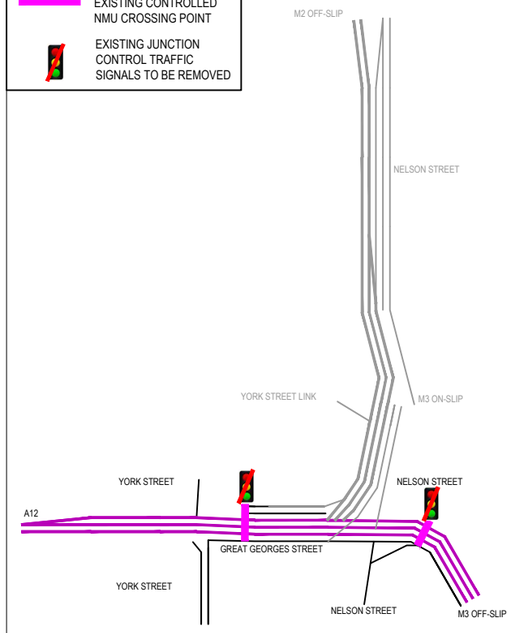
PROPOSED ROUTE FIVE

PROPOSED ROUTE SIX

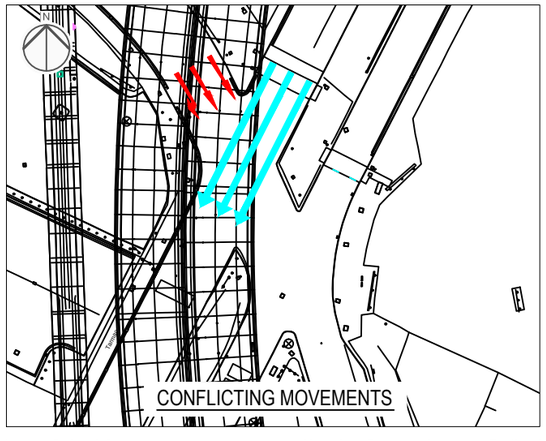
ADJACENT ROUTE

EXISTING CONTROLLED NMU CROSSING POINT

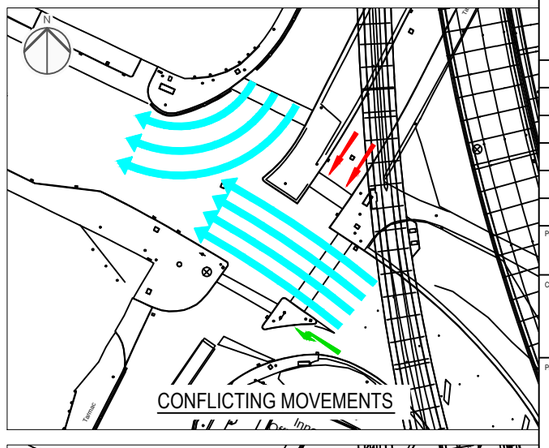
EXISTING JUNCTION CONTROL TRAFFIC SIGNALS TO BE REMOVED



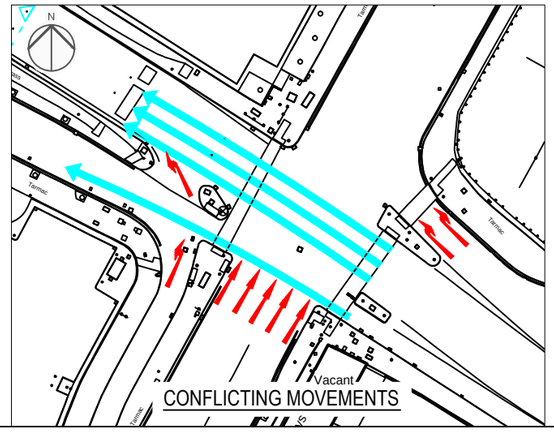
SCHEMATIC ROUTE 6



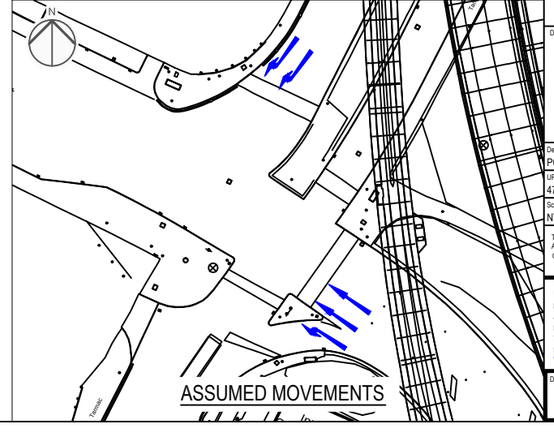
CONFLICTING MOVEMENTS



CONFLICTING MOVEMENTS



CONFLICTING MOVEMENTS



ASSUMED MOVEMENTS

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

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

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.
2. DO NOT SCALE FROM THIS DRAWING, USE ONLY PRINTED DIMENSIONS.
3. ALL DIMENSIONS IN MILLIMETRES. ALL CHAINAGES, LEVELS AND COORDINATES ARE IN METRES UNLESS DEFINED OTHERWISE.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

KEY

BLOCKED ROUTE

ALLOWED ROUTE

ASSUMED ROUTE

FREE FLOW

Revision Details	By / Check	Date	Suffix

Purpose of issue

INFORMATION

Client

TRANSPORTNI

Project Title

YORK STREET INTERCHANGE

Drawing Title

VECTOR RE-ROUTING PROPOSAL ASSESSMENT: ROUTES 5 AND 6

Designed	Drawn	Checked	Approved	Date
PC	PC	MM	MM	01.11.2015

URS Internal Project No.	Suitability
47037827	
Scale @ A1	Zone
NTS	

URS Infrastructure & Environment UK Limited
Beechill House
40 Beechill Road
Belfast, BT8 7RP
Tel:+44 (0)28 9070 5111
Fax:+44 (0)28 9070 5651
www.ursglobal.com

Drawing Number	Rev
DRAWING 7	P01

APPENDIX B ROAD SAFETY AUDITORS SUMMARY REPORT

Vector Motorway Optimisation Proposal

Road Safety Review

October 2015

Prepared by: .....
Becky Jackson
Principal Engineer

Checked by: .....
Richard Kilner
Associate Director

Approved by: .....
Richard Kilner
Associate Director

Vector Motorway Optimisation Proposal – Road Safety Review

