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# Chapter 5

## Traffic Analysis

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## Traffic Analysis

### 5.1 Introduction

This chapter considers and assesses the potential traffic and transportation impacts associated with the construction phase of the proposed Flood Defences West for the protection of critical infrastructure including the existing Plunkett Train Station, the railway line east and west of Plunkett Station and the Rice Bridge roundabout.

### 5.2 Methodology

The chapter has been prepared in line with the following documents:

- Waterford City Development Plan, 2013 – 2019;
- Traffic and Transport Assessment Guidelines, (TII, 2014).

Data relating to any collisions in the vicinity of the development site during the 12-year period between 2005 and 2016 was collected from the Road Safety Authority (RSA) online mapping tool and analysed.

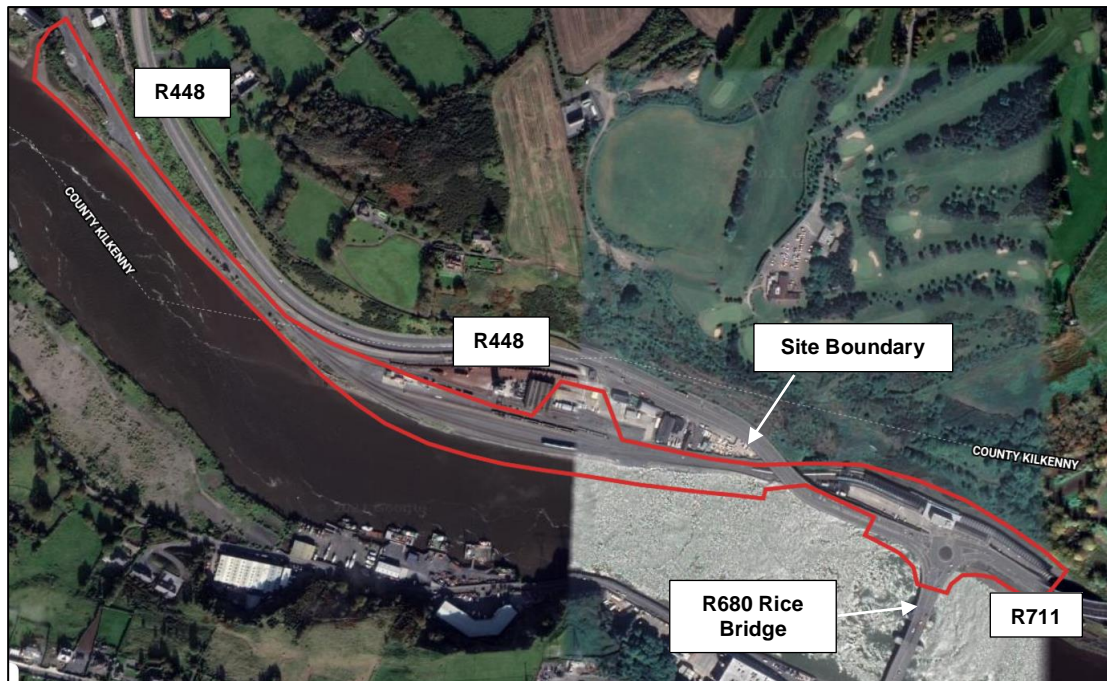
A manual classified junction turning count survey was carried out at the Rice Bridge / R448 Junction on Wednesday the 12<sup>th</sup> of June 2019. The survey took place for 12 hours between 7am and 7pm. This survey data is used to analyse the traffic impact of the proposed development.

This traffic assessment determines the additional traffic loading resulting from the construction stage of the proposed development and considers the potential impact on the surrounding road network and traffic conditions. Appropriate traffic management measures are then identified.

