



## **Engineering Assessment Report**

Mixed Use Development at Clongriffin, Dublin 13  
Strategic Housing Development Application No. 1

August 2019

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### Quality Assurance – Approval Status

This document has been prepared and checked in accordance with  
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

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<b>Issue</b>	<b>Date</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>
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### Comments

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# 1. Introduction

## 1.1 Background of Report

This report has been prepared by Waterman Moylan as part of the documentation in support of a Strategic Housing Development (SHD) planning application for 1,030 residential units and 2,286m<sup>2</sup> of commercial space at Blocks 6, 8, 11, 17, 25, 26, 27, 28 and 29 in Clongriffin, Dublin 13.

This application is being submitted concurrently along with two other applications consisting of a second SHD application for 500 residential units and 3,125m<sup>2</sup> of commercial space and a planning application to Dublin City Council (DCC) for 420 residential units and 17,317m<sup>2</sup> of commercial space.

Application	Block Numbers	Total No. of Residential Units	Ancillary Facilities (m <sup>2</sup> )	Commercial Floor Area (m <sup>2</sup> )	Total Floor Area (m <sup>2</sup> )
Strategic Housing Development: Application No.1	6, 8, 11, 17, 25, 26, 27, 28 and 29	1,030	2,421m <sup>2</sup>	2,286m <sup>2</sup>	105,944m <sup>2</sup>
<i>Strategic Housing Development: Application No.2</i>	<i>4, 5 and 14</i>	<i>500</i>	<i>1,094m<sup>2</sup></i>	<i>3,125m<sup>2</sup></i>	<i>51,840m<sup>2</sup></i>
<i>Planning Application to Dublin City Council</i>	<i>3, 13 and 15</i>	<i>420</i>	<i>820m<sup>2</sup></i>	<i>17,317m<sup>2</sup></i>	<i>65,772m<sup>2</sup></i>
<b>Total</b>	<b>15 Blocks</b>	<b>1,950</b>	<b>4,335m<sup>2</sup></b>	<b>22,728m<sup>2</sup></b>	<b>223,556m<sup>2</sup></b>

**Table 1** | Schedule of Accommodation by Application

These three applications form part of an infill site that was previously granted planning permission by Dublin City Council as part of the Clongriffin residential and commercial development, Reg. Ref. 0132/02, PL29N.131058. The permitted Clongriffin parent planning permission originally received planning permission for 3,520 dwellings and c. 85,000m<sup>2</sup> of commercial floor space. Subsequent amendments increased the permitted commercial development to c. 100,000m<sup>2</sup>.

The roads and drainage infrastructure in the vicinity of the subject Blocks (SHD Application 1) have been constructed under the Clongriffin parent planning permission, with the exception of a section of Station Street to the west of Blocks 8, 11 and 28. The main trunk drainage has been constructed along the alignment of Station Street to serve these Blocks; however, the road and watermain have yet to be constructed.

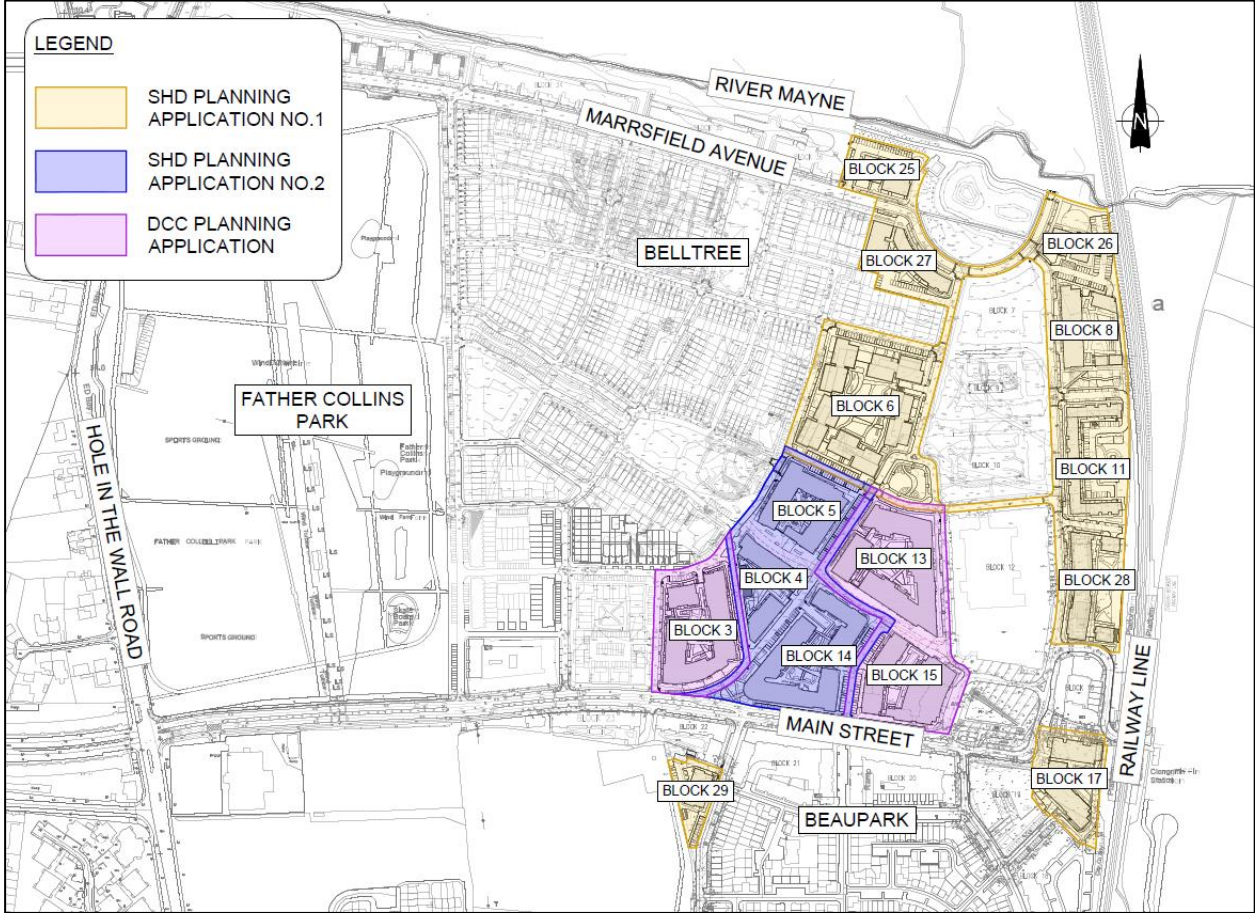
This report details the criteria used to design and detail the foul water drainage, surface water drainage, water supply and road network required to serve the subject blocks. While the infrastructure serving the site has been substantially constructed under the Clongriffin parent planning permission, it is proposed to complete and improve where possible the roads, drainage and watermains under this submission.

## 1.2 Site Location and Description

The Clongriffin site is bounded to the north by the Mayne River, to the east by the Dublin–Belfast railway line, to the west by Fr. Collins Park and to the south by the Grange Road.

The site generally slopes down from the south-west to the north-east, towards the Clongriffin regional attenuation pond at the north of the site, with a road centreline level of approximately 10.6m OD Malin south of Block 29 and a road centreline level of approximately 5.6m OD Malin north of Block 26.

The subject development consists of nine 'infill' sites comprising of a combined area of 6.332 hectares. Refer to Figure 1, below, which indicates the SHD Application 1 Blocks 6, 8, 11, 17, 25, 26, 27, 28 and 29 sites within the overall Clongriffin Development.



**Figure 1 | Subject Development Blocks**

Blocks 6, 25 and 27 are located at the eastern edge of the existing Belltree and Marrsfield developments and are bounded to the east by Lake Street, to the north by the River Mayne and attenuation pond, and to the south by Dargan Street.

Blocks 8, 11, 26 and 28 are located along the eastern edge of the Clongriffin Development and are bounded to the east by the railway / Dart line and to the west by the existing Block 12 and three other Blocks (7, 9 and 10) which are subject to future development by others. The Block 26 site is bounded by the attenuation pond to the west and the River Mayne to the north.

Block 29 is located south of Main Street and is bounded by Grange Lodge Avenue to the east, while the Block 17 site is located south of Bridge Street and east of Station Square, and is bounded to the east by the railway / Dart line.

The accompanying Waterman Moylan drawings 18-059-P1000 to P1030 show the site location with the existing and planning approved Clongriffin development as background information. The drawings highlight the extent of buildings and roads which have already been constructed under the previous Clongriffin parent permission. A schedule of accommodation for the subject development and for the two concurrent applications is set out in Table 2 overleaf, indicating the number of residential units and the quantum of commercial floor space for each block.



### 1.3 Proposed Development

The subject development comprises of 1,030 apartments and 2,286m<sup>2</sup> of commercial floor area. The site is served by existing infrastructure constructed under the parent planning permission. The infrastructure includes foul water drainage, surface water drainage and watermains built within the existing roads around the subject sites. The proposed development will provide for roads, drainage (foul water and surface water), water supply and utilities to serve the subject development.

