L Traffic Assessment

INTENTIONALLY BLANK

JBA on behalf of Balfour Beatty and Denbighshire County Council
East Rhyl Coastal Defence Scheme

Transport Assessment

8 October 2018
Version 1.2
Issue


Fore

Contents

Figures

Appendices

1 Introduction

1.1 Commission

Fore Consulting Limited (Fore) has been commissioned by JBA Consulting to prepare a Transport Assessment to be used to inform an Environmental Statement for submission with a planning application for the East Rhyl Coastal Defence Scheme in North Wales. The scheme forms part of the Welsh Government's Coastal Management Programme and is being delivered by Balfour Beatty on behalf of Denbighshire County Council.

Due to the nature of the scheme, traffic movements associated with the completed development when in operation will be limited to occasional maintenance vehicles, and are likely to be negligible in practice. This Transport Assessment therefore considers the impacts of construction traffic that would be generated as part of the construction process. It is submitted to Denbighshire County Council as local highway authority as part of the planning application for the works.

The scope and methodology for this Transport Assessment has been discussed and developed with Denbighshire County Council (DCC), as the Local Planning and Highway Authority. The scoping report and associated comments are included in Appendix A

1.2 Background

Rhyl is a seaside resort town on the coast of Denbighshire, North Wales. The town has historically been protected from coastal flooding by a range of defence structures in the east of the town which are now exceeding their performance standards and design lives.

The existing defences have overtopped in recent history, causing significant damage and disruption to the residential and commercial properties within the town. In 2013, deep flooding of 130 properties led to 400 people being evacuated from their homes with some requiring rescue by boat.

Flood modelling has shown that this risk is set to increase with climate change and therefore the effectiveness of the existing defences will continue to reduce. Action is needed to protect East Rhyl in order to sustain the community and encourage investment into Rhyl as a popular tourist destination.

1.3 Development Proposals

The East Rhyl Coastal Defence project is a proposed flood defence scheme designed to prevent coastal flood events such as that experienced in 2013. Primarily, the Scheme is designed to protect the Garford Road area of East Rhyl (from Splash Point to the Rhyl Golf Course) from flooding resulting from waves overtopping the existing seawall.

The proposals comprise:

- Demolition of approximately 600m of the existing upstand part of the recurved sea wall on the Rhyl Promenade;
- Construction of a replacement recurved upstand sea wall;
- Raising the level of the Promenade with resurfacing works;
- Placing of additional rock armour revetment along the beach in front of the sea wall, and the extension of the existing rock armour revetment around Splash Point by 350m to the west;
- Additional tie-in works to the adjacent sea defences, including the provision of entry points through the upstand sea wall with steps down to the beach.

The construction proposals will occupy 18ha of beach for access, excavation work, and bulk materials storage for the duration of the construction process, which is scheduled to be around 3 years. For the duration of the construction works, public access will need to be restricted to this area of the beach.

The proposed extent of the construction works is illustrated in Figure 1 and the proposed access restrictions, including proposed diversions, are illustrated on Figure 2.

1.4 Structure of the Report

This document is structured as follows:

- Chapter 2 summarises the existing situation of the local transport network within the vicinity of the development.
- Chapter 3 outlines the relevant national and local transport planning policies.
- Chapter 4 summarises the development proposals.
- Chapter 5 sets out the trip generation associated with the construction.
- Chapter 6 sets out the distribution of trips onto the local highway network.
- Chapter 7 considers the impacts of the scheme upon the operation of the local highway network.
- Chapter 8 summarises and presents the conclusions of this report.

2 Existing Situation

2.1 Site Location

The construction proposals will occupy 18ha of beach for access, excavation work, and bulk materials storage for the duration of the construction, as illustrated on Figure 1.

The site is bordered by the Rhyl Promenade to the west which is a popular leisure destination, providing access to the beach as well as other facilities such as a cinema and aquarium. To the south of the site is the centre of Rhyl, containing a mixture of residential, commercial, and recreational land uses. The east of the site is bordered by the Rhyl golf course.

2.2 Local Highway Network

The main materials compound will be accessed from East Parade, by the existing Theatre Car Park, which is a single carriageway road, approximately 9m wide with dedicated space for on-street parking. It is subject to a 30mph speed limit.

To the west, East Parade connects to West Parade which is also approximately 9m wide with dedicated on-street parking areas and subject to a 30mph speed limit. West Parade connects to Ffordd Wellington via a roundabout. Ffordd Wellington runs through Rhyl town centre to the east and crosses the River Clwyd via Foryd Bridge connecting to A548 Foryd Road in the west. There are no height or weight restrictions posted for the bridge.

To the east of East Parade is Marine Drive which is also approximately 9m wide with dedicated parking areas and subject to a 30mph speed limit. After a sharp turn, Marine Drive turns into Tynewydd Road which connects to the Rhyl Coast Road at a signal-controlled junction. To the west of the junction, Rhyl Coast Road leads to Rhyl town centre and to the east it leads out of Rhyl and into the neighbouring town of Prestatyn, approximately 4km to the east.

2.3 Pedestrian and Cycle Infrastructure

The Rhyl Promenade provides a continuous footpath and cycleway along the seafront. The Promenade forms part of National Cycle Route 5 and there are several registered Public Rights of Way within the vicinity of the Promenade.

There are footpaths and pedestrian crossing facilities provided along all of the main roads within Rhyl, include the East/West Parade, Marine Drive, Rhyl Coast Road, and Ffordd Wellington. The streets in the town centre and Promenade also well-lit by street lighting.

2.4 Public Transport

2.4.1 Bus Service

400m is typically considered to be a convenient walking distance to bus stops. A summary of the bus services available from the closest stops to the construction compounds are presented in Table 1. These services are presented on Figure 3, along with the bus stops within the a 400m vicinity of the compounds.

Table 1: Summary of Bus Services

Number	Route	Approximate Frequency		
		Weekday	Saturday	Sunday
East Parade (Primary 'Materials' Compound)				
35	Rhyl – Prestatyn	2 per hour	2 per hour	Every 2 hours
PS1	Rhyl – Prestatyn - Rhuddlan	1 per hour	No service	No service
Rhyl Coast Road (Secondary 'Office' Compound)				
11*	Rhyl - Flint	1 per hour	1 per hour	No service
19	Rhyl – Flint	2 per day	2 per day	No service
35	Rhyl – Prestatyn	2 per hour	2 per hour	Every 2 hours
PS1	Rhyl – Prestatyn - Rhuddlan	1 per hour	No service	No service
Eaton Avenue (Secondary 'Office' Compound)				
47	Rhyl Circular	2 per day	2 per day	No service

* Service 11 is split into 11F, 11G, 11M, and 11X and each have slightly different routes

This assessment demonstrates that each compound is served by Service 35 which provides a regular frequency bus service between Rhyl and Prestatyn. These are supplemented by other services which provide additional opportunities for bus travel to the site.

2.4.2 Rail Service

Rhyl Train Station is located within the centre of the town, approximately 1.3km from the primary compound and 2.3km from the secondary compound. It connects to the Chester and Holyhead Line, providing services to Bangor and Hollyhead to the west and Chester and Crewe to the east. There are also connections to Manchester and Birmingham.

The station therefore provides opportunities for rail travel to the site.

3 Planning and Transport Policy

This Chapter identifies national and local transport policy which is relevant to the scheme.

3.1 National Policy

3.1.1 Planning Policy Wales: Edition 9

Planning Policy Wales: Edition 9 (PPW) was published in November 2016 and sets out Welsh land use planning policy. Chapter 8 related to Transport and sets out policy for promoting active travel, supporting public transport, and managing traffic and parking.

Notable points relating the East Rhyl Coastal Defence Scheme include that:

- *"[Transport Assessments] can be required for any proposed development if the local planning authority considers that there is a justification or specific need."* The TA will *"provide the basis for negotiation on scheme details"*.

- *"Local Authorities should consider which routes are most suitable for use by road freight […]. The same applies to other developments generating frequent road freight movements"*.

PPW also outlines the factors taken into account when determining a planning application for a development which has transport implications. Those factors relating to the East Rhyl Coastal Defence Scheme include:

- The impacts of the proposed development on travel demand;

- The nature of public transport provision;

- The environmental impact of both transport infrastructure and the traffic generated (with a particular emphasis on minimising the causes of climate change associated with transport); and

- The effects on the safety and convenience of other users of the transport network.

3.1.2 Technical Advice Note 18: Transport

Technical Advice Note 18 should be read in conjunction with PPW. It states that the aims of a Transport Assessment are, amongst other things, to:

- *Understand the transport impacts of the development;* and

- *Clearly communicate the impacts to assist the decision-making process;*

The Transport Assessment should include an implementation strategy identifying access arrangements and management measures required to accommodate the development and mitigate its potential impacts.

3.2 Local Policy

3.2.1 Denbighshire County Council's Adopted Local Development Plan

The Local Development Plan (LDP) sets out the proposals and policies for future development and use of land in Denbighshire. The LDP was adopted in June 2013. Regarding Transport Assessments, it notes that:

"A Transport Assessment for a proposed development should assist in predicting implications and identifying measures to counteract the likelihood of negative impacts. Like non-motorised user audits, the conclusions and recommendations of a transport assessment should be incorporated into the development proposal."

4 Development Proposals

The proposals comprise:

- Demolition of approximately 600m of the existing upstand part of the recurved sea wall on the Rhyl Promenade;
- Construction of a replacement recurved upstand sea wall;
- Raising the level of the Promenade with resurfacing works;
- Placing of additional rock armour revetment along the beach in front of the sea wall, and the extension of the existing rock armour revetment around Splash Point by 350m to the west;
- Additional tie-in works to the adjacent sea defences, including the provision of entry points through the upstand sea wall with steps down to the beach.

4.1 Construction Compounds

Two compounds will be set up to provide access to the site for construction-related traffic:

- The main materials compound will serve as the bulk materials import into the site and have a small car park for specialist construction staff. It will be located adjacent to the Pavilion Theatre Car Park and accessed off East Parade.
- A secondary compound is intended for offices and minor plant access, it will also have parking space for office staff and be the primary location for the delivery of pre-cast elements. It will be located adjacent to the Rhyl Golf Club and accessed off Garford Road.

The location of these compounds are demonstrated on Figure 1.

4.2 Access Restrictions

The construction proposals will occupy 18ha of beach for access, excavation work, and bulk materials storage for the duration of the construction, which based on the current programme will be around 3 years. For the duration of the construction works, public access will need to be restricted to this area of the beach.

The access restriction proposals are illustrated on Figure 2 and involve the temporary diversion of two Public Rights of Way, as well as National Cycle Route 5 for the duration of the construction process.

4.3 Vehicle Access

4.3.1 Employee Access and Car Parking

Although the exact provision is not confirmed, car parking will be provided in both the primary 'materials' compound and the secondary 'office' compound to minimise parking by construction staff on nearby public roads. It is envisaged that there will be 50 permanent site staff: 15 office staff and 35 construction workers. The construction staff will park in the primary compound and the office staff will park in the secondary compound.

4.3.2 Construction Traffic

Two bulk access routes have been identified for access to the site from the A55 North Wales Expressway, as illustrated on Figure 4, to minimise the impact of construction traffic on the environment and road network surrounding the site. Both routes were presented to Denbighshire County Council during the scoping process for the Transport Assessment and no specific concerns were raised with the exception of a minor diversion of the secondary route to stay on the A548 when passing through Prestatyn.

The primary route, which will be used by the majority of construction traffic, exits off the A55 at Junction 27 onto the A525. It then turns left onto Ffordd Abergele and then right onto St. Asaph Avenue before turning right onto Foryd Road and crossing the River Clwyd. At the roundabout after the bridge, it turns left onto West Parade and continues along the Parade to the primary compound. Traffic travelling to the secondary compound via this route would then continue to the junction between Tynewydd Road and Rhyl Coast Road, turning right onto Rhyl Coast Road before turning right again onto Garford Road.

The secondary route will serve as an alternate route in the event of disruption along the primary route. This route originates from the A548, travelling through Prestatyn, before turning right onto Garford Road and the secondary compound. Traffic travelling to the primary compound would continue before turning right onto Tynewydd Road and continuing to the primary compound. For the purposes of this assessment, no construction traffic has been assigned to this route.

5 Trip Generation

Vehicle movements associated with the construction process are split into two distinct components: movements associated with staff trips and movements associated with construction materials. The trip generation methodology for each of these components is outlined below.

5.1 Construction Staff

In the outline construction methodology, Balfour Beatty estimate that 50 full-time staff will be on site for the duration of the construction: 15 office staff and 35 construction workers. Regular working hours are scheduled to be between 07:00 and 19:00 although much of the construction work subject to beach access will require variations around tidal patterns.

For the purposes of this assessment, in the interest of providing a robust indication of the traffic impacts associated with the construction, it has been assumed that all staff will arrive and depart from the site during the typical highway peak hours of 08:00-09:00 and 17:00-18:00.

5.1.1 Mode Share

It has been demonstrated in Section 2.4 that there is existing public transport provision to the site with opportunities for travel by both bus and train. Section 2.3 also identified that the pedestrian and cycle infrastructure surrounding the site was of a suitable quality to facilitate travel on foot or via bicycle. Car sharing provides a further sustainable option for travel to the site for construction staff.