### 5.3 Description of Receiving Environment

#### 5.3.1 Road Infrastructure

The site of proposed development is located along the north bank and within the foreshore of the River Suir, extending approx. 100m to the east and c.1.1km to the west from the Rice Bridge roundabout in front of Plunkett Station. The proposed works will be carried out on both the riverside and the landside of the existing quay wall which currently bounds the River Suir. With the exception of the overground flood defence measures proposed for the Rice Bridge roundabout, the landside works will be carried out within the Iarnród Éireann (IE) lands. The site area is bounded to the north by Terminus Street (R448) - a regional road dual carriageway connecting Waterford City Centre with the N25 and the N9, located 3km to the northwest - and by the Dock Road (R711) – a regional road dual carriageway connecting Waterford City Centre with the N29, located 4.7km to the northeast, and the Rice Bridge connecting into the City Centre, as presented in Plate 5.1.



**Plate 5.1** Surrounding road network around the site boundary: R448 (Terminus St.), R711 (Dock Road) and Rice Bridge.

The R711 Dock Road is a dual carriageway road, with a posted speed limit of 50km/hr. There are continuous footpaths on both sides of the R711, with an average width of between 2m and 3m. There are no facilities for cyclists provided, as presented in Plates 5.2 and 5.3.

The R448 Terminus Street is a dual carriageway road, with a posted speed limit of 60km/hr running to the north of the proposed development. There are continuous footpaths on both sides of the R448, with an average width of between 2m and 3m. There are no facilities for cyclists provided, as presented in Plates 5.4 and 5.5.



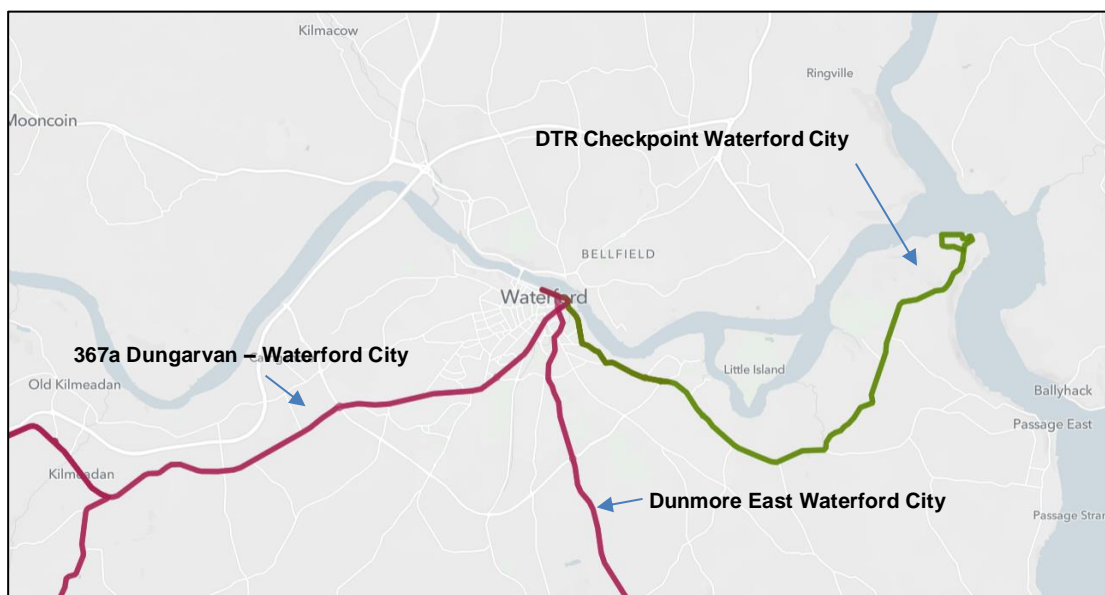
**Plate 5.2, 5.3** Views of R711 Dock Road looking east and west respectively



**Plate 5.4, 5.5 Views of R448 Dock Road looking west and east respectively**

### 5.3.2 Public Transport Facilities

On the south side of the River Suir, Waterford Bus Station is situated on the R680, Merchants Quay and is serviced by both Bus Eireann and private operators. Local bus services operate to and from Waterford city area: 3 routes are available, with the nearest bus stop (Clock Tower) located on the south side of the River Suir, 770m from the site as shown in Plate 5.6 and 5.7. Waterford Plunkett Train Station which is located within the site boundary, is served by the Waterford – Dublin Heuston and Waterford – Limerick Junction trains.