Rev No	Comments	Checked by	Approved by	Date
1	Draft Issue to Client	RK	RK	30/10/15
2	Final Issue to Client	RK	RK	04/11/15

First Floor, One Trinity Gardens, Quayside, Newcastle upon Tyne, NE1 2HF
Telephone: 0191 224 6500 Website: http://www.aecom.com

Job No: 47037827 Reference: 47037827/RSRV01 Date Created: October 2015

j:\projects\2014\47037827 york street interchange rsa\0700 technical\0701 documents\vector proposal oct 2015\vector proposal road safety review_final.docx

CONTENTS

Introduction

01

1 Introduction

This report results from a road safety review of the 97 slide Vector Motorway Optimisation Proposal in objection to the York Street Interchange scheme. This road safety review has been requested by Transport Northern Ireland (TNI) to inform the upcoming Public Inquiry. This road safety review was carried out in October 2015.

This road safety review was carried out by:

R Kilner BEng(Hons) CEng MICE

AECOM, Newcastle

(Certificate of Competency in Road Safety Audit)

R Jackson MEng(Hons) CEng MICE

AECOM, Newcastle

(Certificate of Competency in Road Safety Audit)

The road safety review comprised an examination of the documents provided and these are listed in Appendix A. The staff undertaking the review had visited the site on 11th & 12th February 2014 as part of the Stage 1 Road Safety Audit of the York Street Interchange Scheme. During the site visit, the weather was fine and the existing road surface was wet. Traffic conditions were free flowing during off peak times and congested at peak times.

The Vector Proposal has been examined and reported only on the road safety implications of the Vector Proposal as presented and has not been examined or verified the compliance of the design to any other criteria.