On this basis, it has been assumed that 80% of staff will drive to work, 10% will be passengers in a car share, and the remaining 10% will travel to via sustainable modes. These assumptions and the resulting trips by mode are summarised in Table 2.

Table 2: Estimated Office and Construction Staff Mode Share

Mode	Percentage	Office Staff	Construction Staff
Driving	80%	12	28
Car Share Passenger	10%	2	4
Sustainable Modes*	10%	2	4
Total**	100%	15	35

* walking, cycling, bus, and rail

** values may not total due to rounding error

5.2 Construction Materials

Based on the current construction method, Balfour Beatty have provided the quantity of bulk construction materials required for the project, as summarised in Table 3.

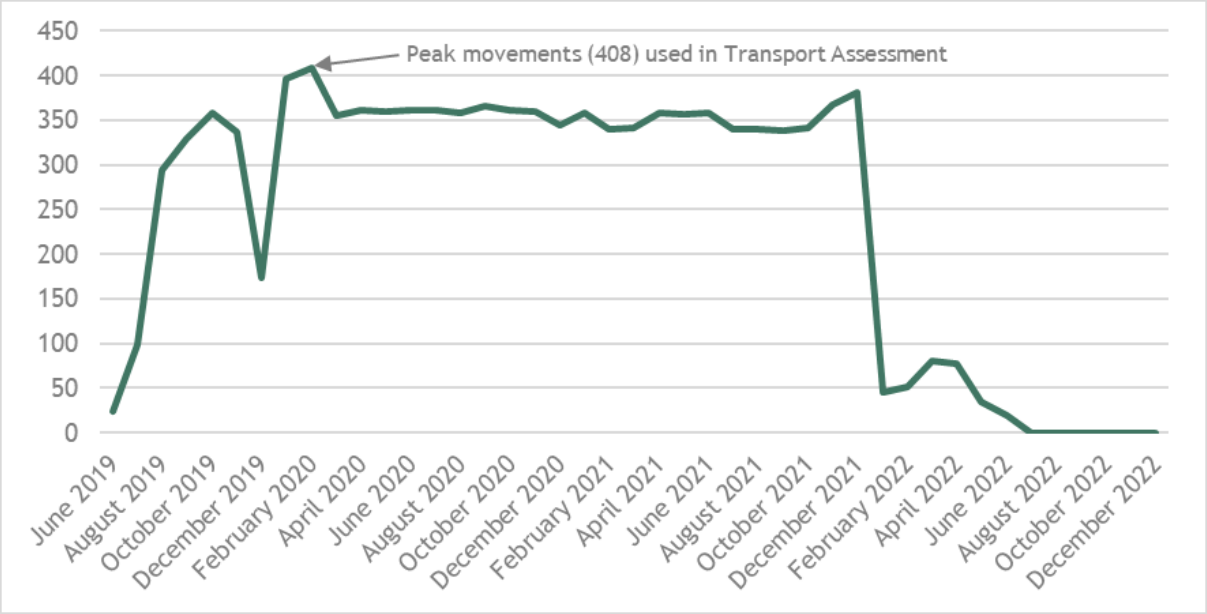
Table 3: Summary of Bulk Construction Materials

Material	Quantity	Unit
Rock armour stone	99,600	t
Filter layer stone	66,120	t
Geotextile	28,600	m^2
Quarry run core	7,000	t
Ready mixed concrete	2,350	m^3
Hydraulically bound subbase material	750	m^3
Pre-cast concrete wall sections	201	no.
Pre-cast concrete access step units	63	no.
Reinforcing steel to concrete	163,000	kg

In addition to the delivery and hording of these materials, there will also be traffic generated throughout the construction process in relation to the mobilisation and demobilisations of the construction compounds and the disposal of waste materials.

Balfour Beatty have provided a month-by-month estimate of the number of HGV movements to the site, broken down by the trip purpose and the destination compound. The total trips per month for the duration of the construction are illustrated on Graph 1 and the full estimates are presented in Appendix B.

Graph 1: Estimated Total One-Way HGV Movements per Month



February 2020 is the month with the highest projected number of HGV movements (408 one-way trips). In order to provide a robust estimate of the traffic impacts of the scheme, the HGV figures for February 2020 have been assessed as a 'worst-case' scenario.

Additionally, it is understood that the geometry of the rock armour revetment has been optimised subsequent to the estimation of HGV movements. This could reduce the amount of rock armour required by 5%, thereby resulting in a reduction of HGV trips to the site. For the purposes of this assessment, however, the original geometries have been utilised as the most robust assumption.

5.2.1 Peak Hour Trip Generation

The following assumptions have been made to derive daily AM and PM peak hour HGV movement estimates:

- Excluding weekends, there are 20 working days in February 2020
- 408 / 20 = approximately 20 one-way HGV trips per day
- It is assumed the HGV trips are equally distributed across the working hours (07:00 – 19:00);
- 20 / 12 = approximately 2 one-way HGV trips per hour

This equates to approximately 2 arrivals and 2 departures each hour (4 two-way movements).

5.3 Summary

Table 4 summarises the vehicle trip generation, split into cars and HGVs, associated with the construction for February 2020 which is considered to be the 'worst-case' month for the duration of the construction.

Table 4: Summary of Construction-related Vehicle Movements (February 2020)

Time	Vehicle	Arrivals	Departures	Total
AM Peak Hour	Cars	40	0	40
	HGVs	2	2	4
	Total	**42**	**2**	**44**
PM Peak Hour	Cars	0	40	40
	HGVs	2	2	4
	Total	**2**	**42**	**44**
Daily Total	Cars	40	40	80
	HGVs	20	20	40
	Total	**60**	**60**	**120**

It should also be noted that these arrivals and departures will be distributed between the two construction compounds, as detailed in Section 6.

6 Trip Distribution and Assignment

This Chapter outlines the likely distribution of vehicle trips associated with the construction process (as presented in Section 5) on the local highway network.

6.1 Construction Staff

At this stage, it is not known where construction staff are based and will need to travel from. Consequently, for the purposes of this assessment the distribution of staff trips has been estimated using a population-based gravity model for Census Merged Local Authority Districts in Wales, North West England, and the West Midlands. Construction staff have been distributed onto the network from the primary 'materials' compound while office staff have been distributed from the secondary 'office' compound.

The resulting distribution and associated traffic flows are summarised in Table 5 and presented on Figure 5 to Figure 7. The gravity model calculations in full are presented in Appendix C.

Table 5: Vehicle Trip Distribution and Assignment - Staff Trips

Ref	Route	Trip Distribution (% of all journeys)	Development Traffic Flows (Two-way flows)	
			AM Peak Hour (08:00-09:00)	PM Peak Hour (16:00-17:00)
1	Rhyl Coast Road	3%	1	1
2	A55 (East)	53%	21	21
3	A525 (South)	14%	6	6
4	Rhuddlan Road (West)	0%	0	0
5	A55 (West)	3%	1	1
6	Rhyl Town Centre	13%	5	5
7	Prestatyn	13%	5	5
Total*		**100%**	**40**	**40**

* values may not total due to rounding

6.2 Construction Materials

Vehicle trips associated with the delivery of materials to the site have been distributed onto the highway network according to the bulk delivery routes outlined in Section 4.3.2

and illustrated on Figure 4; 100% of trips are assumed to travel via the primary route as the secondary route would only be utilised in the event of disruption along the primary route.

The compound from which the trips are distributed to has been derived from the information provided Balfour Beatty. In February 2020, 89% of materials will be delivered to the primary compound, with the remaining 11% being delivered to the secondary compound.

The resulting distribution is summarised in Table 6 and the associated traffic flows are presented on Figure 9 and Figure 10.

Table 6: Trip Distribution and Assignment – Construction Materials Trips

Ref	Route	Trip Distribution (% of all journeys)	HGV Traffic Flows (Two-way flows)		
			AM Peak Hour (08:00-09:00)	PM Peak Hour (17:00-18:00)	Daily Total
1	Rhyl Coast Road	0%	0	0	0
2	A55 (East)	100%	4	4	40
3	A525 (South)	0%	0	0	0
4	Rhuddlan Road (West)	0%	0	0	0
5	A55 (West)	0%	0	0	0
6	Rhyl Town Centre	0%	0	0	0
7	Prestatyn	0%	0	0	0
Total		**100%**	**4**	**4**	**40**

7 Impact on the Highway Network

The total vehicle trips generated during the construction process are presented on Figure 11 and Figure 12. Table 7 summarises the estimated impact of the construction on key junctions of the local highway network.

Table 7: Estimated Traffic Impacts at Key Links and Junctions (Two-Way Movements)

Links / Junctions	AM			PM			Daily		
	Cars	HGVs	Total	Cars	HGVs	Total	Cars	HGVs	Total
Links									
West Parade	1	4	**5**	1	4	**5**	2	40	**42**
East Parade / Marine Drive	27	0	**27**	27	0	**27**	54	0	**54**
Garford Road	12	0	**12**	12	0	**12**	24	0	**24**
Rhyl Coast Road	15	0	**15**	15	0	**15**	30	0	**30**
Junctions									
East Parade / Primary Compound Junction	28	4	**32**	28	4	**32**	56	40	**96**
Ffordd Wellington / West Parade Roundabout	1	4	**5**	1	4	**5**	2	40	**42**
St. Asaph Avenue / Foryd Road Junction	1	4	**5**	1	4	**5**	2	40	**42**
A525 / Abergele Road / Station Road Roundabout	27	4	**31**	27	4	**31**	54	40	**94**
A55 Junction 27	27	4	**31**	27	4	**31**	54	40	**94**
Rhyl Coast Road / Tynewydd Road	37	0	**37**	37	0	**37**	74	0	**74**
Rhyl Coast Road / Garford Road	17	0	**17**	17	0	**17**	34	0	**34**

When distributed over the hour, the 37 two-way trips estimated during each peak Hour at the Rhyl Coast Road / Tynewydd Road junction (which is the junction which experiences the greatest increase in traffic) represent less than one vehicle trip per minute. It is therefore considered that the traffic associated with the construction will not affect the operation of the local highway network.

Furthermore, it should be noted that these estimates represent an absolute 'worst-case' scenario. For the majority of the duration of the construction, the traffic impacts will be significantly lower than those presented here for the following reasons:

- The hourly HGV trips are derived from February 2020 which is the month with the highest single number of estimated HGV trips associated with the delivery of construction materials; the 408 estimated trips in February 2020 is significantly higher than the median number of estimated HGV trips for a given month (344).

- In reality, it is likely that the arrivals and departures of staff will be more widely distributed throughout the day rather than concentrated in the AM and PM peak hours, especially given the need to schedule construction work around tidal patterns.

- The construction material estimates are outdated and do not account for the optimisation of the geometry of the rock armour revetment which could reduce the amount of rock armour required by 5%.

8 Summary and Conclusions

This report has considered the transport impacts of the construction of the East Rhyl Coastal Defence Scheme. This assessment has demonstrated that:

- The transport impacts associated with movement of construction vehicles are likely to be limited, even in the worst-case scenario assumed for the purposes of this assessment.
- There are numerous opportunities for construction staff to reach the sites via sustainable modes of travel with good quality footpaths, cycleways, bus routes, and train connections within Rhyl;
- The proposed scheme accords with relevant national and local transport policy;
- The proposed temporary diversion of cycle routes and public rights of way, can be appropriately delivered.