**Plate 5.6 Views of the local routes serving Waterford area: DTR Checkpoint Waterford City, Dunmore East Waterford City and 367a Dungarvan – Waterford City**



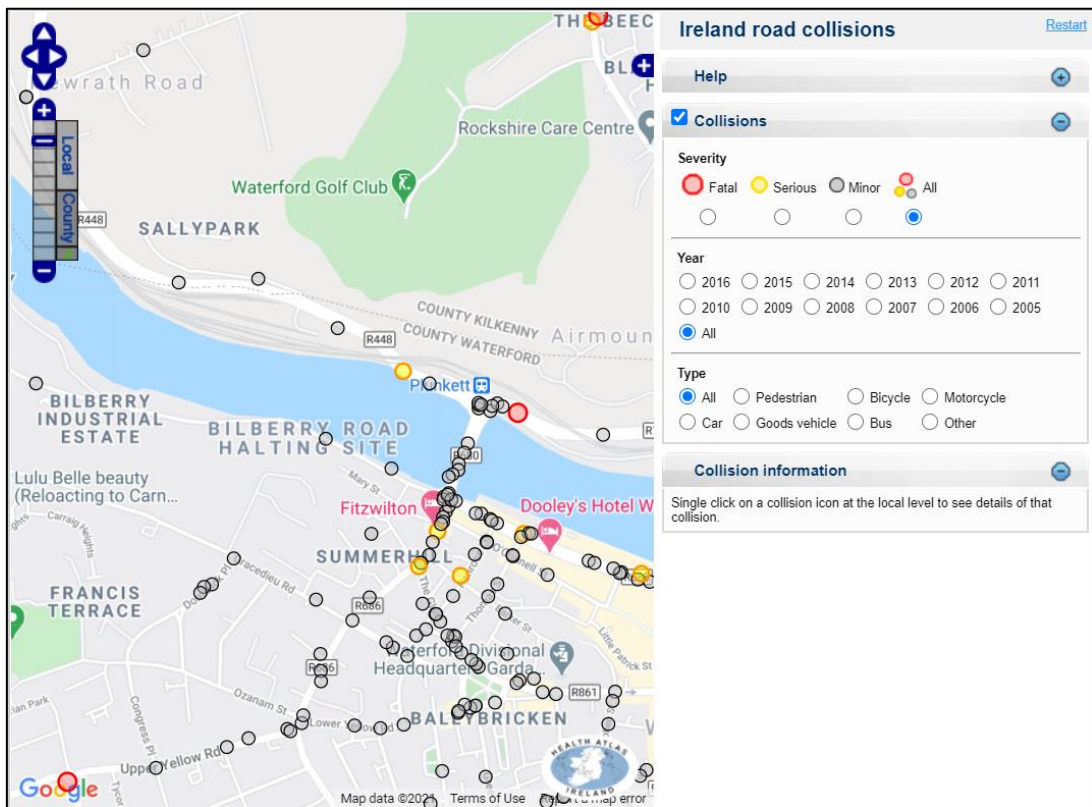


**Plate 5.7 Views of the nearest bus stops to the site area: Clock Tower stop**

### 5.3.3 Road Safety

Between 2005 and 2016 a total of 16 accidents were recorded in the vicinity of the site area, on Dock Road (R711) and Terminus St. (R448): 14 of them classified as minor, 1 classified as serious and 1 accident which was fatal.

The locations of the collisions on the road network near to the development site are indicated in Plate 5.8 and a summary of the collisions in the area is provided in Table 5.1.



**Plate 5.8 Road Collision Data from RSA**

Two of the accidents to date in the area have involved a pedestrian, these collisions were classified as fatal and minor. Two further accidents involved a bicycle or motorcycle, both of which were minor accidents.