The Vector Motorway Optimisation Proposal as contained in the 97 slide presentation provides a conceptual design, without details of local road junctions and intersections, so the level of the review is therefore limited in scope.

Vector Proposal

02

2 Vector Proposal

The Vector Proposal is as described in Vector's document; Motorway Optimisation Proposal, dated 14th October 2015 by Paschal Lynch.

The existing York Street Junction provides links between the M2, M3 and A12 Westlink, together with connections to the local road network that provide access to Belfast city centre and the port. At present, there is a direct link between the M2 and the M3, but the connections to and from the Westlink all pass through an at-grade signal-controlled gyratory system with numerous links to the local road system.

The Vector Proposal promotes the creation of free-flow links between the Westlink and M2 and between the Westlink and M3, by utilising the existing local road network in the vicinity of the junction without the need for structural works. The scheme is presented in a conceptual form, so much of the detail as to how it would operate was not available to review. However, the proposal is understood to incorporate re-routing of the following links:

Route 1: City to M2

Route 2: City to North Shore

Route 3: Westlink to M3

Route 4: Westlink to M2

Route 5: M2 to Westlink

Route 6: M3 to Westlink

The proposal is to create free-flow links by diverting conflicting traffic streams and removing traffic signal junctions on these links. The key element is the severance of York Street and the re-routing of the Westlink to M3 movement (Route 3) via York Street, Dock Street and Nelson Street. This, together with removal of access to local roads, would allow the remaining Westlink / Motorway links (Routes 4, 5 and 6) to operate as free-flow links.

Route 1 would provide a link between the City and the M2, directing the city traffic that previously used the York Street junction to the south, to access the M2 via the M3 entering the motorway at Middlepath Street Junction instead. This makes use of an existing route that would be largely unchanged, except for the removal of the majority of traffic signal controls. At most intersections, traffic signal controls would be replaced by pedestrian crossing signals only.

Route 2 would provide an alternative route to York Street between the City and the North Shore by diverting vehicles along Corporation Street and through the Dock Street Bridge under the M3. All traffic signals would be removed on this route, other than signalised pedestrian crossing points.

Little detail has been provided on how affected junctions will be reconfigured to accommodate the free-flow links, whilst still maintaining access for local traffic, or whether access for local traffic will be provided onto / off these links.

Issues Identified

03

3 Issues Identified

The vast majority of safety issues on schemes generally arise not from the main links themselves, but at the junction and conflict points that are affected by a scheme and how vehicular traffic will interact with Non-motorised users (NMUs).

From the limited detail provided for this proposal, it is unclear whether the free-flow links between the Westlink, M2 & M3 (Routes 3, 4, 5, or 6) would operate completely independently from the local road system, without any connections on or off these routes.

If they did operate as a closed system, this would avoid many of the safety concerns that would arise from having to deal with conflict points on the routes themselves. However, it would appear that there would need to be some local access connections, as evidenced by the proposals for off-side slip roads to Galway House, for example. Without detail of how local connections would be accommodated (or not), it is impractical to assess the full safety implications of the scheme.

Even if these links could be designed to operate as a closed system, redistribution of traffic would have significant knock-on effects on the surrounding local roads and junctions that do not appear to have been assessed in any detail.

If, on the other hand, these links did allow for access and egress onto the local road system, there is the potential for bottlenecks on the local road system to cause blocking back onto the free-flow links and to result in significant congestion on these links. Traffic joining the free-flow links would also have the potential to cause significant congestion on these links themselves and blocking back onto the local road and motorway network.

In summary, as details are unclear, this review attempts to consider both scenarios:

1. Routes 3, 4, 5, and 6 operating as closed systems, and
2. Routes 3, 4, 5, and 6 operating with connections to local roads

It should be noted that this review is limited to a large extent by the minimal detail available.