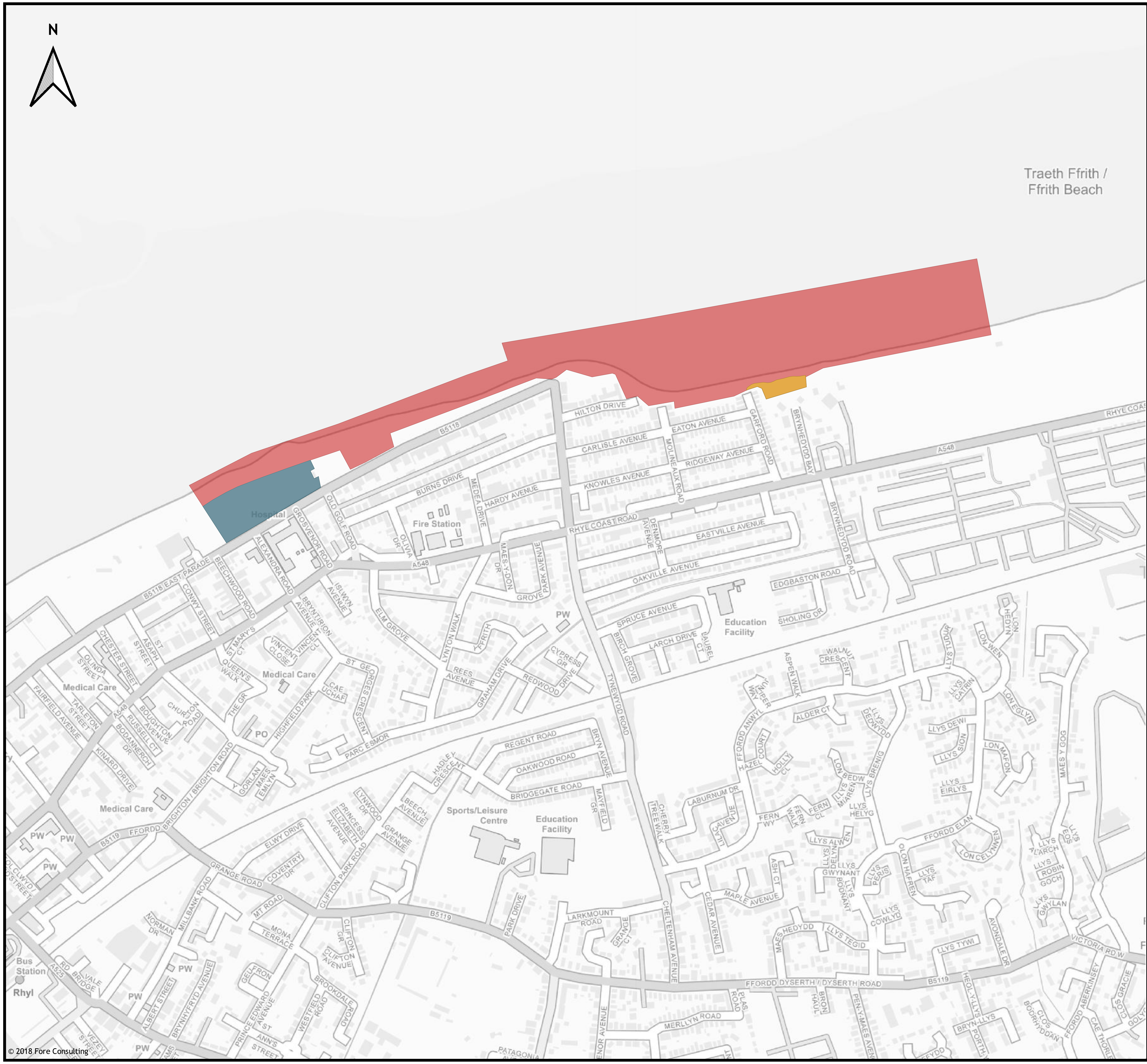
On the basis of this Transport Assessment, it is considered that the traffic impacts associated with the construction of the coastal defences can be satisfactorily accommodated by the existing highway network in the vicinity of the site. The scheme can therefore be supported from a transport and highways perspective.

8.1 Transport Implementation Strategy

In addition to demonstrating the traffic impacts associated with the construction of the scheme, this report has also outlined several strategies which will be implemented in order to minimise the schemes impact upon the local transport network. These measures include:

- The diversion of two Public Rights of Way and a section of National Cycle Route 5 along the Rhyl Coast Road and through Rhyl Golf Course. These diversions will be clearly demarcated for the duration of the construction.
- The provision of two bulk transport routes to the construction compounds. These routes have been chosen to be appropriate for HGVs and to minimise impacts on the local roads.
- The provision of car parking for construction and office staff in each of the construction compounds to avoid issues which may arise from on-street parking.

Figures



Key:

Site Location

- Indicative Site Area
- Primary 'Materials' Compound
- Secondary 'Office' Compound

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire COunty Council

Project:
East Rhyl Coastal Defence Sceheme

Figure Title:
Site Location

Scale:	Figure Status:
1:7500	Issue
Job Number:	Figure Number:
8011	Figure 1

N

Traeth Ffrith /
Ffrith Beach

© 2018 Fore Consulting

Key:

- Indicative Site Location
- Primary 'Materials' Compound
- Secondary 'Office' Compound
- Rhyl Promanade / National Cycle Route 5
- Registered Public Rights of Way
- Proposed Promenade Closure Points
- Proposed Promenade Diversions

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbigshire County Council

Project:
East Rhyl Coastal Defence Scheme

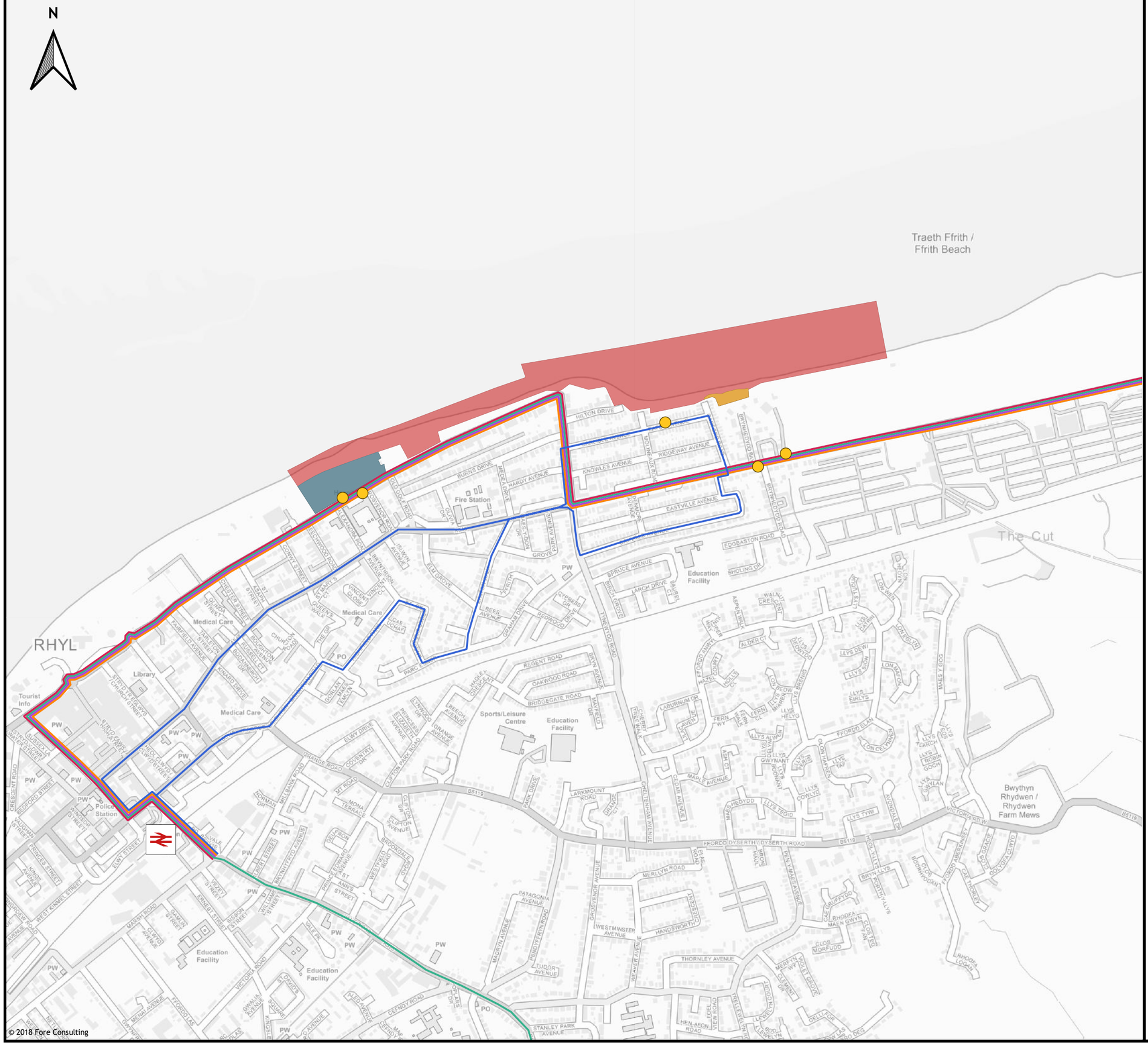
Figure Title:
Proposed Promenade Closures and Diversions

Scale:
1:10000

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 2



Key:

Site Location

- Indicative Site Area
- Primary 'Materials' Compound
- Secondary 'Office' Compound

Bus Services

- 11
- 19
- 35
- 47
- PS1
- Bus Stops
- Train Station

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire COunty Council

Project:
East Rhyl Coastal Defence Sceheme

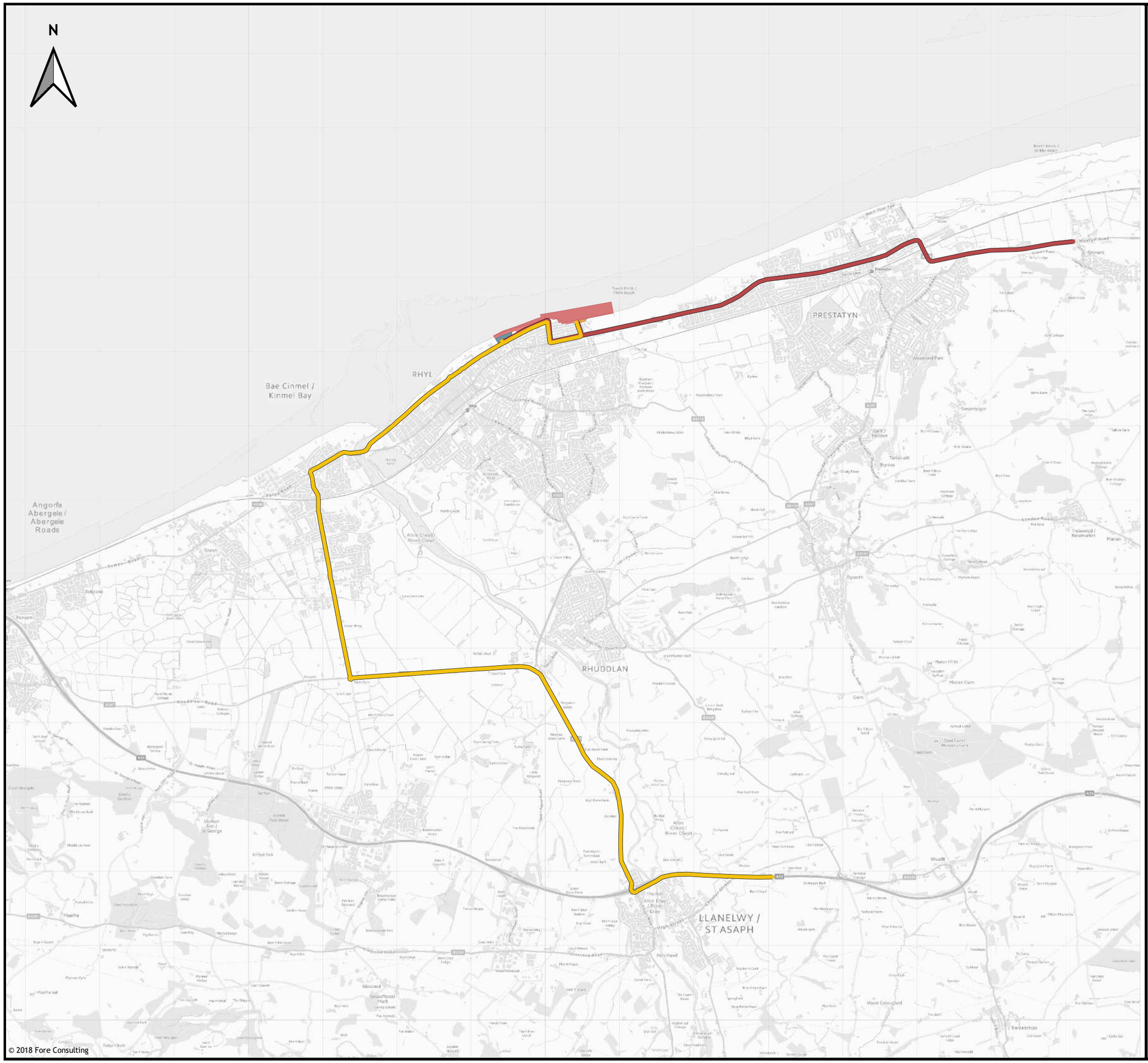
Figure Title:
Public Transport Provision

Scale:
1:10000

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 3



Key:

Site Location

🟥 Indicative Site Area
🟦 Primary 'Materials' Compound
🟨 Secondary 'Office' Compound