Application	Block Numbers	Total No. of Residential Units	Ancillary Facilities (m <sup>2</sup> )	Commercial Floor Area (m <sup>2</sup> )	Total Floor Area (m <sup>2</sup> )
Strategic Housing Development: Application No.1	Block 6	270	795	418	25,470
	Block 8	114	252	0	11,983
	Block 11	96	15	0	9,316
	Block 17	210	590	431	22,789
	Block 25	63	159	0	5,898
	Block 26	78	326	0	7,396
	Block 27	57	175	508	6,695
	Block 28	122	109	929	14,348
	Block 29	20	0	0	2,049
	<b>Subtotal</b>	<b>1,030</b>	<b>2,421</b>	<b>2,286</b>	<b>105,944</b>
Strategic Housing Development: Application No.2	Block 4	74	205	799	10,438
	Block 5	138	144	393	14,942
	Block 14	288	745	1,933	26,460
	<b>Subtotal</b>	<b>500</b>	<b>1,094</b>	<b>3,125</b>	<b>51,840</b>
Planning Application to Dublin City Council	Block 3	141	147	4,523	20,285
	Block 13	187	540	6,108	27,751
	Block 15	92	133	6,686	17,736
	<b>Subtotal</b>	<b>420</b>	<b>820</b>	<b>17,317</b>	<b>65,772</b>
<b>Total</b>	<b>15 Blocks</b>	<b>1,950</b>	<b>4,335</b>	<b>22,728</b>	<b>223,556</b>

**Table 2 | Schedule of Accommodation by Block**

The proposed development is to be constructed in four phases, as indicated in Figure 2, below. It is anticipated that construction of Phase 1 will commence shortly after receipt of planning approval. The estimated programme for the development shall therefore commence in 2020, with completion of all phases expected to be completed by 2025.

The construction of each block will be divided into two stages, which will include, in broad terms, the following:

- Stage I: Site clearance and construction of associated infrastructure including drainage, water supply, utilities and roads.
- Stage II: Construction and subsequent fitting out of the apartment units and commercial space.

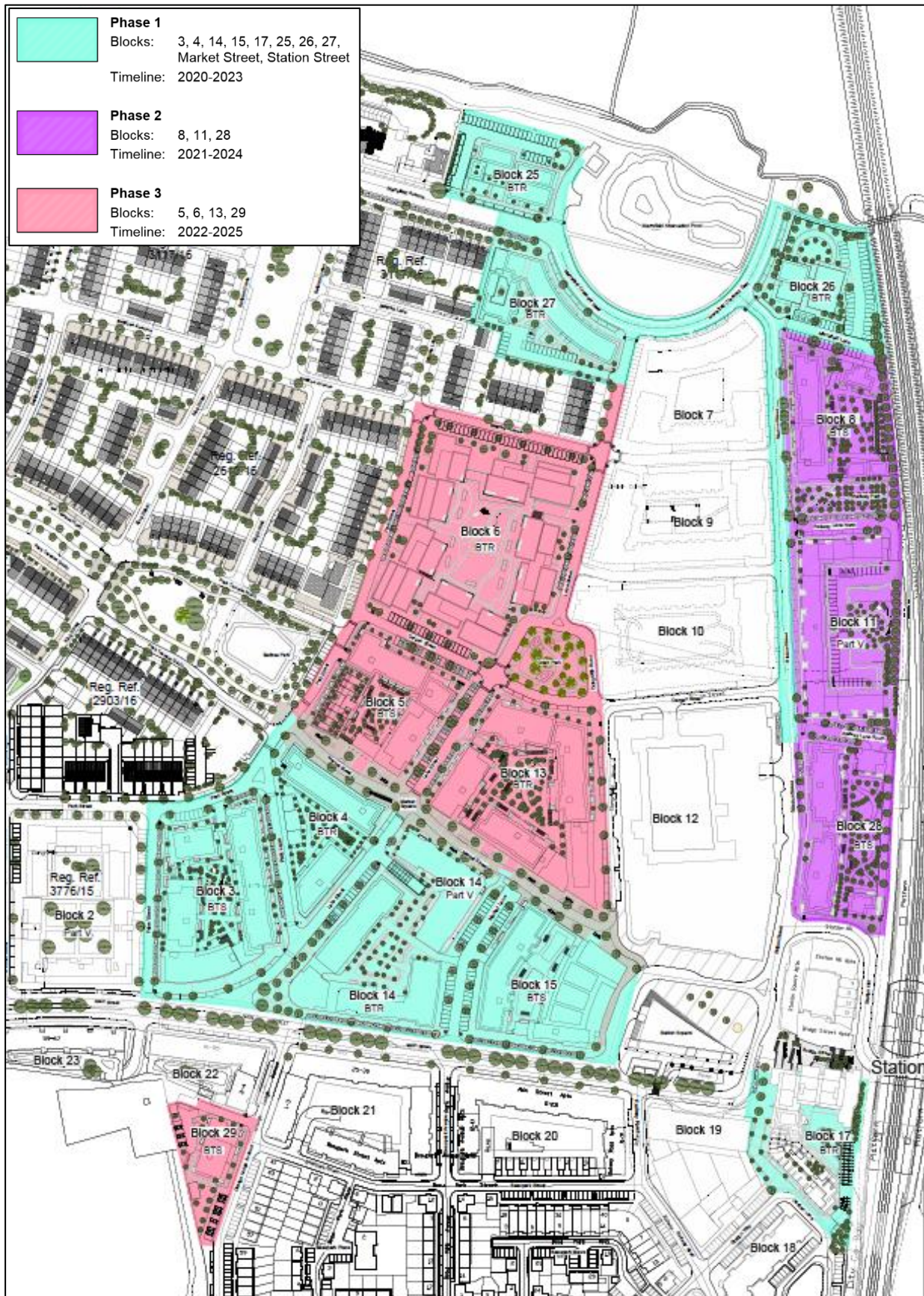


Figure 2 | Indicative Phasing Plan

## 2. Foul Water Network

### 2.1 Existing Foul Water Drainage

The entire Clongriffin development drains by gravity to the Clongriffin Pumping Station on Marrsfield Avenue to the north of Clongriffin through a series of existing 225mm, 300mm and 450mm diameter foul sewers within the road network.

The pumping station was designed and constructed to accommodate the full development of the Clongriffin lands and was taken in charge by Dublin City Council Drainage Division, subsequently coming under the ownership of Irish Water.

As part of the pre-connection enquiry with Irish Water, it was confirmed that the pumping station has more than sufficient capacity to cater for the proposed development. On 10 April 2019, Irish Water provided a Statement of Design Acceptance letter which is included in Appendix A of this report.

The pumping station pumps wastewater for approximately 70m, discharging to the 1,600mm diameter North Fringe Northern Interceptor Sewer (NFNIS) which is located within the reservation of Marrsfield Avenue, running west-east through the site. The NFNIS has been designed to accommodate the Clongriffin Development and discharges eastwards to Sutton Pumping Station and ultimately to the Ringsend Waste Water Treatment Works.

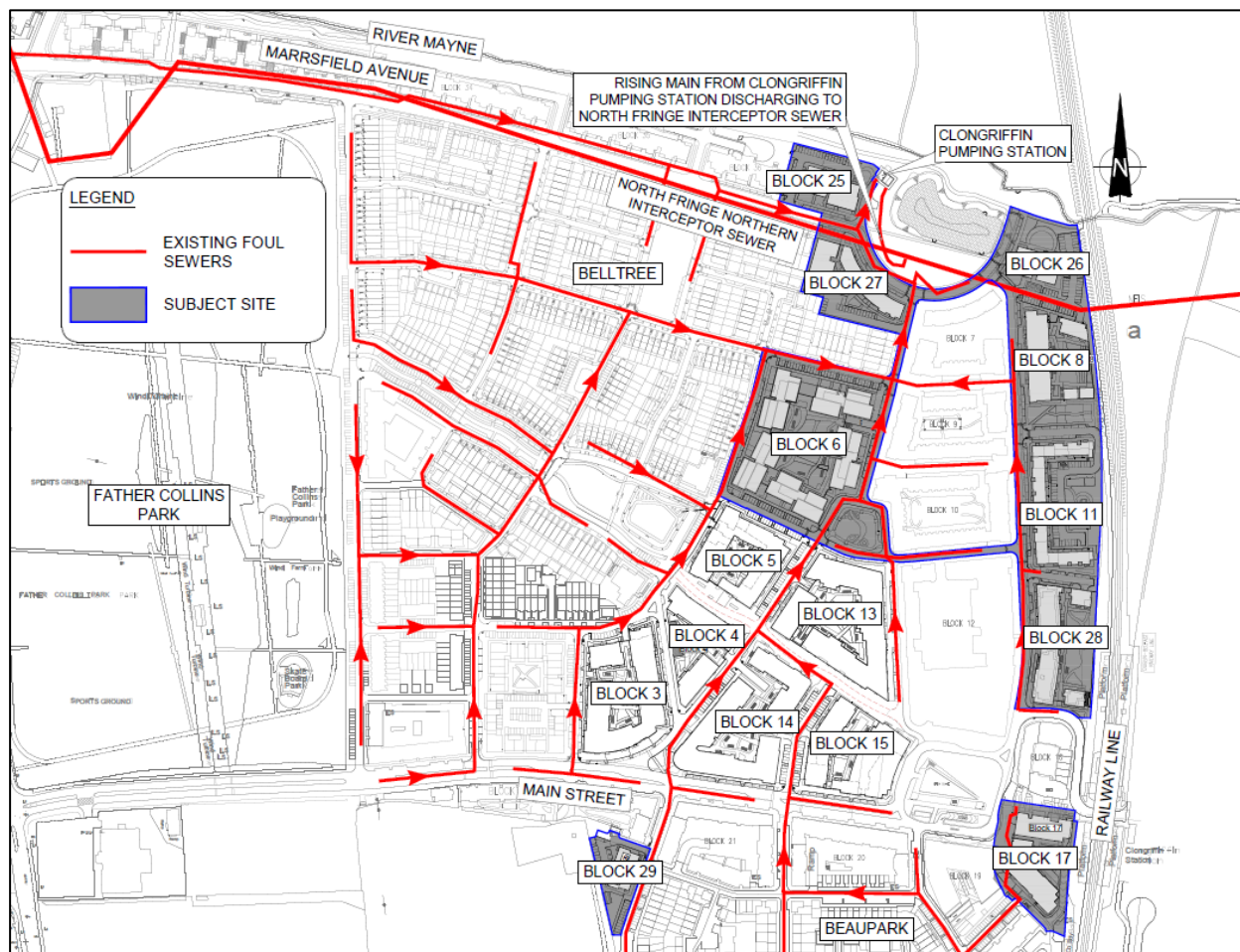


Figure 3 | Existing Foul Water Layout

The existing foul sewers serving the Clongriffin development have been constructed under the parent planning permission. The network has been designed and constructed to accommodate the subject development blocks.