General

Issue 3.1 Drivers may not appreciate the sudden change in design standards between high speed approaches and the free-flow links

Location: Routes 3, 4, 5 & 6

The safe operation of a road results in a large part from giving drivers a good appreciation of how the road ahead operates. The concern over the proposed layout is that drivers will have been travelling on high standard / high speed roads as they approach the York Street junction and may not fully appreciate the sudden change in design standard in terms of horizontal radii and visibility in particular, and would be at risk of underestimating their speed as they enter the tight radii and be at risk of losing control or veering into the adjacent traffic lane. While it is recognised that the radii are similar to those negotiated by drivers at present, they are at present clearly within a junction environment, where drivers would expect such an arrangement.

Route 1 City to M2

Issue 3.2 Congestion related accidents due to reduced connections to the M2

Location: Citywide

Closing the existing York Street link to the M2 will restrict traffic flows to and from the City, routing more traffic through the Middlepath Street/M3 connection, Castle Street/Westlink connection and Clifton Street/Westlink connection (albeit that movements from Clifton Street north to the Westlink eastbound merge slip is prohibited). This could potentially exacerbate or redistribute bottlenecks onto the city centre road network and result in congestion related accidents; driver frustration; pulling out in front of traffic; poor manoeuvres e.g. U-turns. Without undertaking city-wide traffic modelling of the scheme, there is great uncertainty as to which bottlenecks and accident conflict points could arise from the proposals.

Issue 3.3 Collisions involving buses pulling out into oncoming free flow traffic

Location: Donegall Quay junction with Queen's Square

In order to achieve free flow traffic along Donegall Quay, the Vector Proposal appears to re-configure the Donegall Quay traffic signals to become "ad hoc pedestrian lights" which would in turn require installation of a giveway arrangement from Queen's Square Bus Only and Access Road. Removing bus priority could lead to buses queuing back to the Victoria Square/High Street junction. Furthermore, Donegall Quay is a four lane carriageway and under free flow conditions it will be difficult for slower moving buses to pull out from Queen's Square into oncoming traffic with the potential for collisions.

Issue 3.4 Collisions involving vehicles pulling out into oncoming free flow traffic

Location: Middlepath Street junction with Queens Quay

"Ad hoc pedestrian lights" are proposed at the exit from the Queen Elizabeth Bridge, Middlepath Street junction with Queens Quay. To implement this free flow movement from Queen Elizabeth Bridge east along Middlepath would require a give way arrangement for Queens Quay northbound and eastbound traffic. During peak traffic periods, drivers on Queens Quay may become frustrated and pull out into oncoming traffic on Middlepath, resulting in collisions.

Issue 3.5 Collisions involving vehicles pulling out into oncoming free flow traffic

Location: Middlepath Street junction with Quay Gate

The proposal to downgrade the Middlepath Street signalised junction at Quay Gate raises further concerns about vehicles pulling out from Quay Gate into the path of Middlepath Street "free flow" traffic. This is a particularly hazardous location because visibility splays are obstructed by the viaduct piers therefore drivers may not be aware of vehicles approaching along Middlepath Street.

Issue 3.6 Weaving length too short to cope with the volume of crossing traffic

Location: M3 north of Middlepath merge

At the Middlepath Street merge slip road onto the M3 the 2 lanes from the slip road, operate as a lane gain arrangement, forming a 4-lane section across the Lagan Bridge, with lanes 1 and 2 diverging approximately 300m later onto the Westlink and lanes 3 and 4 continuing onto the M2.

The proposal to close York Street and existing connections from York Street to the M2 would have the effect of significantly increasing traffic flows from the city entering the M3 at Middlepath Street merge. Nearly all of this additional traffic would be destined for the M2 and would therefore have to move 2 lanes to the right, whilst traffic diverging towards the Westlink would be crossing lanes 2 and 3 over this relatively short length, increasing the potential for lane change / shunt type collisions.

Route 2 City to North Shore via Corporation Street

Issue 3.7 Inadequate safe design consideration of Dock Street

Location: Dock Street

The proposal to close York Street will redirect traffic from the city to North Shore via Corporation Street, Dock Street and joining the A2 at the Brougham Street junction. Vector's proposal to re-route (Route 3) traffic from Westlink via Dock Street and Nelson Street to join the M3 further increases pressure on the operational capacity of the Dock Street underbridge.