**Table 5.1 Summary of Road Collision Data along R711 and R448**

Classification	Location	Year	Vehicle Involved	Pedestrian Involved?	Day & Time	No. Casualties
Minor	Dock Road	2005	Car	No	Saturday, 10:00 – 16:00	2
Fatal	Dock Road	2016	Car / Pedestrian	Yes	Wednesday, 16:00 – 19:00	2
Minor	Dock Road	2014	Car	No	Monday, 10:00 – 16:00	1
Minor	Dock Road	2011	Bus	No	Wednesday, 19:00 – 10:00	1
Minor	Dock Road	2012	Car	No	Friday, 07:00 – 10:00	1
Minor	Dock Road	2014	Bicycle	No	Saturday, 16:00 – 19:00	1
Minor	Terminus St.	2012	Car	No	Sunday, 23:00 – 03:00	1
Minor	Terminus St.	2014	Car	No	Tuesday, 23:00 – 03:00	1
Minor	Terminus St.	2007	Car	No	Tuesday, 07:00 – 10:00	1
Minor	Terminus St.	2008	Goods vehicles	No	Wednesday, 10:00 – 16:00	1
Minor	Terminus St.	2006	Undefined	No	Friday, 16:00 – 19:00	1
Serious	Terminus St.	2015	Car	No	Sunday, 23:00 – 03:00	2
Minor	Terminus St.	2008	Car	No	Monday, 07:00 – 10:00	2
Minor	Terminus St.	2010	Car / Pedestrian	Yes	Sunday, 19:00 – 20:00	1
Minor	Terminus St.	2016	Motorcycle	No	Monday, 16:00 – 19:00	1
Minor	Terminus St.	2006	Car	No	Monday, 10:00 – 16:00	2

#### 5.3.4 Existing Traffic

The peak hours for traffic near to the development are as follows:

- Weekday AM Peak: 08:00 – 09:00
- Weekday PM Peak: 17:00 – 18:00

The flows in the AM and PM peak, with the total traffic shown as passenger car unit (PCU) per hour and the Average Annual Daily Traffic (AADT) along the R448, R711

and R680 Rice Bridge are detailed in Table 5.2. The AM and PM peak and the AADT for HGVs on the aforementioned road network are presented in Table. 5.3.

**Table 5.2 AM and PM Peak Flows on the R448, R711 and Rice Bridge**

	Link	To Roundabout (PCU*)	From Roundabout (PCU)	Two-way (PCU)	AADT (PCU)
<b>AM</b>	R448 Terminus St	1,106	486	1,592	19,249
	R711 Dock Road	670	520	1,190	14,396
	Rice Bridge	964	1,720	2,683	32,451
<b>PM</b>	R448 Terminus St	577	917	1,494	15,458
	R711 Dock Road	760	1,116	1,875	19,403
	Rice Bridge	1,921	1,254	3,175	32,852

**Table 5.3 HGVs AM and PM Peak Flows on the R448, R711 and Rice Bridge**

	Link	To Roundabout	From Roundabout	Two-way	AADT
<b>AM</b>	R448 Terminus St	54	79	133	1,608
	R711 Dock Road	27	33	60	726
	Rice Bridge	60	71	131	1,584
<b>PM</b>	R448 Terminus St	21	80	101	1,045
	R711 Dock Road	26	19	45	466
	Rice Bridge	34	39	73	755

The highest level of traffic load is recorded along onto Rice Bridge during AM and PM peak.