Refer to drawing 18-059-P1200 which accompanies this report and which shows the existing trunk foul drainage network for the entire Clongriffin North site. The drawing shows the Clongriffin Masterplan layout in the background, indicating the buildings and roads which have been constructed to date. Refer also to Figure 3, above, which shows the existing foul water network.

## 2.2 Proposed Foul Water Drainage

It is proposed to discharge foul water from the subject Blocks directly to the existing foul water system in front of each block, outlined above in Section 2.1.

On 13 September 2018, in response to a Pre-Connection enquiry submission, Irish Water confirmed that foul connections to the existing foul network for the subject Blocks are feasible without any additional works.

Following the issue of Waterman Moylan final detail design drawings, Irish Water subsequently replied with their Statement of Design Acceptance letter on 10 April 2019, which is provided in Appendix A of this report.

Refer to drawings 18-059-P1200 to P1204 which accompany this report for the existing and proposed foul water drainage layouts for the subject sites.

## 2.3 Foul Water Drainage Calculations

The existing foul water network was modelled on MicroDrainage for the entire Clongriffin development which includes the Blocks subject to this application.

The foul water flows for the subject application are set out in Table 3, below. Domestic wastewater loads have been calculated based on 2.7 persons per residential unit with a per capita wastewater flow of 150 litres per head per day along with a 10% unit consumption allowance, in line with Section 3.6 of the Irish Water Code of Practice for Wastewater Infrastructure. A peak flow multiplier of 3 has been used, as per Section 1.2.5 of Appendix C of the Code of Practice, with commercial flow rates taken from Appendix D of the Code of Practice.

Description	Quantity	Total Population	Load per Capita	Daily Load	Total DWF	Peak Flow
		No. People	l/hd/day	l/day	l/s	l/s
Residential	1,030 No.	2,781 Residents	150	458,865	5.311	15.933
Retail	1,106m <sup>2</sup>	50 Staff	45	2,475	0.029	0.086
		200 Customers	15	3,300	0.038	0.115
Leisure	254m <sup>2</sup>	20 Staff	45	990	0.011	0.034
		15 Customers	15	248	0.003	0.009
Crèche	926m <sup>2</sup>	25 Staff	45	1,238	0.014	0.043
		119 Children	50	6,545	0.076	0.227
<b>Total Domestic</b>					<b>5.311</b>	<b>15.933</b>
<b>Total Commercial</b>					<b>0.171</b>	<b>0.514</b>
<b>TOTAL</b>					<b>5.482</b>	<b>16.447</b>

**Table 3** | Calculation of Total Foul Water Flow from the Development

Dry Weather Flow (DWF) from the Development = 5.482 l/s

Peak Flow (3 x DWF) = 16.447 l/s

## **2.4 Foul Water Drainage – General**

Additional foul water sewers will be constructed strictly in accordance with Irish Water requirements. No private drainage will be located within public areas.

Drains will be laid to comply with the requirements of the latest Building Regulations, and in accordance with the recommendations contained in the Technical Guidance Document H.

### 3. Surface Water Network

#### 3.1 Existing Surface Water Drainage

The subject lands are served by an existing storm water drainage system approved and constructed under the Clongriffin parent planning Reg. Ref. 0132/02. The system was modelled on MicroDrainage and the sizing and gradients of the surface water sewers were based on a storm return period (N) of 5 years. Pipe capacities and velocities have been calculated using a roughness coefficient (Ks) of 0.6mm.

The surface water sewers constructed under the parent planning permission discharge to the regional Clongriffin attenuation pond at the northeast of the Clongriffin scheme before discharging to the Mayne River at a controlled rate of 249 l/s, as permitted under the parent planning permission. The attenuation pond was designed and sized to accommodate rainfall events exceeding the 1 in 100 year return and has over 6,400m<sup>3</sup> of attenuation storage on top of a permanent volume of approximately 2,500m<sup>3</sup>.

Drawing 18-059-P1200 shows the existing surface water drainage layout for the site. The drawing shows the Clongriffin Masterplan layout in the background, indicating the buildings which have been constructed. Refer also to Figure 4, below, which shows the existing surface water network located in front of each of the Blocks subject to this planning application.

As agreed with Dublin City Council, SuDS devices have been incorporated into the more recent Clongriffin developments, mainly within Belltree, in the form of filter drains, permeable paving driveways and road-side parking bays and bioretention tree-pits / planted areas.

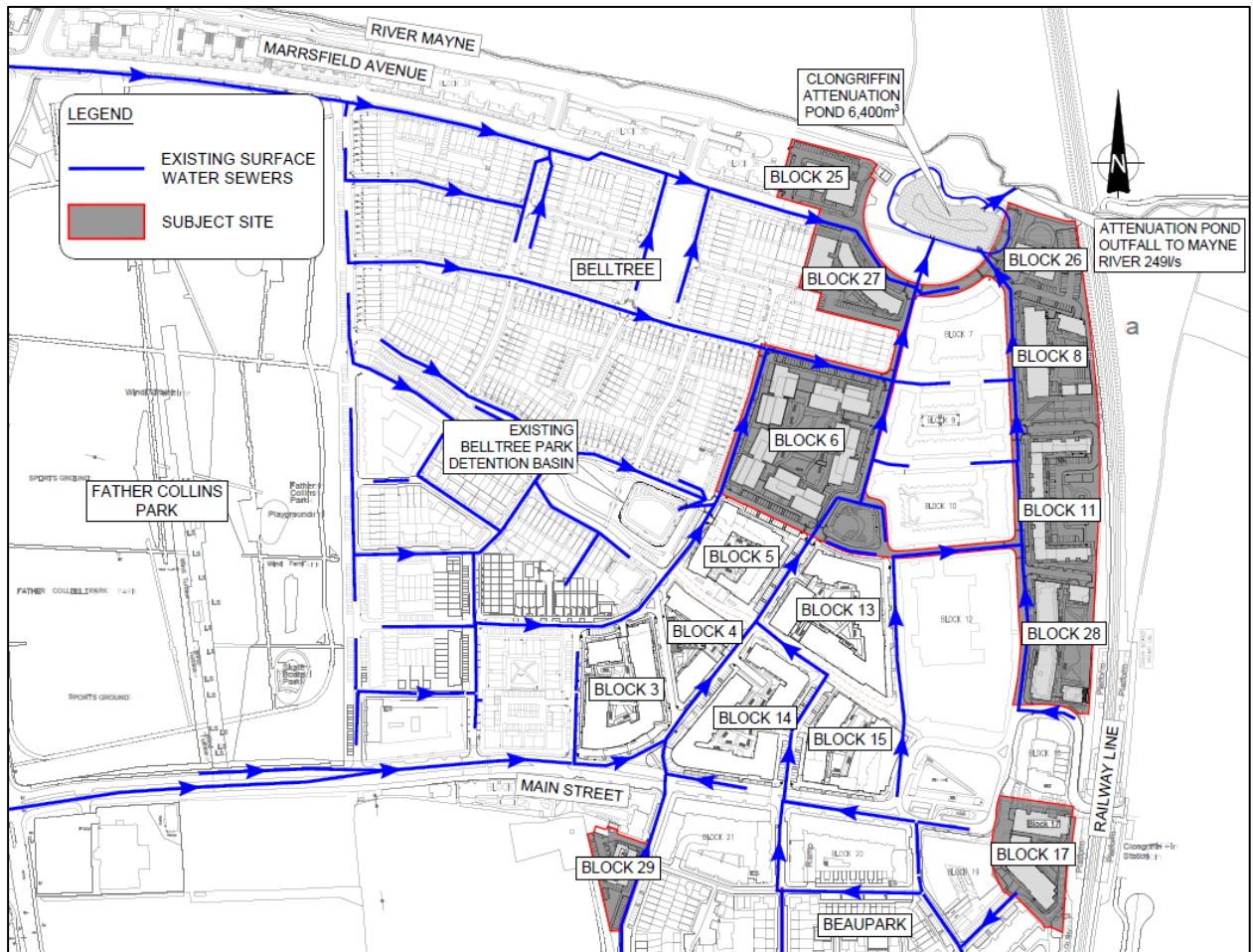


Figure 4 | Existing Surface Water Layout

## 3.2 Proposed Surface Water Network and SuDS Strategy

### 3.2.1 Storm Water Management Plan

Under the parent planning permission, granted in 2003, it was proposed to drain surface water runoff from the Clongriffin development, including the Blocks subject to this planning application, directly into the surface water sewers. As part of the Clongriffin Storm Water Management Plan, it was agreed with Dublin City Council that the surface water run-off from the Clongriffin development would be treated and attenuated within the Clongriffin attenuation pond before discharging to the Mayne River.