It is unclear from the proposals how Dock Street will operate. It is assumed that Route 3's segregated traffic will travel through the southern bridge portal; therefore Route 2's traffic will need to travel through the northern bridge portal along with ALL other local traffic and docks traffic.

The restricted carriageway width through the northern bridge portal would limit adequate lane widths and lane provision to accommodate all traffic movements. Also the Dock Street junctions with the A2 and Garmoyle Street could become more complex than they are at present; however these junctions are not proposed to be traffic signalised. Without appropriate junction design and lane provision, including adequate swept paths to accommodate large good vehicles (related to the docks), there are concerns over the safe operation of these junctions, as well as the links and junctions beyond. Unless major works were undertaken to address these concerns it would be anticipated that there would be significant congestion on the road network surrounding Dock Street.

In addition, the layout through Dock Street bridge could be confusing for drivers, particularly at night, where oncoming vehicles would be approaching on their left, which could disorientate drivers and lead to drivers braking or changing lanes suddenly unless comprehensive screening was provided between the free-flow link and the local traffic.

Route 3 Westlink to M3

Issue 3.8 Access to and egress from the free flow links could result in congestion

Location: Route 3

If Route 3 did allow for access and egress onto the local road system, there is the potential for bottlenecks on the local road system to cause blocking back onto the free-flow links and to result in significant congestion on these links. If congestion arose on these links, there is the potential for shunt-type collisions and lane-change collisions, exacerbated by the tight geometry at the corners and the sub-standard forward visibility.

Traffic joining the free-flow links would also have the potential to cause significant congestion on these links themselves and blocking back onto the local road and motorway network. Confirmation should be provided as to how or whether local traffic would enter or leave Route 3.

Issue 3.9 Loss of control collisions due to tight radii

Location: Dock Street connections with York Street and Nelson Street

The proposal to re-route traffic from Westlink via Dock Street and Nelson Street to join the M3 in free-flow conditions is assumed to result in Route 3 traffic travelling through the southern bridge portal on Dock Street.

This route includes two tight right turns that are well below recognised design standards for links and would need to be taken at low speed to avoid loss of control or overturning. As well as times of peak flows, these design layouts need to also consider low traffic flow periods where vehicle speeds could be higher, without the intervention of traffic signals this free-flow arrangement could result in high speeds on the straight sections of carriageway along York Street adjacent to Cityside Retail Park and along Nelson Street, which could lead to difficulties in negotiating the corners safely if drivers do not appreciate the severity of the corners on the approach to them.

Issue 3.10 Collisions involving vehicles entering or exiting the retail park

Location: York Street access to Cityside Retail Park

It is unclear from the proposal how access will be provided to the Cityside Retail Park. Closure of the existing access on York Street would result in redistribution of retail traffic onto the surrounding road network. Alternative accesses to the retail park (and the local road network) may need to be upgraded to include longer turning pockets or traffic signals to provide a safe means of access/egress.

Issue 3.11 Collision involving vehicles accessing or egressing Galway House

Location: York Street access to Galway House

Slide 76 of the Vector Proposal identifies slip roads in and out of the landlocked area including Galway House. These slip roads would diverge and merge on the right hand side of the carriageway, which can be particularly difficult for drivers of right-hand drive vehicles to judge safely and could result in sideswipe or shunt collisions.

It is also unclear how vehicles would actually reach Galway House and whether they would be required to use the Westlink and Motorway system to reach the access point on York Street, exposing local traffic to high speed road conditions.

Route 4 Westlink to M2

This link retains the existing connector with the removal of traffic signals at the York Street junction as a result of the York Street closure. No directly related safety issues have been identified.

Route 5 M2 to Westlink and Route 6 M3 to Westlink

Both routes retain the existing connector roads with the removal of traffic signals at the Nelson Street / Great George Street Junction.