Bulk Delivery Routes

▬ Primary Route
▬ Secondary Route

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

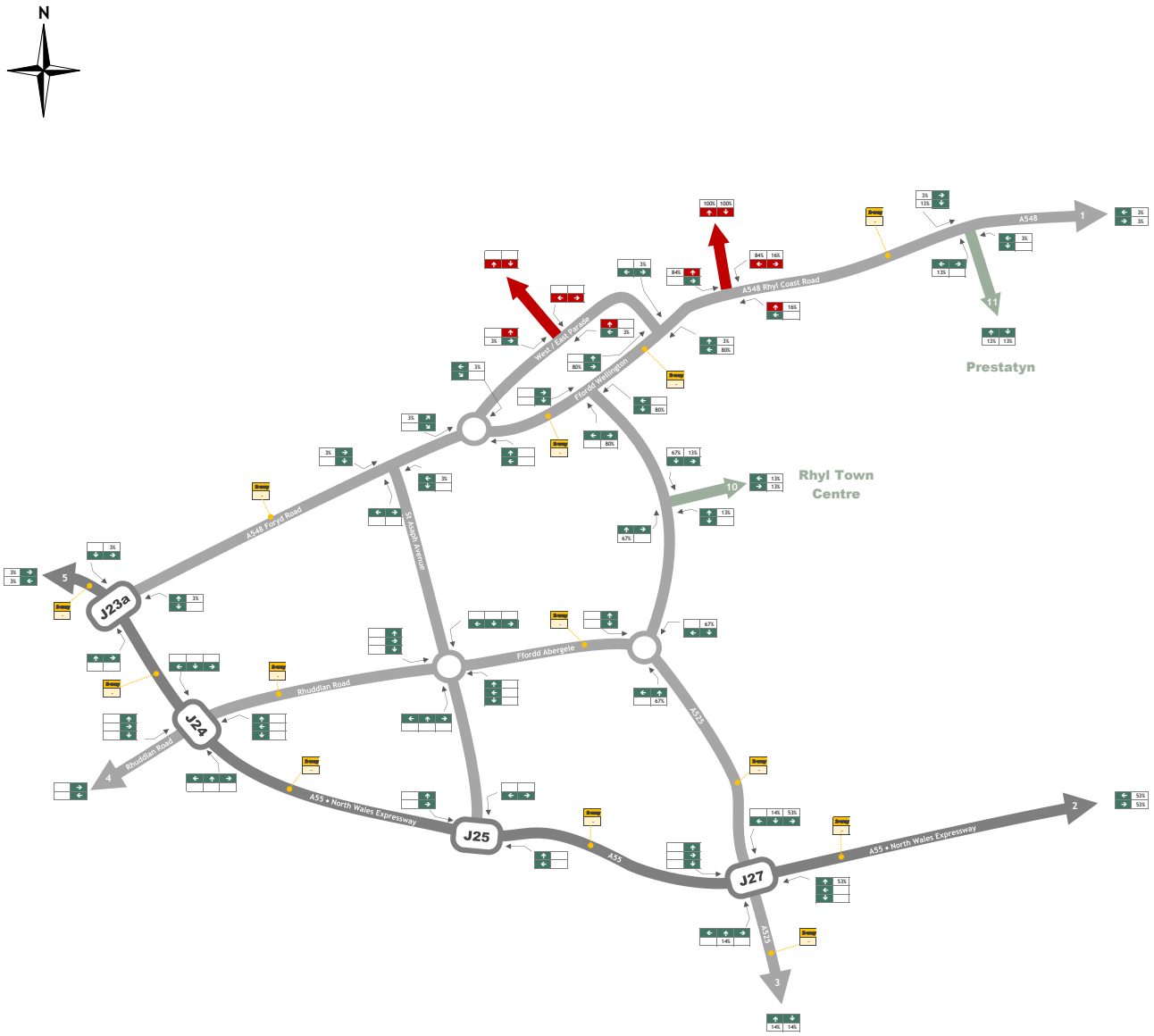
0113 246 0204
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire COunty Council

Project:
East Rhyl Coastal Defence Sceheme

Figure Title:
Bulk Delivery Routes

Scale: 1:50000	Figure Status: Issue
Job Number: 8011	Figure Number: Figure 4



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

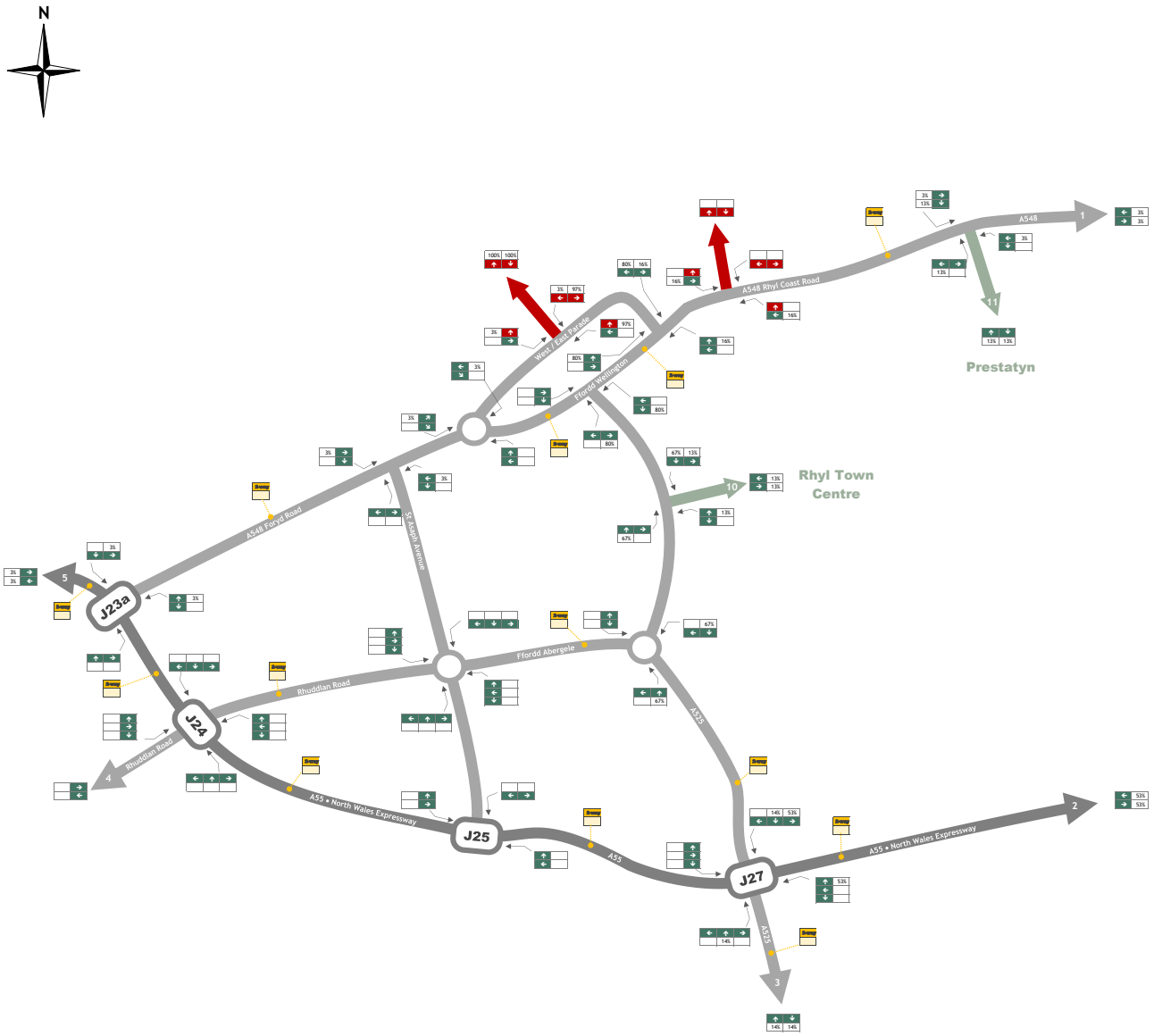
Figure Title:
Staff Vehicle Distribution (Office Staff)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 5



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

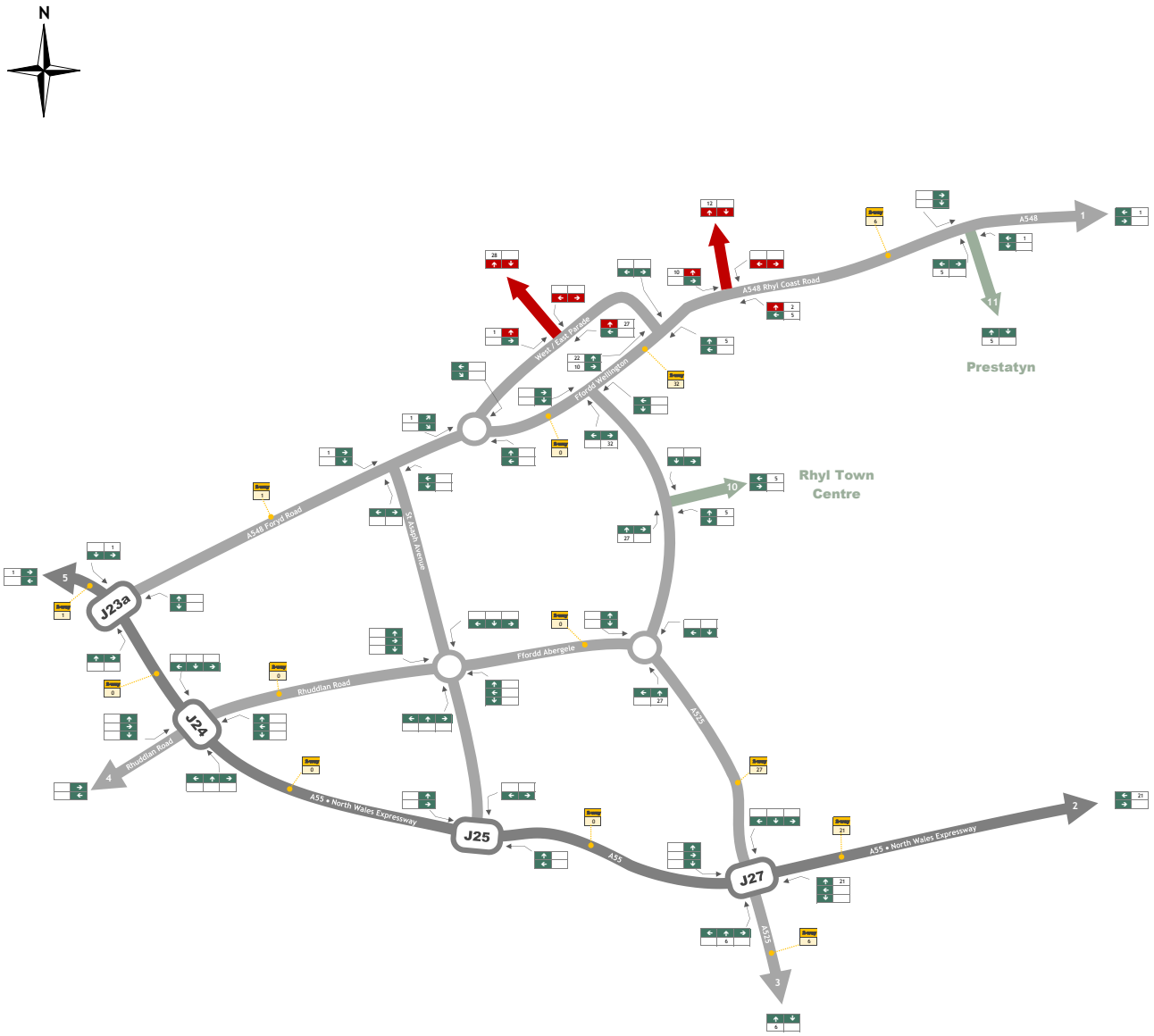
Figure Title:
Staff Vehicle Distribution (Construction Staff)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 6



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

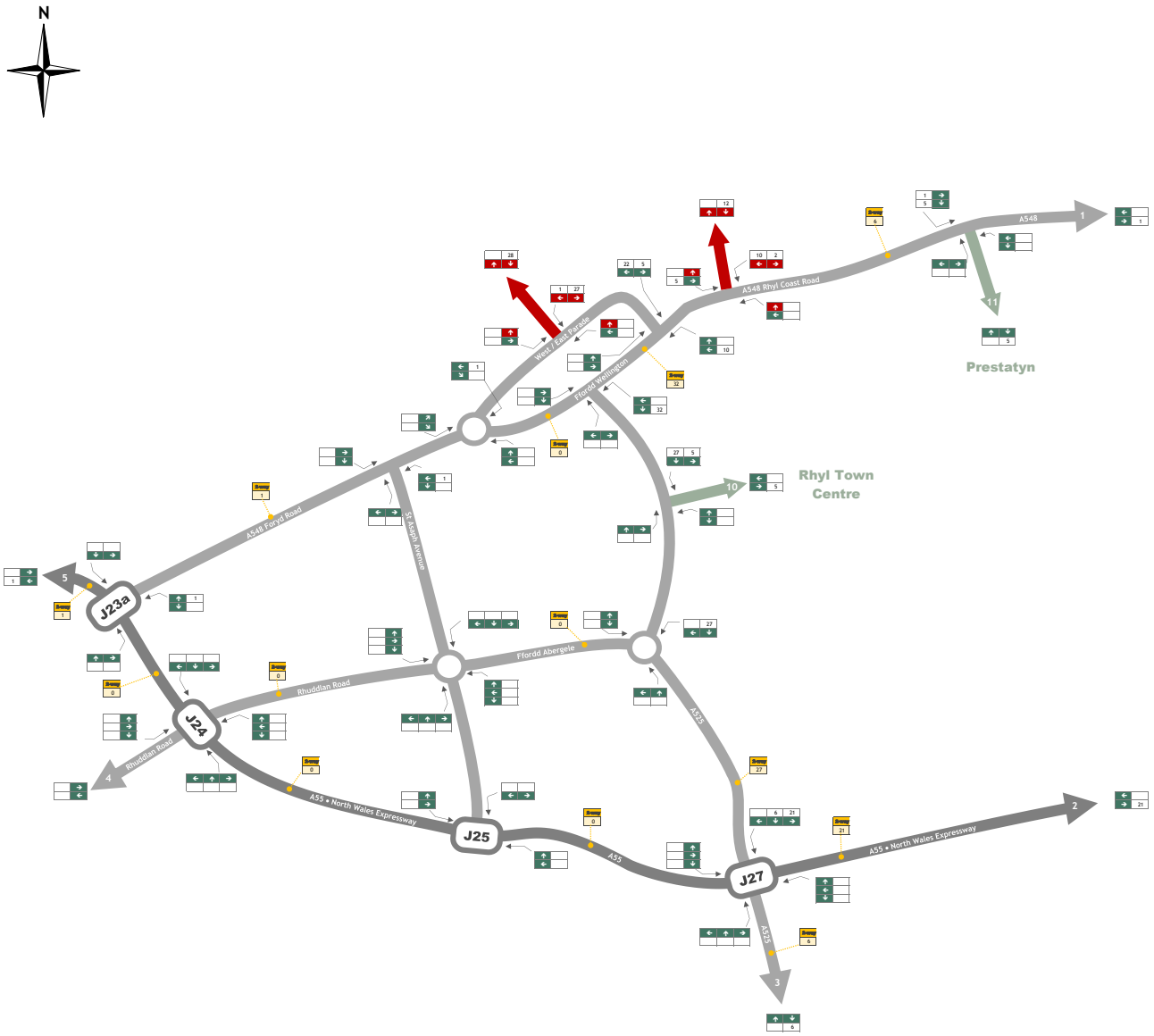
Figure Title:
Staff Vehicle Trips (AM Peak Hour)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 7