In recent years, planning permissions within Clongriffin have been agreed and approved with Dublin City Council on the basis of providing additional Sustainable Drainage System (SuDS) devices at source to treat and slow down surface water runoff before discharging to the attenuation pond.

As part of this planning application, it is now proposed to incorporate a Storm Water Management Plan though the use of extensive SuDS techniques to treat and minimise surface water runoff from the subject blocks at source. The methodology involved in developing a Storm Water Management Plan for the subject sites is based on recommendations in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual, CIRIA C753.

Based on three key elements – Water Quantity, Water Quality and Amenity – the targets of the SuDS train concept have been implemented in the design.

The SuDS train provides SuDS devices for each of the following:

- Source Control – on-site within each Block,
- Site Control – public roads within the development,
- Regional Control – Clongriffin attenuation pond

The SuDS devices proposed throughout the subject application consist of the following:

#### Source Control

- It is proposed to provide open grassed areas with low level planting and permeable paving in the internal courtyards at the ground floor podium level of each block. This will act as soft scape and will significantly slow down and reduce the amount of surface water runoff from the courtyard/podium level.
- Planter boxes, planted areas and permeable paving areas will also take surface water runoff from the down pipes fronting onto the internal courtyard areas.
- Green roofs and Sedum roofs are proposed for several blocks to minimise the runoff, consisting of 75mm substrate with a sedum blanket. The paved areas on these roofs will drain to the planted areas.
- Filter drains are proposed around the perimeter of each block. Rainwater pipes from the roofs of the surrounding buildings will be directed to the filter drains, via a planter box where appropriate. The filter drains consist of perforated pipes surrounded in filter stone that provide for linear collection and treatment of surface water, allowing for some infiltration into the ground. The filter drains will discharge into collector drains before eventually discharging into the storm sewer network at a significantly reduced and slower runoff rate.

#### Site Control

- Permeable paving will be utilised at public roadside parking bays providing some treatment volume, with underlying perforated pipes connecting to the storm water sewer network within the roads.

Adjacent road gullies will be connected to the underlying filter drains to treat and slow down the runoff rate by means of infiltration. Permeable paving public parking bays have been successfully incorporated within the Belltree development within recent years.

- Bio-retention tree pits or planted areas will be provided between on-road parking bays with an inlet to take surface water runoff from the parking bays and adjacent roads & footpaths. Bioretention tree pits and planted areas have been successfully incorporated into the public realm within the Belltree development within recent years.

#### Regional Control

- The Clongriffin regional attenuation pond, located in the north east of the Clongriffin development, was designed and constructed to accommodate attenuation for rainfall event greater than the 1 in 100 year return for the entire Clongriffin development, including the subject Blocks. The pond acts as the final treatment to improve the quality of the surface water discharge from the site prior to discharging to the River Mayne.

Refer to drawings P1220 to P1228 for SuDS layouts for each block and drawing P1230 for SuDS details.

### **3.3 Interception or Treatment Storage and Attenuation Storage**

The methodology involved in developing the Storm Water Management Plan for the subject site is based on recommendations in the Greater Dublin Strategic Drainage Study (GSDSDS) and in the SuDS Manual, CIRIA document C753. Appendix E of the GSDSDS sets out criteria for determining the provision of interception or treatment storage, attenuation storage and long term storage at a development site. These calculations are summarised below:

#### **3.3.1 Criterion 1: River Water Quality Protection**

##### Criteria 1.1 – Interception:

In accordance with the GSDSDS, approximately 30% to 40% of rainfall events are sufficiently small that there is no measurable runoff from greenfield areas into the receiving waters. These events are generally considered as the first 5mm of rainfall. Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 5mm of rainfall yields the following:

Paved surfaces connected to drainage system	$63,320m^2 \times 0.4 \times 0.75 =$ <b>18,996m<sup>2</sup></b>	<i>63,320m<sup>2</sup> site area</i> <i>40% of the site is paved</i> <i>75% of the paved area</i>
Volume of Interception Storage	$18,936m^2 \times 5mm \times 0.8 =$ <b>75.98m<sup>3</sup></b>	<i>Paved area directly drained</i> <i>5mm rainfall depth</i> <i>80% paved runoff factor</i>

**Table 4 | Interception Calculation**

The required interception volume is 76m<sup>3</sup>. Though some interception is anticipated, it is not proposed to provide the entire required interception volume. Criterion 1.2 will therefore be assessed below to provide the required River Water Quality Protection.

##### Criteria 1.2 – Treatment Volume:

For events larger than 5mm, and in situations where interception storage cannot be provided, surface water runoff treatment is provided using a retention pond or wetland in accordance with the CIRIA design manual C521.



Assuming 80% runoff from paved surfaces and 0% from pervious surfaces for the first 15mm of rainfall:

Paved surfaces draining to river	$63,320m^2 \times 0.4 \times 0.75 =$  18,996m <sup>2</sup>	63,320m <sup>2</sup> site area 40% of the site is paved 75% of the paved area
Volume of Treatment Storage	$18,996m^2 \times 15mm \times 0.8 =$  <b>227.95m<sup>3</sup></b>	Paved area directly drained 15mm rainfall depth 80% runoff from paved surfaces

**Table 5 | Treatment Volume Calculation**

The required treatment storage volume is 228m<sup>3</sup>. This is achieved through the use of permeable paving, bio-retention tree pits, filter drains around the perimeter of each block and green/sedum roofs consisting of 75mm substrate with a sedum blanket.

The overflow pipe from the permeable paving will be positioned 150mm above the bottom of the coarse aggregate in order to drain surface water from rainfall events that exceed the infiltration rate and provide storage below the outlet pipe. There is approximately 4,410m<sup>2</sup> of permeable paving throughout the subject site, with an underlying 150mm of course graded aggregate below the overflow outlet pipe and with 33% voids. This provides 218m<sup>3</sup> of treatment storage.

There is approximately 1,000m of filter drains (outside of the permeable paving areas) throughout the subject site, which lie on top of 150mm deep by 600mm wide course graded aggregate with 33% voids. This provides another 30m<sup>3</sup> of treatment storage.

The total treatment storage provided within the voids of the permeable paving and filter drains exceeds the required treatment storage volume of 228m<sup>3</sup>. Further treatment storage is also provided within the green / sedum roofs and bio-retention tree pits / planters and the attenuation pond which holds just under 2,500m<sup>3</sup> of permanent water volume.

The above surface water treatment devices will provide groundwater recharge, additional treatment and attenuation storage and slow down peak flows during heavy rainfall events.

**3.3.2 Criterion 2: River Regime Protection**

As per the GSDSDS, the required attenuation volume is calculated assuming 100% runoff from paved areas, and has been calculated for the 1-year, 30-year and 100-year return periods, identifying the critical storm for each.

The subject Blocks are within the catchment of and discharge to the Clongriffin regional attenuation pond, which has been approved and constructed under the parent planning permission. The pond has a permanent water volume of just under 2,500m<sup>3</sup>. Surface water from the pond discharges to the River Mayne at a controlled rate of 249l/s, as approved under the parent planning permission and subsequent planning permissions. Excess discharge flows from the development are attenuated within the regional attenuation pond which has been designed and approved to attenuate the Clongriffin Development for rainfall events up to the 1-in-100 year return period.

In addition to the regional attenuation pond, an upstream detention basin has been constructed as part of the Belltree development (Reg. Ref. 3802/14). This detention basin will attenuate a sub-catchment of Clongriffin known as Catchment B – refer to Figure 4 above.

**3.3.3 Criterion 3: Levels of Service**

There are four criteria for levels of service. These are:

- Criterion 3.1: No external flooding except where specifically planned (30-year high intensity rainfall event).
- Criterion 3.2: No internal flooding (100-year high intensity rainfall event).
- Criterion 3.3: No internal flooding (100-year river event and critical duration for site storage).
- Criterion 3.4: No flood routing off site except where specifically planned (100-year high intensity rainfall event).

Both internal and external flooding have been assessed in the Flood Risk Assessment report which accompanies this Engineering Assessment report. The Flood Risk Assessment has been carried out in accordance with the *DEHLG/OPW Guidelines on the Planning Process and Flood Risk Management* published in November 2009.

The assessment identifies the risk of both internal and external flooding at the site from various sources and sets out mitigation measures against the potential risks of flooding. The sources of possible flooding assessed in the report include coastal, fluvial, pluvial (direct heavy rain), groundwater and human/mechanical errors.

As a result of the flood risk management and mitigation measures proposed, the residual risk of internal or external flooding for the 30-year and 100-year flood events is low, and accordingly all four of the above criteria have been met. Please refer to the accompanying Flood Risk Assessment report for the full analysis of the flood risk at the subject site.

### 3.3.4 Criterion 4: River Flood Protection

The long term storage volume is a comparison of pre- and post-development runoff volumes. The objective is to limit the runoff discharged after development to the same as that which occurred prior to development.

Of the three methods described in the GSDSDS for establishing River Flood Protection by comparison of the pre- and post-development runoff volumes, (Criteria 4.1, 4.2 and 4.3 respectively), Criteria 4.3 is selected for use as the most practical criteria at this stage in the design.