Issue 3.12 Collisions involving vehicles accessing or egressing free-flow link

Location: Potential local accesses onto Route 5

If all local roads will be segregated from these strategic routes, potential safety issues would be expected to be limited to detail design issues regarding the tight turn from Nelson Street onto Great George's Street and merging of the two traffic streams as they enter the 3-lane Westlink.

However, if local roads are not to be fully segregated, proposed layouts for local road accesses would need to be reviewed at an early stage to ascertain whether there would be safety issues relating to congestion, lane changes, merging traffic and potential shunt collisions.

Non-motorised Users

Issue 3.13 Pedestrian collisions with vehicles on the free flow links

Location: Routes between Westlink, M2 & M3

The provision of free flow links between the Westlink, M2 & M3 would mean that no pedestrians would be permitted to cross any of Routes 3, 4, 5, or 6. To maintain pedestrian safety, it would be necessary to provide and maintain secure pedestrian fencing around the whole of these routes.

However, if vehicle access is to be provided between any of the free-flow links and local roads, such as at Dock Street and Great George's Street, it may be difficult to completely segregate pedestrians, who may therefore attempt to cross the free-flow streams, without any assistance, where they would be a great risk of collision with vehicles

Issue 3.14 Collisions involving Non-motorised Users

Location: York Street, North Queen Street and Corporation Street

Existing NMU links and desire lines along York Street are to be severed with NMUs being restricted to Corporation Street and North Queen Street. This would result in a considerable diversion for pedestrians in particular. As the free-flow links will be at grade, some pedestrians would be expected to try, regardless of the dangers, to continue to use the York Street corridor. To avoid this, it would be necessary to construct and maintain secure fencing around the perimeter of the link. However, in reality, it is considered unlikely that this NMU route would be allowed to be completely severed, and unless proposals for NMU provision along the York Street corridor are considered at an early stage, it is likely to be difficult to provide appropriate and safe NMU links in line with current standards.

A pedestrian / cyclist overbridge is mentioned, to be "considered as a parallel activity". Such a provision along with all other necessary NMU links should be incorporated into the conceptual design in order to identify potential conflict points around the network.

At present North Queen Street and Corporation Street do not have any specific provision for cyclists and not all road crossings are fully accessible to meet current best practice to cater for vulnerable pedestrians.

Without details of NMU concept design concerns remain about NMU safety and potential collisions involving vulnerable road users.

Issue 3.15 Collisions involving NMUs accessing or egressing Galway House

Location: York Street access to Galway House

It is not clear how NMUs would gain access to Galway House. No pedestrian crossing provision is proposed to provide access to Galway House, so pedestrians and cyclists would have to cross the free-flow link unaided, where they would be at risk of collisions with motor vehicles at a location where drivers would not be expecting NMUs to cross.

Issue 3.16 Collisions during proposed trial

Location: City wide

It is suggested that an on-road trial could be developed in a matter of weeks to prove the concept. From the previous paragraphs, it can be seen that the proposal in its final form has some very significant operational and safety issues to resolve. Temporary traffic management arrangements have the potential to be more hazardous than permanent layouts, particularly as there can be unforeseen consequences of changing traffic behaviour, particularly if knock-on effects to surrounding roads are not appreciated, where there can be significant congestion and conflict introduced due to the redistribution of traffic. There would also be particular concern over the management of NMUs in the temporary situation, as it would be difficult to fully segregate NMUs from the free-flow links. To undertake the trial itself, it is considered that it would be necessary to undertake detailed design, traffic modelling and safety audit of all links, junctions, accesses and NMU provision in order to be assured that there would not be significant risks to road users during the trial period.

Appendix A

Schedule of Documents Used

05

Appendix A: Schedule of Documents Used

List of included documents and drawings		
Documents		
Reference	**Title**	**Date**
97 pages (2).pdf	Vector Motorway Optimisation Proposal	14 Oct 2015
47037827 Rev0	Vector Re-Routing Proposal Assessment	14 Oct 2015
TNI Response OBJ07	TNI Response Letter to Vector Objection	02 Mar 2015
Drawings		
Drawing No.	**Title**	
N/A	N/A	