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

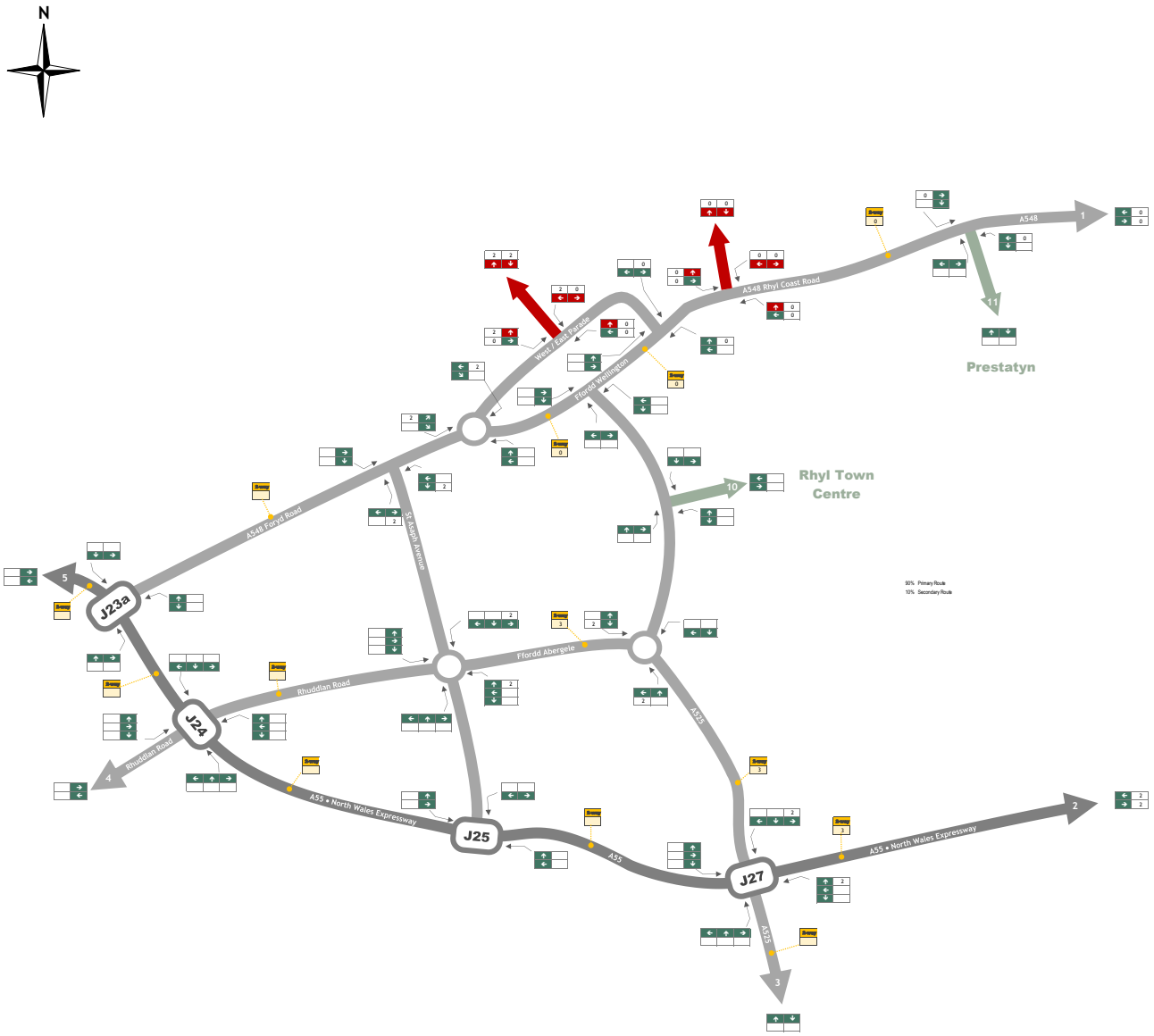
Figure Title:
Staff Vehicle Trips (PM Peak Hour)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 8



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

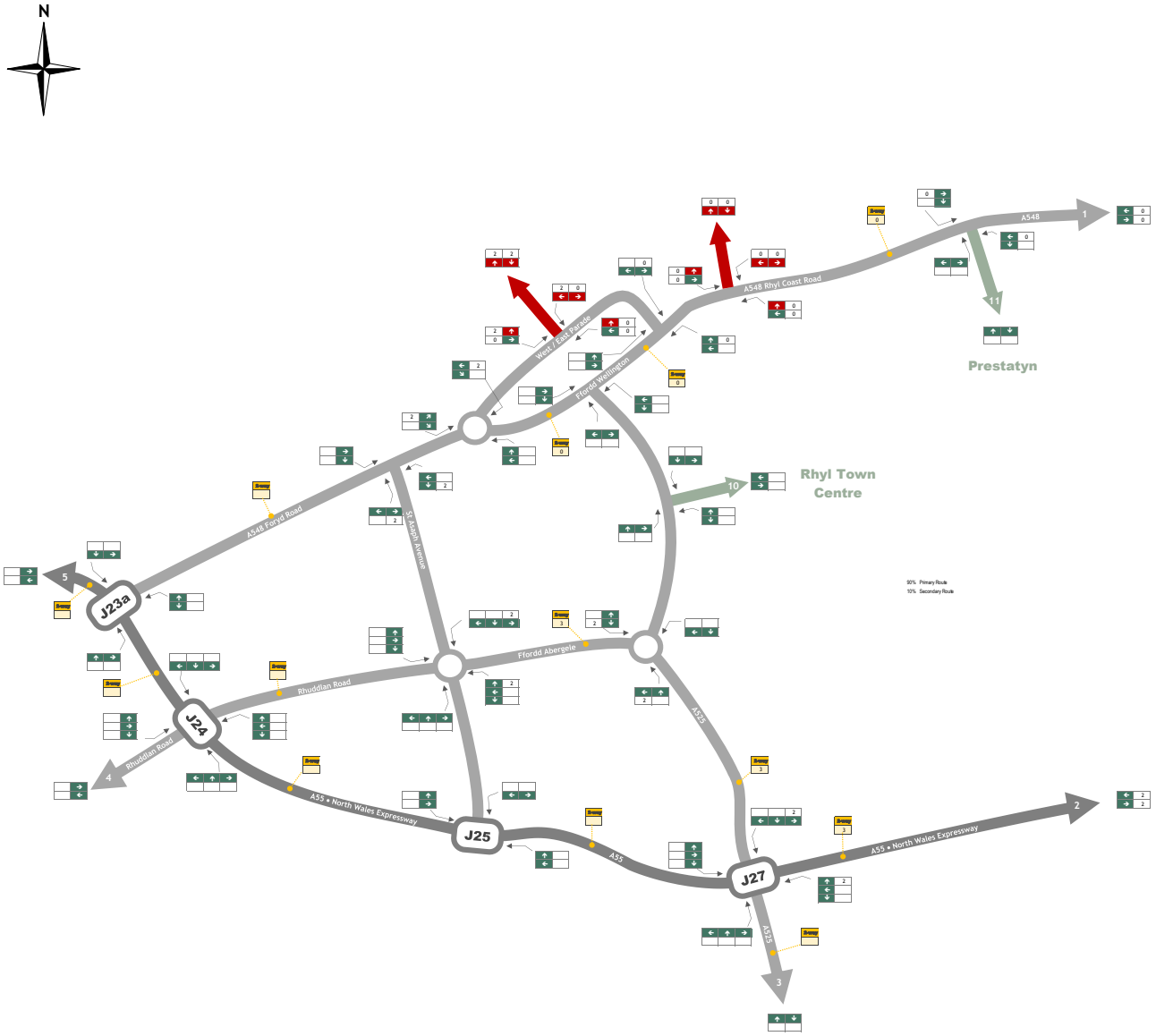
Figure Title:
Construction Material Vehicle Trips (AM Peak Hour)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 9



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

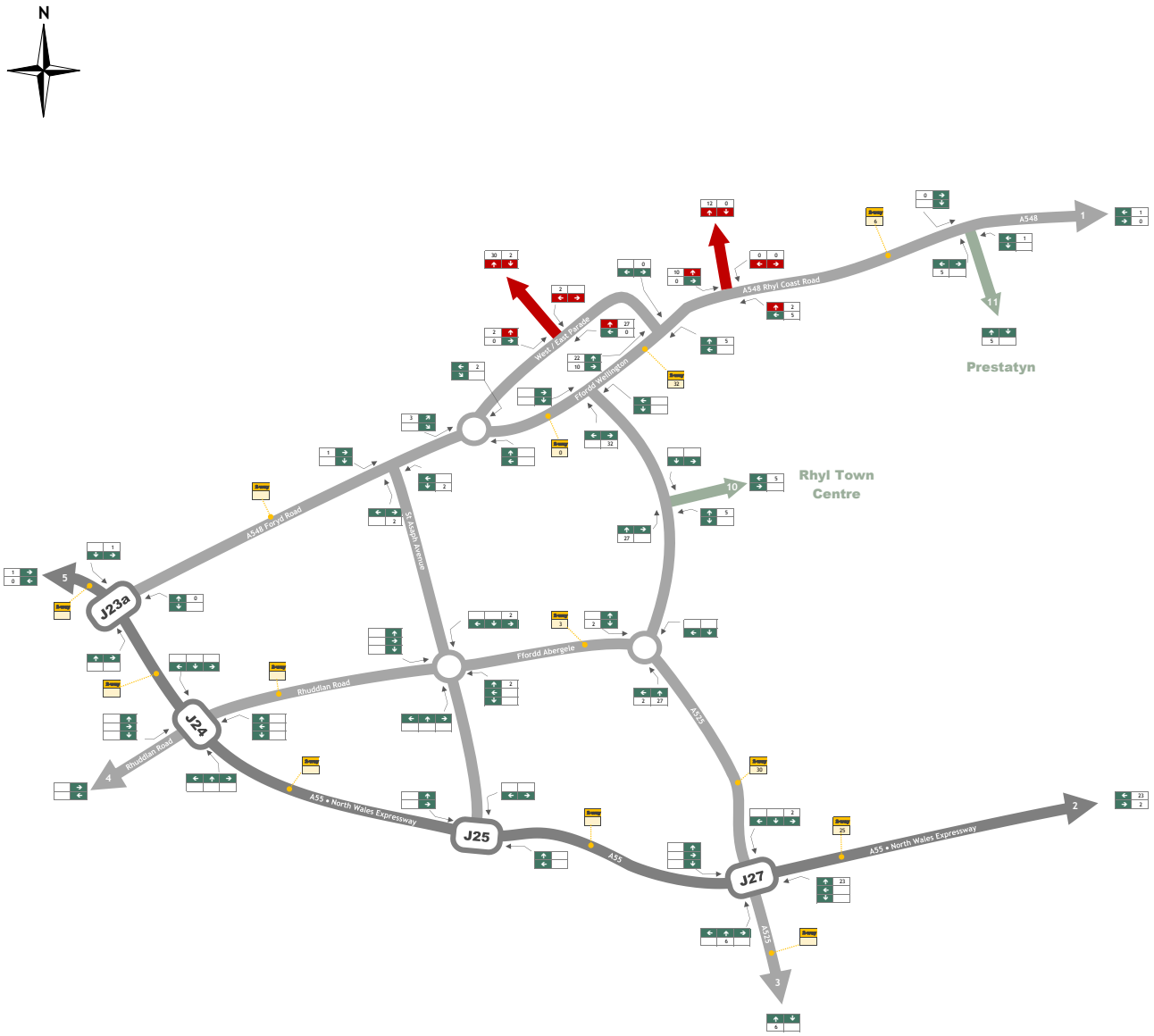
Figure Title:
Construction Material Vehicle Trips (PM Peak Hour)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 10