The Criteria 4.3 approach is for all runoff to be limited to either  $Q_{BAR}$  or to 2 l/s/Ha, whichever is the greater. The proposed drainage system includes flow control devices to ensure that the discharge rate is limited to the greenfield equivalent and ample attenuation is provided for the 1-in-100 year storm, accounting for a 20% increase due to climate change.

Note that as stated in the GSDSDS, the extra runoff volume from the development over the greenfield runoff,  $Vol_{xs}$ , is not additional to the attenuation storage volume but is effectively an element of it.

## 3.4 Surface Water – General

Surface water sewers will be laid strictly in accordance with Dublin City Council requirements for taking in charge. It is intended that all sewers within the public domain will be handed over to Dublin City Council for taking in charge.

All private outfall manholes will be built in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. No private drainage will be located within public areas.

Drains will be laid in accordance with the requirements of the Building Regulations, Technical Guidance Document H.

### **3.5 Flood Risk Assessment**

A site-specific Flood Risk Assessment has been carried out for the proposed development and accompanies this report under separate cover.

## 4. Water Supply

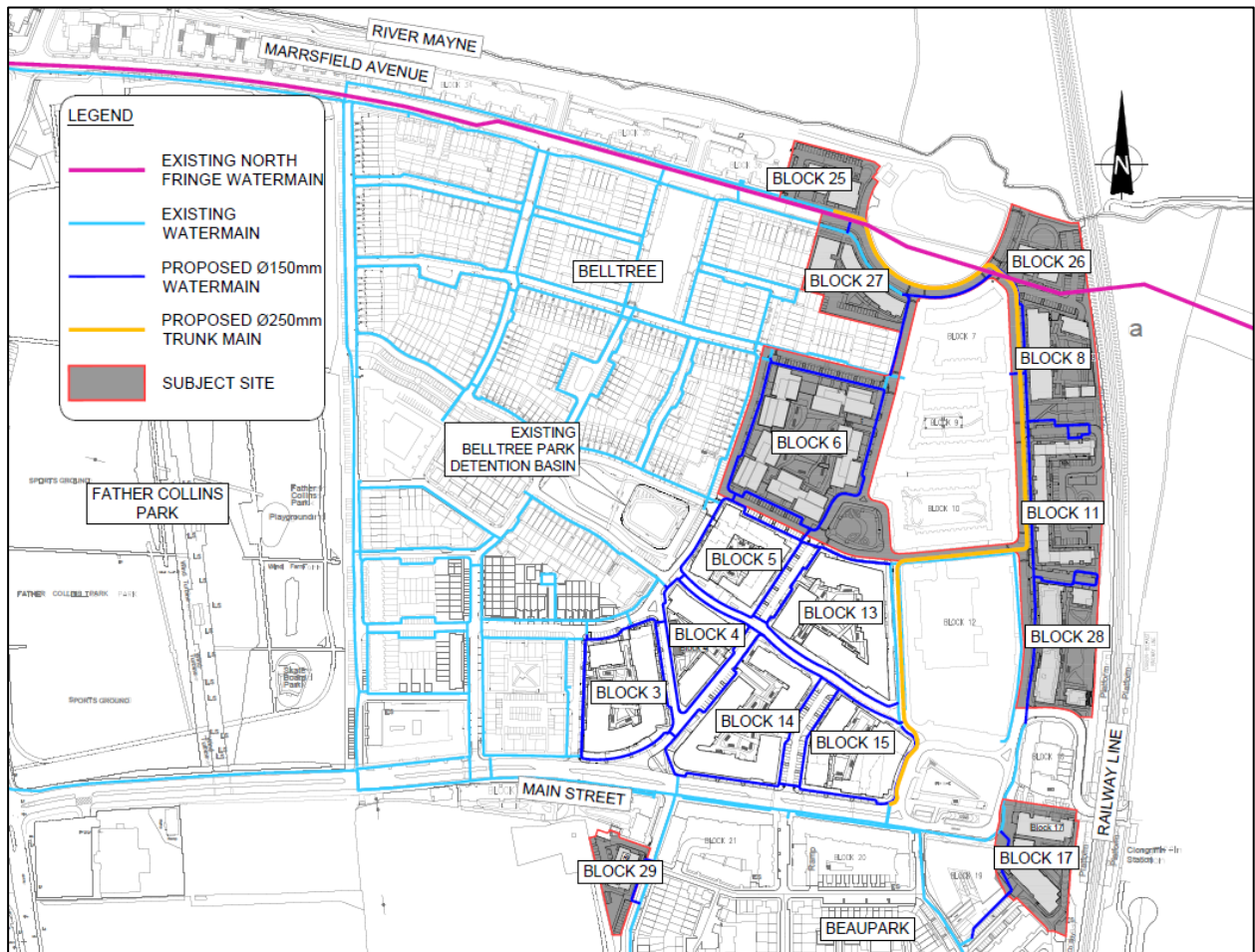
### 4.1 Existing Water Supply

The Clongriffin development is supplied by the 450mm/560mm North Fringe Watermain, which runs along Marrsfield Avenue at the north of the site. The Clongriffin development is currently served from a watermain network which has been designed and constructed under the parent planning permission Reg. Ref. 0132/02.

The Clongriffin watermain design is based on a 250mm diameter watermain looped around the site with a primary connection to the 450mm/560mm North Fringe Watermain and a secondary connection to the 350mm Hole in the Wall Road trunk main.

There are then several loops of 150mm diameter watermain from the 250mm trunk main with further loops of 100mm watermains from the 150mm mains.

The network has been designed and constructed to accommodate the subject blocks, with capped ends provided to enable future connection.



**Figure 5 | Existing and Proposed Watermain Layout**

### 4.2 Proposed Water Supply

As part of the parent planning permission it was proposed to supply water to the subject blocks via a series of 100mm and 150mm watermains which will be connected to the existing 100mm and 250mm Marrsfield

Avenue watermain. This watermain network design follows the original approved Clongriffin watermain masterplan. This subject application proposes the same general arrangement, with individual unit connections complete with meter boxes.

As part of this subject application it is proposed to complete the loop of the 250mm trunk main from Station Street to the Marrsfield Avenue, which is the primary connection from the North Fringe Watermain. Refer to drawings 18-059-P1300 to P1304 which show the extent of existing and proposed watermains.

An estimate of the water demand that will be generated by the proposed development is included in Table 6 below:

Description	Quantity	Total Population	Per Capita Water Demand	Water Demand	Average Demand	Average Peak Demand	Peak Demand
		No. People	l/hd/day	l/day	l/s	l/s	l/s
Residential	1,030 No.	2,781 Residents	150	458,865	5.311	6.639	33.193
Retail	1,106m <sup>2</sup>	50 Staff	45	2,475	0.029	0.036	0.179
		200 Customers	15	3,300	0.038	0.048	0.239
Leisure	254m <sup>2</sup>	20 Staff	45	990	0.011	0.014	0.072
		15 Customers	15	248	0.003	0.004	0.018
Crèche	926m <sup>2</sup>	25 Staff	45	1,238	0.014	0.018	0.090
		119 Children	50	6,545	0.076	0.095	0.473
<b>Total Domestic</b>					<b>5.311</b>	<b>6.639</b>	<b>33.193</b>
<b>Total Commercial</b>					<b>0.171</b>	<b>0.214</b>	<b>1.070</b>
<b>TOTAL</b>					<b>5.482</b>	<b>6.853</b>	<b>34.264</b>

**Table 6 | Calculation of Water Demand for the Development**

Based on Table 6, the average water demand that will be generated by the development is approximately 5.482 l/s, or 473.6m<sup>3</sup> per day. Irish Water have confirmed that the watermain pressures in the area are good and will have sufficient capacity for the subject development.

### 4.3 Irish Water

On 13 September 2018, Irish Water confirmed that water connections for the subject blocks are feasible.

In the feasibility letter, Irish Water requested clarification on a number of items which Waterman Moylan have since discussed and agreed in principle with Irish Water, as follows:

1. Configuration and phasing to be agreed with Irish Water – a phasing rationale is provided in Section 1.3 of this report and formed part of our submission to Irish Water to ascertain Statement of Design Acceptance.
2. A pressure reducing valve is to be provided on the existing spur from the 450mm North Fringe watermain, provided with blank flanges for future adjacent development – the applicant has agreed to provide this as part of the works.

3. Provision of a secondary watermain connection to the Hole in the Wall Road trunk Main to serve the Clongriffin development – this secondary connection is already constructed in the form of a 250mm diameter watermain which is constructed from the Hole in the Wall Road watermain, along Main Street as far as Station Square. As noted above, it is proposed to complete the loop from Station Street to the Marrsfield Avenue 250mm trunk main, as part of this application.
4. Requirement for the applicant to provide adequate storage capacity within the blocks to guarantee a flow rate to meet fire flow requirements – the applicant has committed to providing this for each block.

Following the above items being addressed with Irish Water, Waterman Moylan submitted our final watermain design drawings to Irish Water on 10 April 2019. Irish Water subsequently replied with their Statement of Design Acceptance letter which is provided in Appendix A of this report.

#### **4.4 Water Supply – General**

All watermains will be laid strictly in accordance with Irish Water requirements for taking in charge.

Valves, hydrants, scour and sluice valves and bulk water meters will be provided in accordance with the requirements of Irish Water and will be co-ordinated with the Master Plan watermain layout.