## 5.4 Description of Potential Impacts

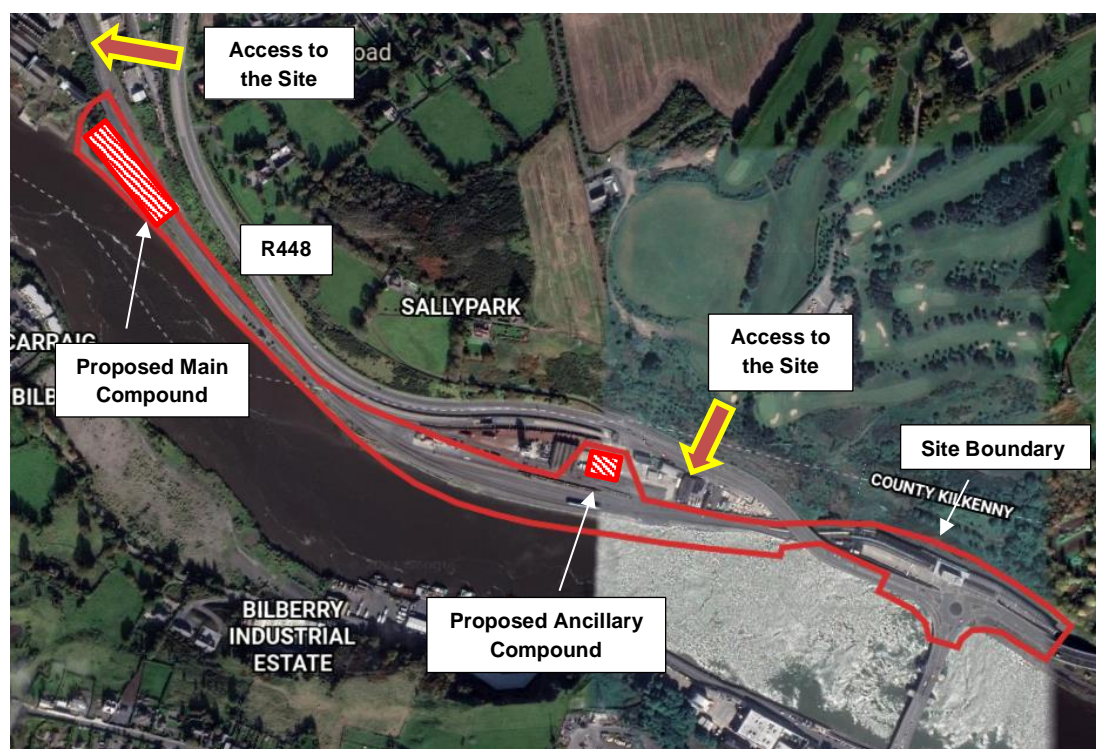
### 5.4.1 Construction Phase Impacts

#### Construction Traffic Access Routes

The main proposed construction compound area is situated at Newrath approximately 1,300m northwest of Rice Bridge Roundabout, and is accessed via the L3408 via a level crossing over the railway line to a site located between the River Suir and the Railway. The land is in the ownership of Córas Iompair Éireann (CIÉ) and is operated by Iarnród Éireann (IÉ). It is envisaged that the sheet piles for the flood defences will be loaded by crane over riverbank to a pontoon at this location before being moved for installation.

An ancillary site compound is proposed in the Iarnród Éireann's Sally Park yard, currently used for material storage, which is accessed via R448 Terminus Street approximately 450m west of Rice Bridge Roundabout. The proposed ancillary site compound has direct access to R448 Terminus Street as showed in Plate 5.9.





**Plate 5.9** View of access to the ancillary compound to Terminus St. (R448) and to the main compound via public level crossing

Any traffic travelling to/from the site will use the R448: traffic will include vehicles transporting the steel sheet pile elements, construction vehicles including cranes and other general construction traffic.

Operational phase will have no traffic impact: routine maintenance is not expected to create any relevant HGVs traffic load: only occasional accesses are envisaged.

#### **5.4.1.1 Main construction phases**

The main activities during the construction stage of the Flood Defences West involve remedial works to the existing masonry wall, the construction of a sheet pile flood defence wall, upgrading the existent drainage network and upgrading the existing drainage outfalls. With the exception of the construction of overground flood protection measures for the Rice Bridge roundabout, the proposed works will be located strictly between the River Suir and the rail lines (from Ch.0.0 to Ch.1090 as shown on Figures 4.1 to 4.6 in Volume 3 of this EIAR): part of the proposed works will extend on to the riverside, with part on the landside area. A brief description of the proposed works has been provided below (see Chapter 4 of this EIAR for detailed description):

- **Remedial Works on concrete/ masonry wall:** Remedial works to existing masonry quay wall to increase its height by between 0.6m and 1.2m to achieve the design (top-of-wall) level of +4.30mOD. The remedial works will likely involve the construction of a reinforced concrete wall add-on to prevent the seepage through the deteriorating existing masonry wall. The estimated duration of the construction works is 4 weeks.
- **Flood defences in front of the Plunkett Station:** Construction of c.365m of underground flood defences in the form of an impermeable shallow trench (approx. 1m in width and up to 3m in depth) within the car parking areas of Plunkett Station. The construction duration is approximately 2.5 months (10

weekends) and 2 weeks at the eastern and western car parking areas respectively.