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

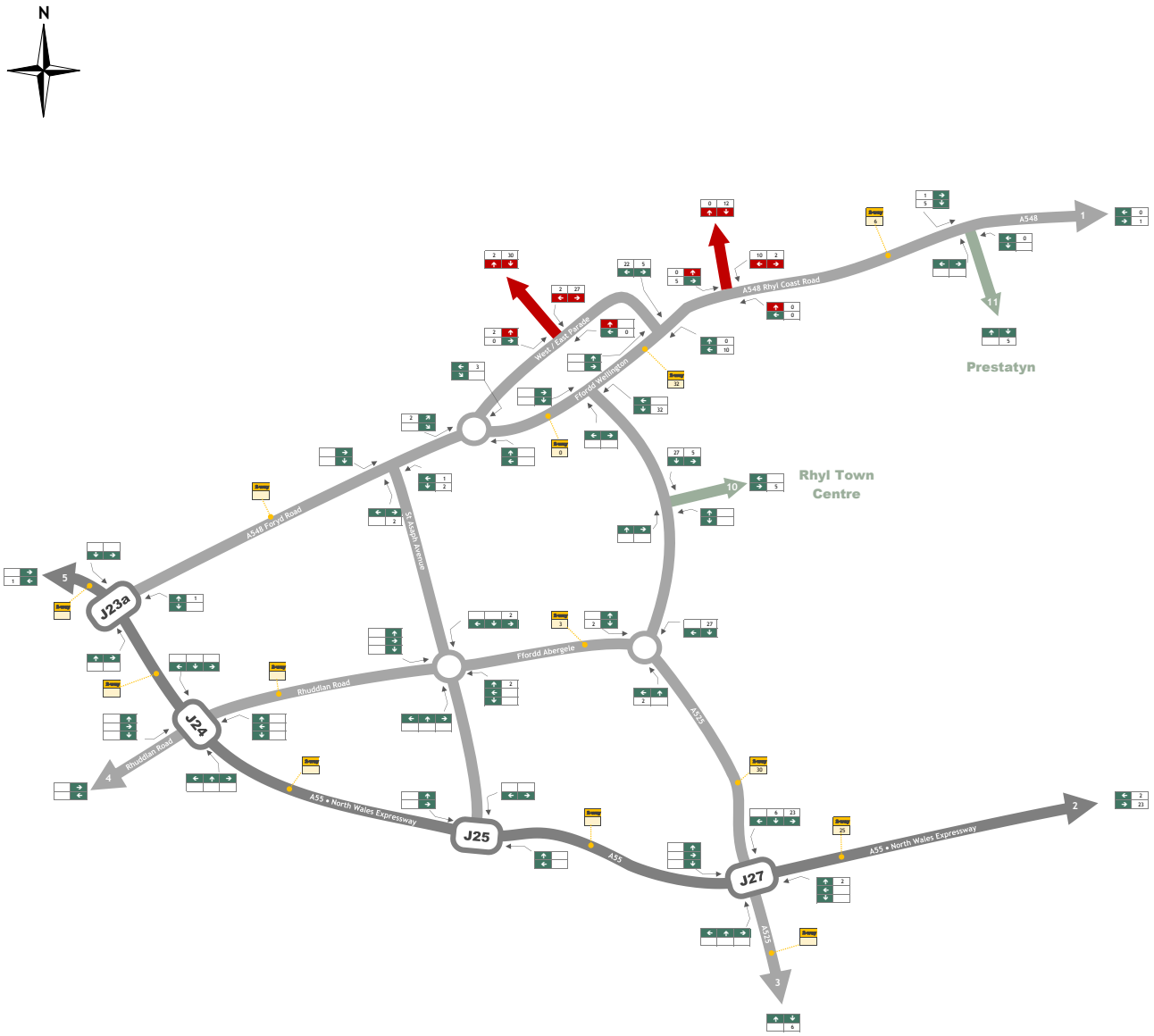
0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

Figure Title:
Construction Material Vehicle Trips (AM Peak Hour)

Scale:	Figure Status:
Not to scale	Issue
Job Number:	**Figure Number:**
8011	Figure 11



Key:

- Primary Road
- Secondary Road
- Site Access
- Additional traffic movements not explicitly represented in the network diagram (e.g. minor roads)

Note: The number in each arrowhead relates to the route reference used in the Trip Distribution

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE

0113 246 0204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA on behalf of Balfour Beatty and Denbighshire County Council

Project:
East Rhyl Coastal Defence Scheme

Figure Title:
Construction Material Vehicle Trips (PM Peak Hour)

Scale:
Not to scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 12

Appendix A

Scoping Report and DCC Comments

JBA on behalf of Balfour Beatty and Denbighshire County Council
East Rhyl Coastal Defence Scheme

Transport Assessment Scoping Report

11 June 2018
Version 1.0
Issue


Fore

Contents

Figures

Appendices

1 Introduction

1.1 Commission

Fore Consulting Limited (Fore) has been commissioned by JBA Consulting to prepare a Transport Assessment to be used to inform an Environmental Statement for submission with a planning application for a Coastal Defence Scheme in Rhyl, North Wales.

1.2 Background

Rhyl is a seaside resort town on the coast of Denbighshire, North Wales. The town has historically been protected from coastal flooding by a range of defence structures, which in the east of the town are now exceeding their performance standards and design lives. In East Rhyl, the existing defences have overtopped in recent history, causing significant damage and disruption to the residential and commercial properties.

In 2013 deep flooding of 130 residential properties led to 400 people being evacuated from their homes and others had to be rescued by boat. Flood modelling has shown that this risk is set to increase with climate change and therefore the effectiveness of the existing defences will continue to reduce. Action is needed to protect East Rhyl now and in the future to sustain this community and encourage investment in Rhyl as a popular tourist destination.

1.3 Development Proposals

The East Rhyl Coastal Defence project is a proposed flood defence scheme to be constructed to prevent coastal flood events such as those experienced in 2013. The coastal defence scheme would be designed to protect East Rhyl primarily from flooding caused by wave overtopping of the existing seawall. The scheme will be designed to protect the Garford Road area of East Rhyl, from Splash Point to the Rhyl Golf Course.

The proposals comprise:

- Demolition of approximately 600m of the existing upstand part of the recurved sea wall on the Promenade.

- Construction of a replacement recurved upstand sea wall, raising of the level of the Promenade with resurfacing works, the placing of additional rock armour revetment along the beach in front of the sea wall works, and extension of the rock armour revetment at around Splash Point by up to 350 metres to the west.

- Additional tie-in works to the adjacent sea defences, and entry points through the upstand sea wall with steps down to the beach, would also be provided.

- Construction of the proposals would temporarily occupy 18 ha of beach for access, excavation works and bulk materials storage. For the duration of the construction works, public access would be restricted to this area of beach; a 1.6 km section of the East Rhyl Promenade, to the public gardens east of Rhyl Pavilion and to an area at the end of Garford Road which will be used as a construction compound.

It is understood that construction of the scheme will take place from April 2019 for approximately 15 months.

The location of the site is shown on Figure 1 and a detailed representation of the site boundary is shown in Appendix A.

1.4 Purpose of this Scoping Study

As the flood defence scheme will have minimal transport impacts when operational, the Transport Assessment will specifically consider the impact of construction traffic that would be generated as part of the construction of the scheme. This scoping report has been prepared to set out the proposed scope and input parameters to the Transport Assessment. It is submitted to Denbighshire County Council (as local highway authority) for agreement prior to undertaken the Transport Assessment.

1.5 Structure of this Report

This Scoping Study is structured as follows:

- Chapter 2 sets out the proposed methodology for estimating the vehicle trip generation and distribution associated with the construction of the proposed development.

- Chapter 3 sets out the proposed scope of the Transport Assessment in respect of assessing the impact of the proposed development on the local transport networks.

- Chapter 4 presents a summary to the Scoping Study.

2 Proposed Trip Generation Methodology

2.1 Introduction

Given the nature of the scheme, only occasional vehicle movements for maintenance purposes are likely to be necessary when operational. The construction phase will therefore be the primary focus of the Transport Assessment.

The following main components of construction traffic will be considered:

- Delivery of material required for construction of the scheme.
- Construction staff worker trips.
- Movements by plant or abnormal loads.

These components are considered in the sections below.

2.2 Delivery of Construction Materials

2.2.1 Vehicle Trip Generation

The precise quantities of construction materials are not fully confirmed at this stage, subject to the outcome of detailed coastal modelling work; however, Balfour Beatty (as contractor) has provided the following initial estimates of materials that to be transported to or from the site:

- 15,000 m3 of material for disposal; this is associated with the demolition of the existing sea wall.
- A total 55,000 tonnes of rock armour, 30,000 tonnes of underlayer and 10,000 tonnes of quarry run to be delivered during the course of the construction process.
- Approximately 20 deliveries per day by car and light vans are also anticipated through the construction works.

The intention is that material is stockpiled at a compound adjacent Rhyl Pavillion on Marine Road, and subsequently transported to the foreshore via a ramp for sorting and stockpiling. Other materials would also be received at the compound site, and then transported on the local road network to the promenade, via Garford Road as required. Ready mix concrete would be delivered direct to the Promenade via Garford Road. The number of vehicle movements between the compounds and site areas will vary through the construction process and as such, the number of vehicle movements either to the

compounds or between the compounds and site will vary. However, at this stage, anticipated that:

- In the region of 25 HGV loads per day (representing 50 two-way trips) will occur during the main period of material stockpiling at the start of the construction process.

- Following the initial period prior to commencement of works on site, stockpiling will continue through the construction process, albeit not necessarily at the same rate. At peak, a total of 40 HGV loads per day associated with both processes are anticipated, although between 30 and 35 HGV loads are anticipated for the majority of the construction process.

- Around 5 movements associated with disposal of demolition materials per day are expected through the construction process.

- Overall, between 35 and 40 HGV movements per day are generally expected, rising to around 45 HGV loads per day at peak times of the construction process (approximately 2 months). On the basis that each HGV movement represents an arrival and departure trip (i.e. two trips), this equates to between 70 and 80 HGV movements per day for the majority of the construction process, increasing to around 90 HGV movements per day at peak.

2.2.2 Vehicle Trip Distribution

There are numerous restrictions to heavy good vehicles HGVs on the local highway networks, which have been taken into consideration in selecting appropriate routes. Two main haulage routes proposed from the A55, either approaching from the west of the site or the east of the site.

The distribution of vehicle trips on the local network will be separated across the two main haulage routes proposed. These routes are described below.

- Route 1, approaching from the west, comprises: A55 (J27) > St Asaph Road (A525) > Ffordd Abergale (A547) > St Asaph Avenue > Foryd Road (A548) > Ffordd Wellington (A548) > West Parade (B5118) > East Parade (B5118) > Marine Drive (B5118).

- Route 2, approaching from the east, comprises: A55 (J27) St Asaph Road (A525) > A525 > A547 > Ffordd Talargoch (A547) > Meliden Road (A547) > Ffordd Pendyffryn (B5120) > Penisarde Road (B5120) > Bridge Road (B5120) > Bastion Road (B5120) > Victoria Road (A548) > Victoria Road West (A548) > Rhyl Coast Road (A548) > Tynewydd Road (B5118) > Marine Drive (B5118).

- A further route, Route 3 is proposed for deliveries coming from the east, following the A548 up from its connection at A494 at Deeside (Weighbridge Road), or from its connection with the A5119 in Flint from the A55 (J33). This would comprise: Penisarde Road (A458) > Nant Drive > Gronant Road (A547) > Ffordd Pendyffryn (B5120). Penisardre Road (B5120) > Bridge Road (B5120) > Bastion Road (B5120) > Victoria Road (A548) > Victoria Road West (A548) > Rhyl Coast Road (A548) > Tynewydd Road (B5118) > Marine Drive (B5118).

These routes are indicated on Figure 2.

The likely distribution of construction vehicle trips on the wider network will be confirmed as part of the Transport Assessment following confirmation of the scheme proposals and the associated construction quantities and methodology.

2.3 Construction Staff Trips

The number of trips by construction staff, likely working patterns and associated car parking requirements will be confirmed as part of the Transport Assessment.

Although given the nature of working patterns on site will mean that it is likely that most staff will travel by car, accessibility by all modes will be considered.

2.4 Plant / Abnormal Load Movements

The requirement for movements of plant and abnormal loads will be considered, when the construction methodology is confirmed. Where such movements are necessary, appropriate routes will be identified, and swept path analysis will be undertaken to confirm the impacts and any requirements for mitigation.

3 Scope of Transport Impacts

3.1 Introduction

The Chapter sets out the proposed scope of the Transport Assessment in respect of assessing the impact of the proposed development on the local transport networks.

3.2 Pedestrians and Cyclists

The Transport Assessment will identify how the proposed development will impact pedestrians and cyclists, and existing Public Rights of Way.

Specifically, it is understood that the Wales Coast Path crosses the construction site, and given the need for the public access to areas of the beach to be restricted through the construction process, alternative arrangements will be identified and agreed with Denbighshire County Council to enable temporary diversions.

3.3 Impact on the Highway Network

Construction traffic flows will be estimated based on the approach set out in Chapter 2 of this report. Baseline traffic flow data (observed in 2016) has been provided by Denbighshire County Council. In the first instance the estimated construction traffic flows will be compared to the baseline flows to confirm the likely impacts in terms of flows, and where further detailed capacity assessment may be warranted.

The modelled flows would also be used to inform a traffic ES chapter, which will follow the methodology provided in the widely-used Institute of Environmental Assessment (IEA) publication '*Guidelines on the Environmental Assessment of Road Traffic*'. This provides various thresholds above which it is necessary to assess the environmental effects of traffic in more detail; in particular, where the increase in traffic flows (or number of HGVs) as a result of the development is less than 30% then no further assessment is necessary.