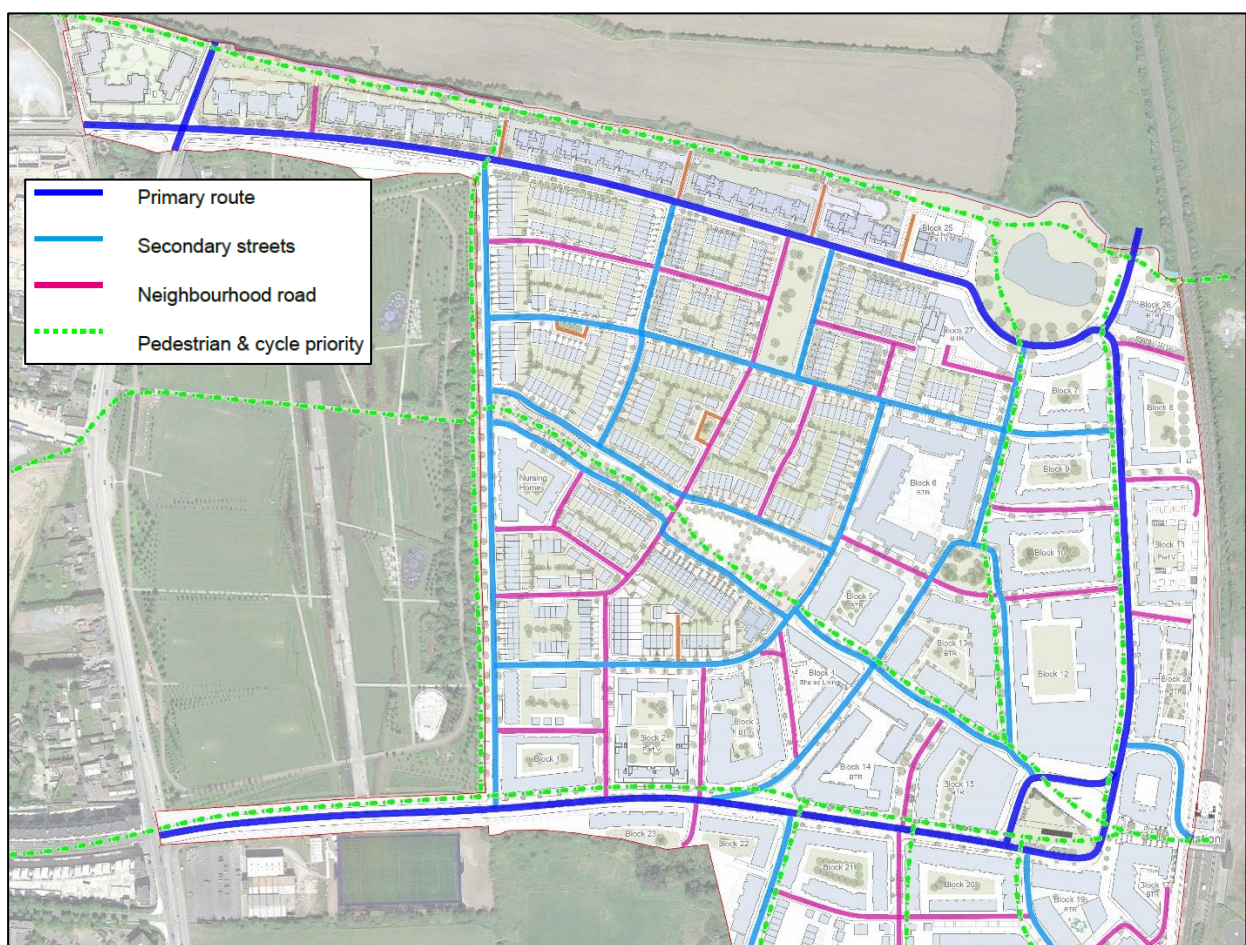
## 5. Road Network

### 5.1 Existing Roads Layout

The Clongriffin internal road network has been substantially constructed under the parent planning application, Reg. Ref. 0132/02. The internal road network connects to Hole in the Wall Road via Marrsfield Avenue to the north and Main Street to the south.

Station Street Street, which has been partly constructed, runs generally north-south through the proposed development providing a connection between Marrsfield Avenue and Main Street / Station Square.

The proposed road hierarchy and pedestrian & cycle routes throughout the site are indicated in Figure 6, below.



**Figure 6 | Road Hierarchy**

Full details of the existing road and transport infrastructure is contained in Section 2 of the Transport Assessment report which is included with this submission. Refer also to Figure 7, overleaf, which shows the existing roads and proposed road surfacing for the development.

### 5.2 Proposed Roads Layout and DMURS Statement

Though the design and construction of the main road network is substantially completed and took place prior to the recommendations of the Design Manual for Urban Roads and Streets (DMURS), the strategic design of the Clongriffin site is intended to deliver a high-quality development which accords with the

objectives and recommendations of DMURS, the stated objective of which is to achieve better street design in urban areas.

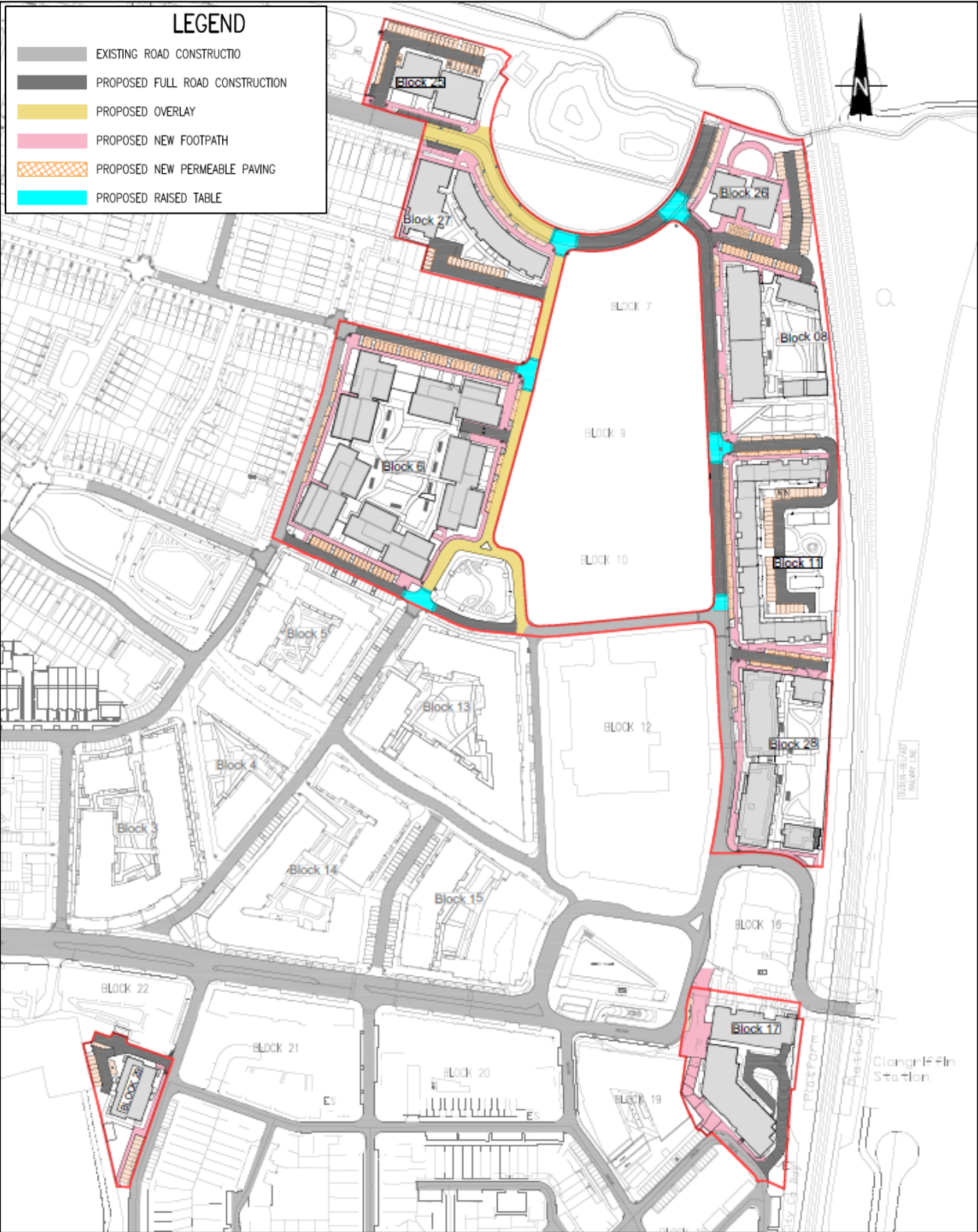


Figure 7 | Surfacing Layout



It is proposed that this submission, along with the two other referenced concurrent planning applications, will implement the recommendations of DMURS as part of this proposal to build out the remainder of Clongriffin. In order of importance, DMURS prioritises pedestrians, cyclists, public transport and private cars. The following DMURS design concept is incorporated into Clongriffin design:

- DMURS Section 3.2.2 *“Place Context”* as a *transition area* or an *area undergoing a period of transition towards more intensive forms of commercial and residential development*. The design of the public realm associated and within the development has taken into account the increased levels of pedestrian activity that has been and will be generated into the future. This has been provided with greater levels of connectivity and pedestrian movement with main links to Station Square from Main Street, Fr Collins Park (along the Green Route) and from Marrsfield Avenue.
- Vehicular and cyclist accesses together with dedicated pedestrian accesses. Pedestrian links will increase the number of walkable and cyclist routes between destinations in accordance with DMURS Section 3.3.1. Cycle tracks and wider footpaths on Main Street, pedestrian & cyclist priority along the Green Route and on road cycle track from Marrsfield Avenue & Station Street will assist along the main desire lines towards Station Square and to Fr. Collins Park.
- Station Square is a central urban area and is appropriately posted by the Roads Authority as a 30kph zone in accordance with DMURS Section 4.1.1.
- Wider footways fronting the development along Main Street and along the Green Route are proposed in accordance with the recommendations of DMURS Section 4.3.1 for areas with a moderate to high pedestrian activity.
- Street trees and landscaping has been integrated into the design of the footway along the internal roads in accordance with the recommendations of DMURS Section 4.2.2. We refer to accompanying Landscaping drawings, provided by Ronan MacDiarmada & Associates Landscape Architects.
- The corner radii of the kerb line at the local access roads have been set to 4.5m in accordance with DMURS Section 4.3.3. to facilitate the occasional large vehicle while maintaining low cornering speeds, significantly improving pedestrian and cyclist safety.
- Visibility splays at the access have been provided in accordance with DMURS Section 4.4.5. Based on a 30kph zone the stopping sight distance is given in DMURS Table 4.2 as 23m. As suggested in DMURS Section 4.4.5 the X distance of 2.0 is acceptable in areas of low speeds and with low minor arm traffic volumes. Visibility splays provided are therefore based on an X distance of 2.0m min and a Y distance of 23m minimum.

The public areas fronting and within the proposed development have been designed by the multidisciplinary design team to accommodate pedestrians and cyclists in accordance with the appropriate principles and guidelines set out the Design Manual for Urban Roads and Streets. In particular the vehicular access and public footways within the remit of the development have incorporated the relevant DMURS requirements and guidelines as set out above.

The proposed development has been designed with pedestrians and cyclists taking precedence over other modes of transport. Pedestrian and cyclist connectivity are provided throughout the development with strong links to Main Street and Station Square where the link to bus and Dart / train is available and strong links to Fr Collins Park via the Green route.

### 5.2.1 Traffic Calming

Traffic calming measures reduce traffic speeds and improve pedestrian and cyclist comfort and safety. Traffic calming has been implemented within the development generally in accordance with the recommendations of DMURS.

Where straight lengths of existing Roads are longer than 70m occur, we propose to retrofit raised tables. These raised table have been located at junctions and will also double up as pedestrian crossing locations.

A sense of enclosure also has the effect of traffic calming. On street parking and landscaping and tree planting are provided along the roads/streets which assists in providing a sense of enclosure.

### 5.2.2 Green Route

As part of this subject application and two other concurrent applications the Clongriffin Green Route which will link Station Square to Fr. Collins Part will be completed. This Green Road will be the main pedestrian and cyclist artery linking Clongriffin North (Belltree and Marrsfield Avenue) to Station Square.

The Green Route extends further west beyond Fr. Collins Park and links in with the Belmayne Green Route, providing cycle and pedestrian connectivity to Station Square which is the main transport hub for Clongriffin-Belmayne North Fringe area. Completion of this green route will provide safe connectivity for Vulnerable Road Users and will encourage residents within Belmayne and Clongriffin to walk and cycle to the Station Square for accessing the dart and train, bus stops and Go Cars, which are further detailed in the accompanying Travel Plan report.

It is proposed to provide raised tables which will give cyclists and pedestrians priority along Market Street where it crosses Priory Street, Lake Street and Clongriffin Road. Priory will be controlled by road signs and markings which will stop cars on approach to the Green Route raised table crossing points. Station Square will also be downgraded to pedestrian / cyclist priority roads by providing a shared surface area and introducing one-way vehicular direction with limited through route.

It is proposed to complete the Clongriffin Green Route within the initial phase of construction of the development with is subject to this application and two other concurrent applications.

### 5.2.3 Additional Reports

The following accompanying reports should be read in conjunction with this section:

- Transport Assessment
- Travel Plan / Mobility Management Plan
- Proposals for Parking
- Road Safety Audit (included in Appendix B)

## **Appendices**

### **A. Irish Water Statement of Design Acceptance Letter**



Gerard Gannon Properties C/O Matteo Iannucci,  
Waterman Moylan Engineering Consultants,  
Block S,  
East Point Business Park,  
Alfie Byrne Road,  
Dublin 3

10 April 2019

**Uisce Éireann**  
Bosca OP 448  
Oifig Sheachadta  
na Cathrach Theas  
Cathair Chorcaí

**Irish Water**  
PO Box 448  
South City  
Delivery Office  
Cork City

[www.water.ie](http://www.water.ie)

**Re: Design Submission for Strategic Housing Development for Blocks 6, 8, 11, 17, 25, 26, 27, 28 and 29 at Main Street, Clongriffin, Co. Dublin (the “Development”) (the “Design Submission”) / 2372787925.**

Dear Matteo,

Many thanks for your recent Design Submission.

We have reviewed your proposal for the connection(s) at the Development. Based on the information provided, which included the documents outlined in Appendix A to this letter, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at [www.water.ie/connections](http://www.water.ie/connections). Irish Water’s current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities (CRU) ([https://www.cru.ie/document\\_group/irish-waters-water-charges-plan-2018/](https://www.cru.ie/document_group/irish-waters-water-charges-plan-2018/)).

You the Customer (including any designers/contractors or other related parties appointed by you) is entirely responsible for the design and construction of all water and/or wastewater infrastructure within the Development which is necessary to facilitate connection(s) from the boundary of the Development to Irish Water’s network(s) (the “**Self-Lay Works**”), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water Representative

Name: Marina Byrne  
Phone: 018925991  
Email: [mzbyrne@water.ie](mailto:mzbyrne@water.ie)

Yours sincerely,



**Maria O’Dwyer**

**Connections and Developer Services**

## Appendix A

### Document Title & Revision

- 18-059-P1201-A Drainage Layout Sheet 1 of 4
- 18-059-P1202-A Drainage Layout Sheet 2 of 4
- 18-059-P1203-A Drainage Layout Sheet 3 of 4
- 18-059-P1204-A Drainage Layout Sheet 4 of 4
- 18-059-P1211-A Public Foul Water Drainage Construction Details
- 18-059-P1301-A Watermain Layout Sheet 1 of 4
- 18-059-P1302-A Watermain Layout Sheet 2 of 4
- 18-059-P1303-A Watermain Layout Sheet 3 of 4
- 18-059-P1304-A Watermain Layout Sheet 4 of 4
- 18-059-P1310 Watermain Construction Details Sheet 1 of 2
- 18-059-P1311 Watermain Construction Details Sheet 2 of 2

### Standard Details/Code of Practice Exemption: N/A

For further information, visit [www.water.ie/connections](http://www.water.ie/connections)

*Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.*

**B. Road Safety Audit**





Road Safety Audit  
Stage 1  
for  
CLONGRIFFIN DEVELOPMENT, DUBLIN 13

**Date:** August 2019

**Report produced for:** Waterman Moylan Consulting Engineers

**Report produced by:** Road Safety Matters

**Reference:** RSM/MOB/070918/CLONGRIFFIN – RSA1

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Company Registration No 386966 V.A.T. Reg No 6763608 D

## DOCUMENT CONTROL SHEET

<b>Client</b>	Waterman Moylan Consulting Engineers
<b>Project Title</b>	Clongriffin development, Dublin 13
<b>Document Title</b>	Stage 1 Road Safety Audit
<b>Document Ref.</b>	RSM/MOB/070918/CLONGRIFFIN – RSA1
<b>Status</b>	FINAL

### Record of Issue

Rev	Originator	Team Member	Date	Distribution
DRAFT 1	M O' B	AJS	17/9/18	Stephen Dent-Neville, Waterman Moylan Consulting Engineers
FINAL	M O' B	AJS	8/8/19	Stephen Dent-Neville, Waterman Moylan Consulting Engineers

## BACKGROUND INFORMATION

The report which follows is the Road Safety Audit - Stage 1 for the proposed road network surrounding a phased mixed use development to the north of Clongriffin in Dublin 13, based on the information supplied to the RSA Team as detailed below. The Clongriffin Development is located between Marrsfield Avenue and Main Street and involves construction of a number of residential blocks, a school, and a hotel, with associated access roads, parking and all associated ancillary works. The Audit involved an examination of a number of existing and proposed links and junctions within the development site, along with tie-ins to existing junctions and links on the surrounding road network, within the area highlighted in red outline on the location plan presented in Appendix C of this Stage 1 RSA report.