- **Overground Flood Defences** consisting of c.170m of glass flood barrier on the river side of the road edge vehicular parapets on Rice Bridge roundabout and along the 3 roundabout arms (R680 Rice Bridge, R448 Terminus St., and R711 Dock Rd). c.15m of demountable flood barriers are also proposed on the R680 Rice Bridge for the section leading to the North Quays Strategic Development Zone. The estimated duration for the construction works is approximately 6-8 weeks.
- **New sheet pile flood defence walls:** The new flood defence wall will be constructed on the landside in IÉ lands and within the foreshore (riverside) of the River Suir. The total length of the wall is approximately 730m. Precast concrete cladding (“eco-wall”) will be fitted to the intertidal zone of the new riverside sheet pile wall from the riverside. The estimated duration for the construction works is approximately 12 weeks for the new flood defence wall and 2-3 weeks for attaching cladding to the sheet pile wall.

Landside sheet piling will include the construction of a new landside sheet pile wall and a 20m long underground isolation structure. The estimated construction duration is 7-8 weeks.

**Drainage:** Part of the proposed works will be carried out on the landside within IÉ lands and within the foreshore of the River Suir. The drainage works will include:

- Remedial measures to the existing drainage outfalls to the River Suir
- Construction of new trackside drainage, groundwater drains, and outfall structures to the River Suir.
- Construction of 2 no. pumping stations.

The estimated duration of drainage works is approximately 22-24 weeks.

The total construction phase for the proposed development is approx. 30 – 35 weeks. All construction works described above will be undertaken during normal working hours, 6 days per week, Monday to Saturday. Night-time works will also be required to construct the underground isolation structure, sections of drainage landside sheet pile wall, where rail possession is required. Night-time works will be carried out for 5 days a week, from Monday evening to Friday morning.

#### **5.4.1.2 Construction Stage Traffic**

##### **Remedial Works on concrete/ masonry wall**

The proposed remedial works to the existing quay wall will require approximately 50m<sup>3</sup> of imported concrete. The amount of exported material is negligible.

Based on a standard construction dump truck volume capacity of 9m<sup>3</sup> and since the importing / exporting of this material should be carried out for 6 days per week, for approx. 4 weeks, this will generate 2 HGVs movements per day.

##### **Flood defences in front of the Plunkett Station**

The construction of the impermeable trench in front of the Plunkett Station will require 350 m<sup>3</sup> of imported concrete. The excavated soil to be exported has been estimated at 350 m<sup>3</sup> which will be disposed of at a suitably licensed facility.

Considering a standard construction dump truck volume capacity of 9 m<sup>3</sup> and 10 weeks timeframe to import/ export this material, 6 days per week, this will generate 4 HGV movements per day.

### **Overground Flood Defences**

Approximately 120 glass barriers will be imported to provide overground flood defences for Rice Bridge roundabout and the three roundabout arms (as described above). The approximate total weight of the glass barriers is 8.16 tonnes and considering that works will be carried out over six weeks, 6 days each, 2 extra flatbed trucks will be required per day.

### **Sheet Pile Wall**

Approximately 2,000m<sup>3</sup> of imported fill material is required to backfill the area between the existing quay wall and the landside sheet pile wall.

Approximately 720m<sup>3</sup> of waste will be generated during the demolition works of the existing quay wall which will be exported off-site and disposed at an appropriate licenced facility.