An audit of the identified HGV access routes will also be undertaken to confirm existing pinchpoints. Where changes to accommodate construction traffic are considered necessary, appropriate schemes will be identified for discussion and agreement with Denbighshire County Council.

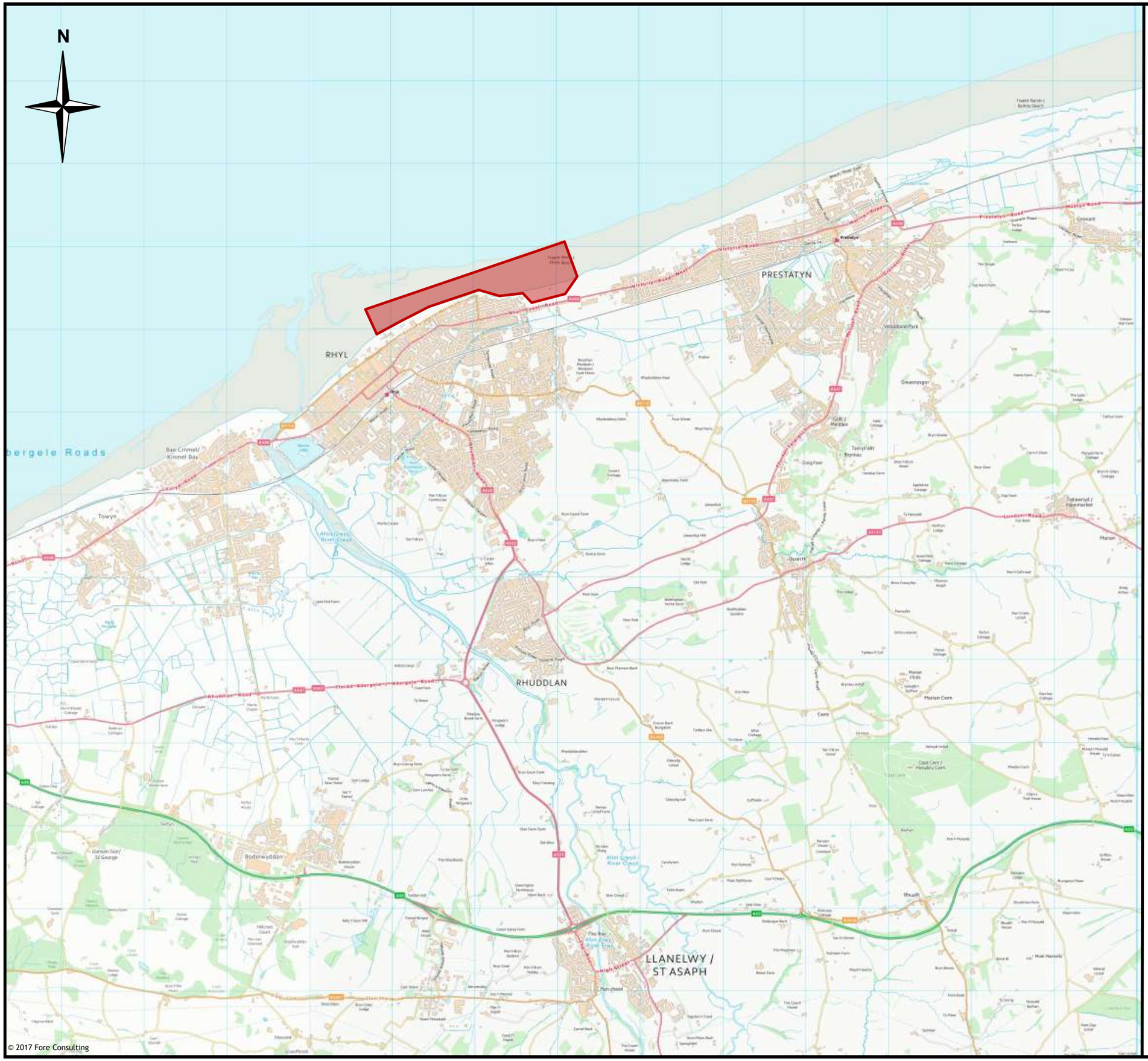
A detailed analysis of the personal-injury accident record within the study area for the most recently available five-year period will be undertaken as part of the Transport Assessment. A qualitative assessment of the impact of the proposed development on road safety will be undertaken and appropriate mitigation measures will be identified, where they are considered to be necessary.

4 Summary and Conclusions

This Scoping Report has been prepared to set out the proposed scope and methodology for a Transport Assessment (which will in turn be used to inform the Environmental Statement) to be submitted as part of a forthcoming planning application for the East Rhyl Coastal Defence scheme.

This report is presented to Denbighshire County Council for agreement prior to undertaking the Transport Assessment. The Assessment will be undertaken in accordance with the agreed scope.

Figures



Key:

🟥 Indicative Site Boundary

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE
0113 2460204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA Consulting

Project:
Rhyl Coastal Defence Scheme

Figure Title:
Site Location

Scale:
Not to Scale

Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 1

N

Route 3

Route 2

Route 1

PRESTATYN

RHYL

RHUDDLAN

LLANELWY / ST ASAPH

Towyn

Bodelwyddan

Key:

Indicative Site Boundary

Fore Consulting Limited
2nd Floor, Queens House
34 Wellington Street
Leeds
LS1 2DE
0113 2460204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

Client:
JBA Consulting

Project:
Rhyl Coastal Defence Scheme

Figure Title:
Construction Traffic Routes

Scale:
Not to Scale

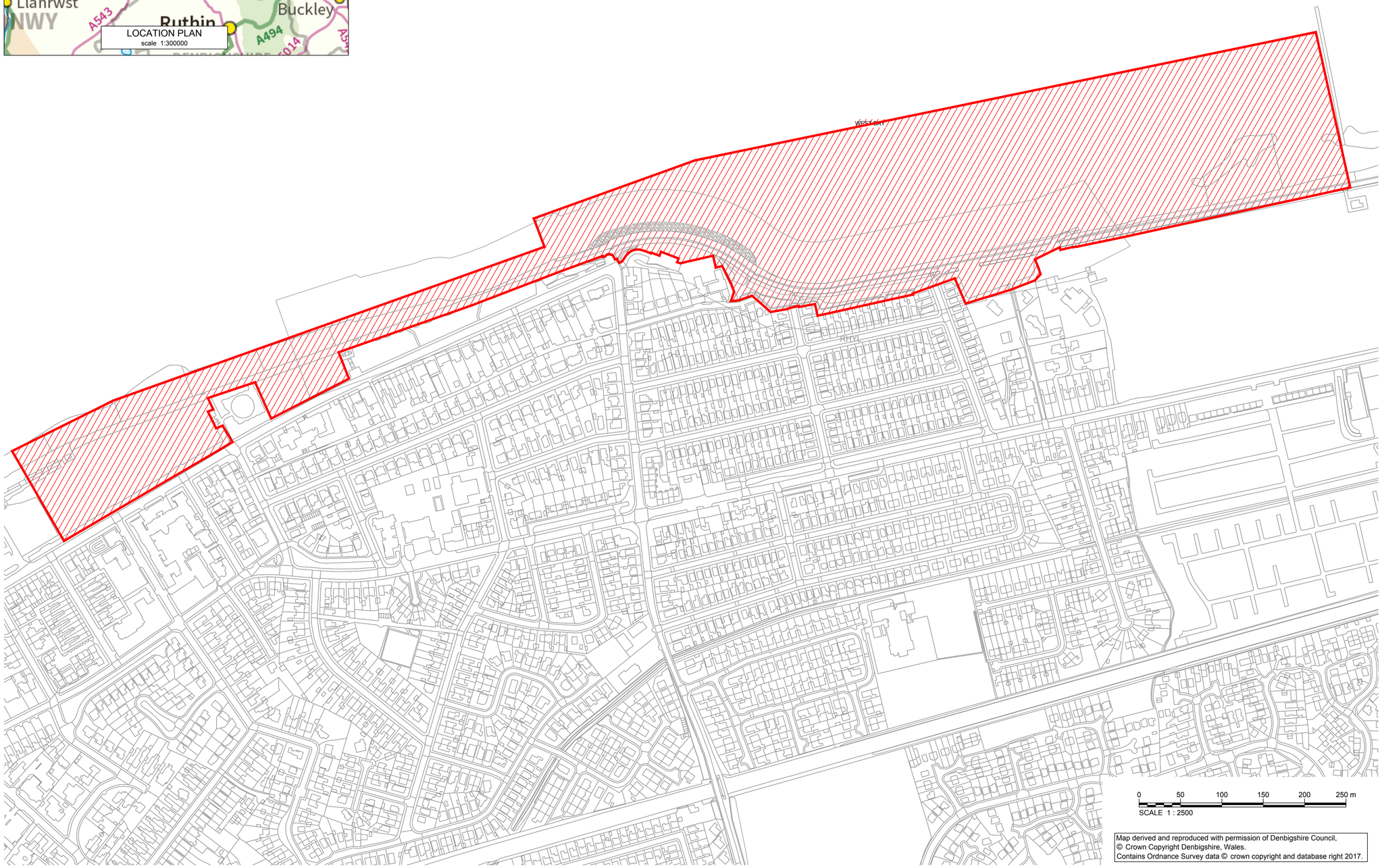
Figure Status:
Issue

Job Number:
8011

Figure Number:
Figure 2

Appendix A

Indicative Site Plan



0 50 100 150 200 250 m
SCALE 1 : 2500

• Surveying around private property and on golf course • Restricted access and egress through Rhyl • Working in an exposed coastal environment • Tidal working conditions • Unknown ground conditions	• Working on public amenity beach and public open space • Working adjacent to public right of way	• Pollution hazards associated with working near the sea • Risk of damage to flora and fauna
Construction Risks	Public Risks	Environmental Risks

In addition to the hazards/risks normally associated with the types of work detailed on this drawing take note of the above.
It is assumed that all works detailed on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

KEY

SITE BOUNDARY
TOTAL HECTARES = 22.0

Rev.										
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
	Comments									
Rev.:	Date		Drawn		Designed		Checked		Approved	
P03	Comments Project boundary changed									
Rev.:	Date	22/01/18	Drawn	RG	Designed	GK	Checked	AD	Approved	GK
P02	Comments Project boundary changed									
Rev.:	Date	18/12/17	Drawn	RG	Designed	AD	Checked	GK	Approved	GK

Client Approval	
	A - Approved
	B - Approved with Revisions
	C - Do Not Use

Purpose of Issue	Status
For comment	Concept

JBA consulting
35 Perrymount Road
HAYWARDS HEATH
West Sussex
RH16 3BW
United Kingdom
www.jbaconsulting.com
t +44 (0)1444 473652
f +44 (0)845 8627772
e info@jbaconsulting.com
Offices at Coleshill, Doncaster, Dublin, Edinburgh, Exeter, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Saltaire, Skipton, Tadcaster, Thirsk, Wallingford and Warrington

DENBIGHSHIRE COUNCIL- EAST RHYL COASTAL DEFENCE SCHEME

EAST RHYL
SITE BOUNDARY
LOCATION

for

Cyngor sir ddinbych denbighshire County Council

Scale:			
1:2500 @ A1	Drawn:	R. Groves	29/09/17
	Designed:	A. Dane	29/09/17
	Checked:	G. Kenn	29/09/17
	Approved:	G. Kenn	29/09/17

Digital File Name: ER-JBA-02-00-DR-C-0001-S8-P03.dwg

Drawing Number: ER-JBA-02-00-DR-C-0001-S8

Revision: P03

Fore Consulting Limited
2nd Floor, Queens House
Wellington Street
Leeds
LS1 2DE

0113 2460204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk

From: Joseph Baker <joseph.baker@denbighshire.gov.uk>

Date: 21 June 2018 at 10:15

Subject: RE: East Rhyl Coastal Defence Scheme - scoping report for Transport Assessment

To: "adam.smout@foreconsulting.co.uk" <adam.smout@foreconsulting.co.uk>

Cc: Mike Parker <mike.parker@denbighshire.gov.uk>, "mark.cope@jbaconsulting.com" <mark.cope@jbaconsulting.com>

Morning Adam

The contents of the scoping report and proposals for the Transport Assessment seem fine. There are just a couple of points which we would like to raise:

- We have some concerns over the proposed route 2 and 3 through the centre of Prestatyn. Is there a more appropriate route which could be utilised for route 2?. Also, rather that route three traversing through the centre of Prestatyn could the route not continue along the A548.

- Could you please discuss the potential impact of the scheme on the cycle network with our Road Safety and Sustainable Transport Engineer Ben Wilcox Jones

I am on annual leave next week returning on the 2nd of July. Should you wish to discuss any of the above in more detail please contact Mike Parker in my absence.

Ben Wilcox Jones – ben.wilcox-jones@denbighshire.gov.uk – 01824 706922

Mike Parker – mike.parker@denbighshire.gov.uk - 07771504785

Regards

Joe Baker

Peiriannydd Rheoli Datblygiad Priffyrdd / Highways Development Control Engineer

Gwasanaeth Cynllunio a Gwarchod y Cyhoedd / Planning and Public Protection

---

From: Adam Smout [mailto:adam.smout@foreconsulting.co.uk]

Sent: 11 June 2018 16:34

To: Mike Parker <mike.parker@denbighshire.gov.uk>; adrian.wallks@denbighshire.gov.uk

Cc: Mark Cope <Mark.Cope@jbaconsulting.com>

Subject: East Rhyl Coastal Defence Scheme - scoping report for Transport Assessment

Mike, Adrian

Fore Consulting have been commissioned to prepare a Transport Assessment and assist the preparation of an Environmental Statement for submission as part of a forthcoming planning application for the East Rhyl Coastal Defence Scheme. I understand that some scoping discussion has already been held with the Council regarding the Environmental Statement, and we have therefore prepared the attached scoping report to set out our proposed approach to the Transport Assessment.

Once you've had time to digest, we'd welcome any comments or feedback you may have – happy to discuss at the appropriate time if that would be helpful.

Kind regards

Adam Smout

Associate

Appendix B

Construction Vehicle Movement Estimates

					Year	2019									2020												2021												2022											
					Month	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
					Month			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
Actvity	Volume	Unit	Assumption	No of loads	Destination																																													
Compound 1 mobilisation																																																	
Hoarding	7	No	7 loads	7	Both				7																																								
Hardcore	2700	t	20t per trailer load	135	Location 1				67	68																																							
Site cabins and stores	8	No	1 cabin per load	8	Location 1				8																																								
Site access	10	No	assumed movements	10	Location 1			10																																									
Rock import for revetment																																																	
Rock armour stone 3t-6t	99600	t	20t per trailer load	4980	Location 1					168	226	230	118	50	175	175	175	175	175	175	175	175	175	175	175	175	174	174	174	174	174	174	174	174	174	174	174											
Filter layer stone 0.3t-1t	66120	t	20t per trailer load	3306	Location 1								116	48	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	130	130											
Quary run core	7000	t	20t per trailer load	350	Location 1								14	14	14	14	14	14	14	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13											
Compound 2 mobilisation																																																	
Hoarding	3	No	3 loads	3	Location 2				3.00																																								
Hardcore	630	t	20t per trailer load	32	Location 2			12	12	8																																							
Site cabins ans stores	6	No	1 cabin per load	6	Location 2					6																																							
Site access																																																	
Beach Acces at splashpoint	1600	t	20t per trailer load	80							40	40																																					
Concrete Buttress	1496	m^3	6m^3 per wagon	249	Both						20	46	46	46	46	45																																	
Erect pre-cast wall	201	No	3 No per wagon	67	Both																						6	6	5	5	5	5	5	5	5	5	5	5	5	5									
Concrete wall base	998	t	6m^3 per wagon	166	Both																							18	19	18						28	28			27	28							
Pavement																																																	
Reinforcement	163	t	20t per trailer load	8	Both																						3								3				2									
Concrete	411	m^3	6m^3 per wagon	69	Both																																	10	14	17	14	14							
Hydraulically bound subbase	750	t	10t per wagon	75	Both																															15	15	15	15	15								
Access steps																																																	
Concrete	450	m^3	6m^3 per wagon	75	Both											5	4	4	4	4	4	5	9	8	8	8	8	4																					
Pre-cast	60	No	3 units per wagon	20	Both											3	1	1	1	4	1	1	1	3	1	1	1	1																					
Demobilisation																																																	
Site cabins and stores	14	No	1 cabin per load	14	Both																																											14		
Plant mob and de-mob through project	55	No	assumed movents	55	Both			2	2	2	2		1	2	1			1		1	1	1	3	1		2	2	2		2		2	2	2			2	2			2	5	5	5					
Disposal off site	8250	m^3		825	Both					42	42	42	42	14	30	35	30	35	35	32	35	32	33	30	32	14	30	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15					
			HGV total	**10540**				24	99	294	330	358	337	174	397	408	355	361	360	361	361	359	366	362	360	344	359	340	342	359	357	358	340	340	338	341	367	382	45	51	81	77	34	19					

Mean	285
Median	344

Appendix C

Gravity Model Calculations

Employee Vehicle Trip Distribution

Population data derived from 2011 Census data (Source: KS101EW - Usual resident population)

3 Time coefficient (N)

Destination	Population (P)	Travel time (T) *Minutes*	Nationwide Catchment		Trip Distribution									
			P / T^N	% of Total	Route Assignment					Proportion by Route				
					A	B	C	D	Count	A	B	C	D	Total
Blaenau Gwent	69,814	222	0.006403977	0.0%	2				1	0%	0%			0%
Bridgend	139,178	254	0.008521645	0.0%	2				1	0%	0%			0%
Caerphilly	178,806	226	0.015490191	0.0%	2				1	0%	0%			0%
Cardiff	346,090	237	0.025954425	0.1%	2				1	0%	0%			0%
Carmarthenshire	183,777	219	0.017421119	0.0%	3	2			2	0%	0%			0%
Ceredigion	75,922	169	0.015794554	0.0%	3	2			2	0%	0%			0%
Conwy	115,228	45	1.258901111	3.1%	5				1	3%	0%			3%
Denbighshire	93,734	18	16.0723594	39.4%	3	10	11		3	13%	13%	13%		39%
Flintshire	152,506	34	3.735509593	9.2%	2				1	9%	0%			9%
Gwynedd	121,874	93	0.152581261	0.4%	5				1	0%	0%			0%
Merthyr Tydfil	58,802	217	0.005738688	0.0%	2				1	0%	0%			0%
Monmouthshire	91,323	202	0.01114021	0.0%	2				1	0%	0%			0%
Neath Port Talbot	139,812	232	0.01122546	0.0%	2				1	0%	0%			0%
Newport	145,736	218	0.014089482	0.0%	2				1	0%	0%			0%
Pembrokeshire	122,439	234	0.009596863	0.0%	3				1	0%	0%			0%
Powys	132,976	145	0.04378419	0.1%	2				1	0%	0%			0%
Swansea	239,023	241	0.017086728	0.0%	2				1	0%	0%			0%
The Vale of Glamorgan	126,336	255	0.00757747	0.0%	2				1	0%	0%			0%
Torfaen	91,075	212	0.009536028	0.0%	2				1	0%	0%			0%
Wrexham	134,844	56	0.757642008	1.9%	2	3			2	1%	1%			2%
Allerdale	96,422	183	0.015776485	0.0%	2				1	0%	0%			0%
Barrow-in-Furness	69,087	159	0.017268521	0.0%	2				1	0%	0%			0%
Blackburn with Darwen	147,489	99	0.150630142	0.4%	2				1	0%	0%			0%
Blackpool	142,065	111	0.105102743	0.3%	2				1	0%	0%			0%
Bolton	276,786	88	0.404777528	1.0%	2				1	1%	0%			1%
Burnley	87,059	110	0.065112242	0.2%	2				1	0%	0%			0%
Bury	185,060	95	0.216984922	0.5%	2				1	1%	0%			1%
Carlisle	107,524	180	0.018411327	0.0%	2				1	0%	0%			0%
Cheshire East	370,127	78	0.77695822	1.9%	2				1	2%	0%			2%
Cheshire West and Chester	329,608	53	2.2519871	5.5%	2				1	6%	0%			6%
Chorley	107,155	91	0.141650764	0.3%	2				1	0%	0%			0%
Copeland	70,603	202	0.008536211	0.0%	2				1	0%	0%			0%
Eden	52,564	157	0.013483805	0.0%	2				1	0%	0%			0%
Fylde	75,757	103	0.069160453	0.2%	2				1	0%	0%			0%
Halton	125,746	58	0.652322232	1.6%	2				1	2%	0%			2%
Hyndburn	80,734	100	0.079971779	0.2%	2				1	0%	0%			0%
Knowsley	145,893	65	0.53329284	1.3%	2				1	1%	0%			1%
Lancaster	138,375	117	0.086102646	0.2%	2				1	0%	0%			0%
Liverpool	466,415	70	1.388371302	3.4%	2				1	3%	0%			3%
Manchester	503,127	79	1.023696858	2.5%	2				1	3%	0%			3%
Oldham	224,897	98	0.242271228	0.6%	2				1	1%	0%			1%
Pendle	89,452	114	0.0605101	0.1%	2				1	0%	0%			0%
Preston	140,202	99	0.145889092	0.4%	2				1	0%	0%			0%
Ribble Valley	57,132	123	0.030776822	0.1%	2				1	0%	0%			0%
Rochdale	211,699	93	0.26038054	0.6%	2				1	1%	0%			1%
Rossendale	67,982	98	0.072266555	0.2%	2				1	0%	0%			0%
Salford	233,933	76	0.525266774	1.3%	2				1	1%	0%			1%
Sefton	273,790	85	0.440617255	1.1%	2				1	1%	0%			1%
South Lakeland	103,658	134	0.043323292	0.1%	2				1	0%	0%			0%
South Ribble	109,057	91	0.145118568	0.4%	2				1	0%	0%			0%
St. Helens	175,308	71	0.487059833	1.2%	2				1	1%	0%			1%
Stockport	283,275	82	0.520402868	1.3%	2				1	1%	0%			1%
Tameside	219,324	88	0.316951379	0.8%	2				1	1%	0%			1%
Trafford	226,578	78	0.485190725	1.2%	2				1	1%	0%			1%
Warrington	202,228	64	0.771438599	1.9%	2				1	2%	0%			2%
West Lancashire	110,685	89	0.156566715	0.4%	2				1	0%	0%			0%
Wigan	317,849	80	0.610439607	1.5%	2				1	1%	0%			1%
Wirral	319,783	50	2.512762356	6.2%	2	1			2	3%	3%			6%
Wyre	107,749	111	0.077974573	0.2%	2				1	0%	0%			0%
Birmingham	1,073,045	138	0.40638379	1.0%	2				1	1%	0%			1%
Bromsgrove	93,637	148	0.028632117	0.1%	2				1	0%	0%			0%
Cannock Chase	97,462	128	0.046783451	0.1%	2				1	0%	0%			0%
Coventry	316,960	156	0.0835696	0.2%	2				1	0%	0%			0%
Dudley	312,925	149	0.093997242	0.2%	2				1	0%	0%			0%
East Staffordshire	113,583	124	0.060177476	0.1%	2				1	0%	0%			0%
Herefordshire, County of	183,477	155	0.049111823	0.1%	2				1	0%	0%			0%
Lichfield	100,654	131	0.044687796	0.1%	2				1	0%	0%			0%
Malvern Hills	74,631	173	0.014322612	0.0%	2				1	0%	0%			0%
Newcastle-under-Lyme	123,871	102	0.116554922	0.3%	2				1	0%	0%			0%
North Warwickshire	62,014	147	0.019709734	0.0%	2				1	0%	0%			0%
Nuneaton and Bedworth	125,252	153	0.035212288	0.1%	2				1	0%	0%			0%
Redditch	84,214	157	0.021609553	0.1%	2				1	0%	0%			0%
Rugby	100,075	167	0.021301543	0.1%	2				1	0%	0%			0%
Sandwell	308,063	136	0.121527374	0.3%	2				1	0%	0%			0%
Shropshire	306,129	96	0.348911252	0.9%	2				1	1%	0%			1%
Solihull	206,674	143	0.071023992	0.2%	2				1	0%	0%			0%
South Staffordshire	108,131	123	0.058702459	0.1%	2				1	0%	0%			0%
Stafford	130,869	109	0.100454555	0.2%	2				1	0%	0%			0%
Staffordshire Moorlands	97,106	118	0.05965615	0.1%	2				1	0%	0%			0%
Stoke-on-Trent	249,008	99	0.255338387	0.6%	2				1	1%	0%			1%
Stratford-on-Avon	120,485	169	0.025013408	0.1%	2				1	0%	0%			0%
Tamworth	76,813	138	0.029376629	0.1%	2				1	0%	0%			0%
Telford and Wrekin	166,641	102	0.155348031	0.4%	2				1	0%	0%			0%
Walsall	269,323	132	0.117498694	0.3%	2				1	0%	0%			0%
Warwick	137,648	166	0.030246218	0.1%	2				1	0%	0%			0%
Wolverhampton	249,470	128	0.12007879	0.3%	2				1	0%	0%			0%
Worcester	98,768	162	0.023081253	0.1%	2				1	0%	0%			0%
Wychavon	116,944	168	0.024832823	0.1%	2				1	0%	0%			0%
Wyre Forest	97,975	138	0.037199255	0.1%	2				1	0%	0%			0%
										70%	17%	13%		100%

Ref	Route	% of Trips						
		A	B	C	D	E	F	Total
1	Rhyl Coast Road	0%	3%	0%				3%
2	A55 (East)	53%	0%	0%				53%
3	A525 (South)	13%	1%	0%				14%
4	Rhuddlan Road (West)	0%	0%	0%				0%
5	A55 (West)	3%	0%	0%				3%
10	Rhyl Town Centre	0%	13%	0%				13%
11	Prestatyn	0%	0%	13%				13%
	TOTAL	70%	17%	13%	0%	0%	0%	100%

Fore Consulting Limited
2nd Floor, Queens House
Wellington Street
Leeds
LS1 2DE

0113 2460204
enquiries@foreconsulting.co.uk
www.foreconsulting.co.uk