A total amount of material to be imported / exported has been estimated at 2,720m<sup>3</sup>. Based on a standard construction dump truck volume capacity of 9m<sup>3</sup>, 295 loads will be necessary, resulting in the total of 590 two-way HGV movements. Since the importing / exporting of this material will be carried out over 6 days per week, for 12 weeks, this will generate 3 HGV movements per day.

The proposed development will also require the import of pre-cast cladding material ("eco-wall") to be attached to the installed riverside flood defence sheet pile wall. Approximately 1,500 m<sup>3</sup> of this material will be needed and imported over a timeframe of 2 weeks, 6 days per week, resulting in 6 extra flatbed trucks per day.

The proposed development will also require the import of steel sheet piles for construction of the new sheet pile flood defence wall. Approximately 1,400 tonnes of steel sheet piles, equating to approximately 1,043 individual sheet piles will be required to construct the proposed flood defence wall, requiring 73 flatbed trucks. This will result in 146 two-way HGV movements to deliver the steel sheet piles. Daily delivery of materials to construction compounds is not expected to be required, however for the purposes of the traffic analysis, it is assumed that delivery will occur for 12 weeks as the worst-case scenario. Based on deliveries for 6 days per week, this therefore equates to approximately 3 HGV movements/day during that timeframe.

### **Drainage Elements**

Drainage works will need a further 2,570m<sup>3</sup> of imported material. Approximately 1,300m<sup>3</sup> of surplus excavation will also be generated, which will have to be disposed off-site at a suitably licensed facility.

A total amount of imported / exported material has therefore been estimated at 3,870 m<sup>3</sup> for the drainage elements of the proposed development. The delivery of materials to construction compounds for drainage works will occur intermittently over 22 to 31-weeks.

When all of the delivery times are combined, it is assumed that a total of 16 weeks, based on a 6-day week, will be required for materials transport. As the worst-case

scenario, it anticipated that 6 to 10 HGV movements/day will be required for the drainage elements.

In relation to the pumping stations, the proposed development requires 3 pumping chambers and smaller valve chambers: it has been assumed that 4 HGV movements/day will be required over a timeframe of 9 weeks.

To upgrade the existing drainage network, 1,309m of pipes will be required: considering 9 weeks to carry out works over 6 days per week, 2 HGV movements in total will be required.

### **Peak Construction Traffic Movements**

Considering the phases sequence for the proposed works, the peak of the HGV traffic load is estimated to occur for a total of 7 weeks of the 30-35-week construction programme. The peak loads are associated with the coinciding construction timeframes for construction of the impermeable trench, the sheet pile wall, installation of cladding and drainage works which will result in an increase in the number of HGVs on the existing road network of between 26 and 32 HGV movements/day over 7 weeks.

At the peak of the construction stage, the proposed development will result in an 0.1% increase in total traffic movements and an increase of 1.2% in HGV movements over the course of a working day on the R448 Terminus Street. This is likely to have *negative, temporary, not significant* impacts on the existing road network.

Lower construction traffic movements are expected during the remainder of the construction programme, ranging from 4 to 20 HGV movements per day.

### **5.4.2 Operation Phase Impacts**

There are no predicted impacts on traffic as a result of the operational stage. Periodic maintenance works will be required during the operation phase of the proposed development however these works are not likely to generate significant volumes of traffic. As such, due to the nature of the proposed development it will not generate traffic and will not impact permanently on the current road network.

The proposed development will protect the existing rail and road infrastructure within the site boundary from future flood events, which will have a *positive, permanent* impact on transport.

## **5.5 Mitigation & Monitoring Measures**

No mitigation measures are deemed necessary as no significant impacts are predicted as standard best practice measures are incorporated into the project design.

## **5.6 Residual Impacts**

The residual impacts of the proposed development will result in a positive effect to the existing transport network, providing flood protection to the railway line and train station, road network and surrounding lands.

## **5.7 Difficulties Encountered**

No difficulties were encountered in undertaking this traffic and transport assessment.

## 5.8 References

Waterford City Development Plan, 2013 – 2019.

NRA 'Traffic and Transport Assessment Guidelines', 2014.

RSA Road Collision Data from [www.rsa.ie](http://www.rsa.ie)