**Table 1: Information Supplied**

Item		Supplied	Comment
A	Plans / Drawings	Y	18-059-MP002-Roads Layout
			18-059 Autotrack
			18-059 Road Signage & Line Markings
			18-059 Surfacing
B	Traffic Volume Information	N	
C	Speed Count Data	N	
D	Collision Data	N	
E	Departures from Standards	N	
F	Audit Brief	Y	Road Safety Audit, Stage 1 on Clongriffin Development within red line boundary
G	Other Data / Documents	N	

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Appendix B - Photographs from Site Visit	
Appendix C - Scheme Drawing(s)	
Appendix D - Feedback Form	

## 1. INTRODUCTION

---

- 1.1 This report results from a Stage 1 preliminary design Road Safety Audit (RSA) on the road network and access/egress proposals to a mixed use development area in Clongriffin, Dublin 13, carried out at the request of Waterman Moylan Consulting Engineers. The Clongriffin Development area is at the location illustrated in Figure 1, with the area of interest and scope of the Audit shown in figure 2. The Audit involved an examination of a number of existing and proposed links and junctions within the development site, along with tie-ins to existing junctions and links on the surrounding road network, to serve a number of proposed residential blocks, a school, and a hotel, with all associated access roads, parking and ancillary works. Links within the site area are partially constructed, hence the Stage 1 RSA included an examination of the condition and layout of the completed road network surrounding the site, within the study area, which should be considered as design for the site progresses.

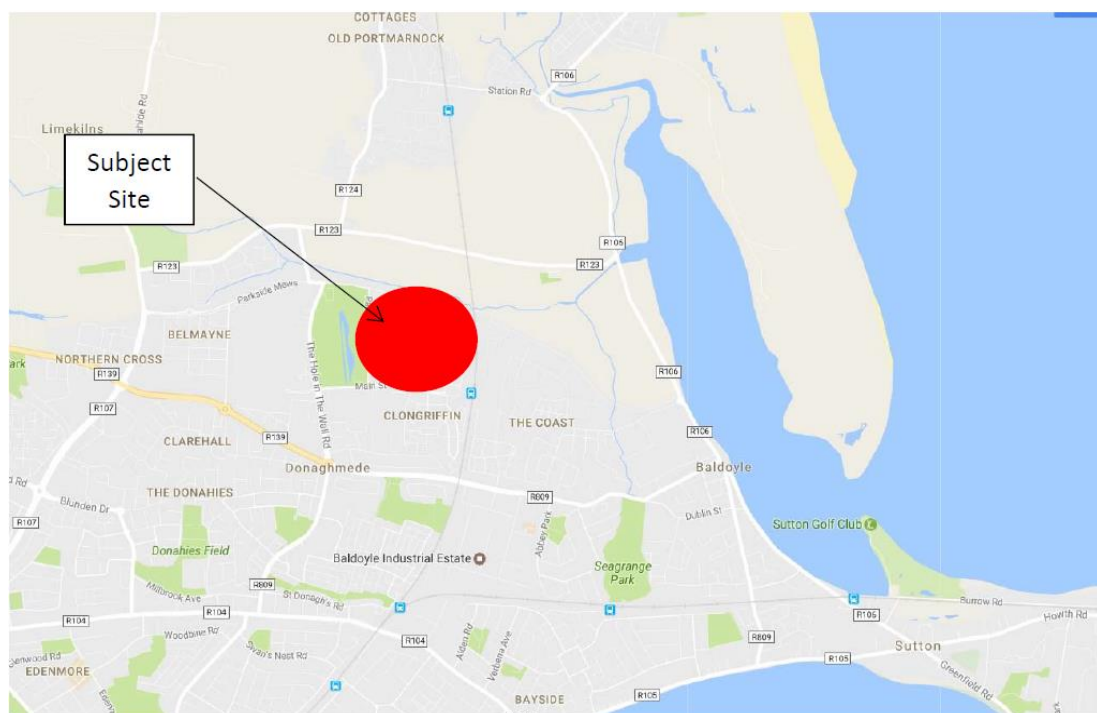
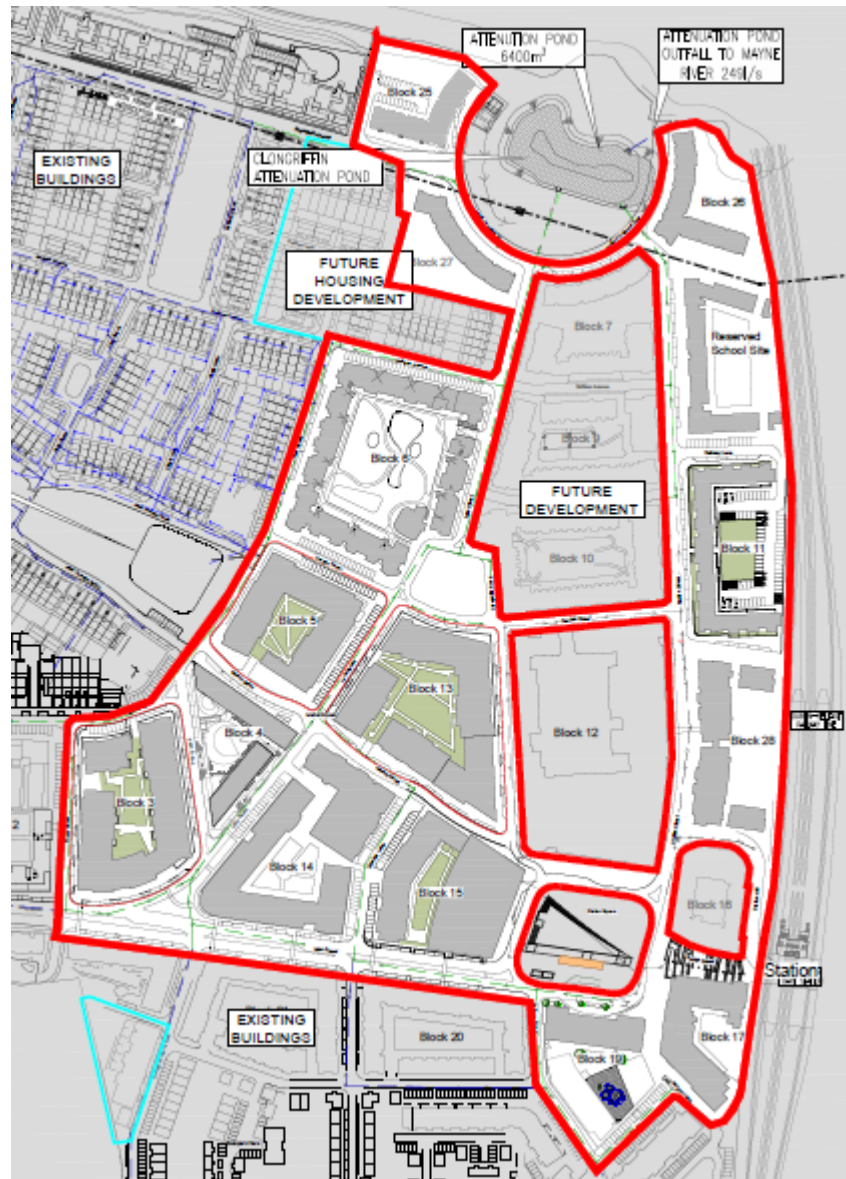


Figure 1: Site Location



**Figure 2: Area of Interest and Scope of Audit**

1.2 This Audit examines the road safety implications associated with proposed (and existing) development within the red line boundary indicated on Figure 2. The RSA was carried out during September 2018 and included a site visit by the Audit Team on Friday 7<sup>th</sup> September during daylight hours. Roads within the development site were only partially constructed, with construction work ongoing in the remainder of the site at the time of the site visit, hence direct access to these areas within the site was not possible at that time. The weather at the time of the site visit was fine and dry, and the surface of the road was predominantly dry, with some areas of

localised ponding noted both within the carriageway and on footways. Traffic conditions were light and the posted speed limit at the site was 30 km / hr.

1.3 The Audit Team Membership was as follows;

Team Leader: Miriam O'Brien – BE (Civil) FIHE MIEI MCIHT- SoRSA RSA CoC

Team Member: Anthony Sumner – HNC Civil Eng, AEng MIEI

1.4 The Audit took place at the offices of Road Safety Matters in September 2018 following the site visit by the Audit Team. The Audit was undertaken in accordance with the Design Team's Audit Brief, and comprised an examination of the plans and information provided by the Design Team, as listed in Background Information, Table 1.

1.5 The terms of reference of the Audit are as described in TII GE-STY-01024 December 2018. The team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. Comments on potential issues arising from a safety review of the site with reference to the Design Manual for Urban Roads and Streets (DMURS) have also been included where relevant, in respect of the location of the site within a reduced urban speed limit zone. DMURS changes the approach to traffic safety in urban areas with the emphasis now on creating low-speed environments where it is clear to car drivers that they must give way to vulnerable road users (VRUs – including pedestrians and cyclists), thus reversing the traditional vehicle-dominated road hierarchy to favour non-motorised traffic.

1.6 Section 2 of this report contains issues raised by this Stage 1 RSA together with recommendations to be considered. Section 3 contains the Audit Team Statement. Most issues raised in Section 3 can be cross-referenced with the scheme drawing (**Appendix C**) and photographs taken on the site visit, which are included within the report where necessary, or in **Appendix B**.

## 2. ISSUES RAISED BY THE STAGE 1 ROAD SAFETY AUDIT

### 2.1 GENERAL

2.1.1 The designers have not advised of any departures from standard.

2.1.2 There was no information provided relating to cross sections or long sections.

2.1.3 No information was provided on any existing collision statistics in the vicinity of the site. A review of the Road Safety Authority (RSA) online collision database indicates that there are no records of collisions on the road network within the site area between 2005-2014 inclusive. The quantum of anticipated traffic volumes for a residential development of this scale is likely to increase the overall level of risk of conflict on the surrounding road network, however the Audit Team considered that vehicular speeds are likely to be low on the network within the study area, therefore potential collision severity is likely to be low.

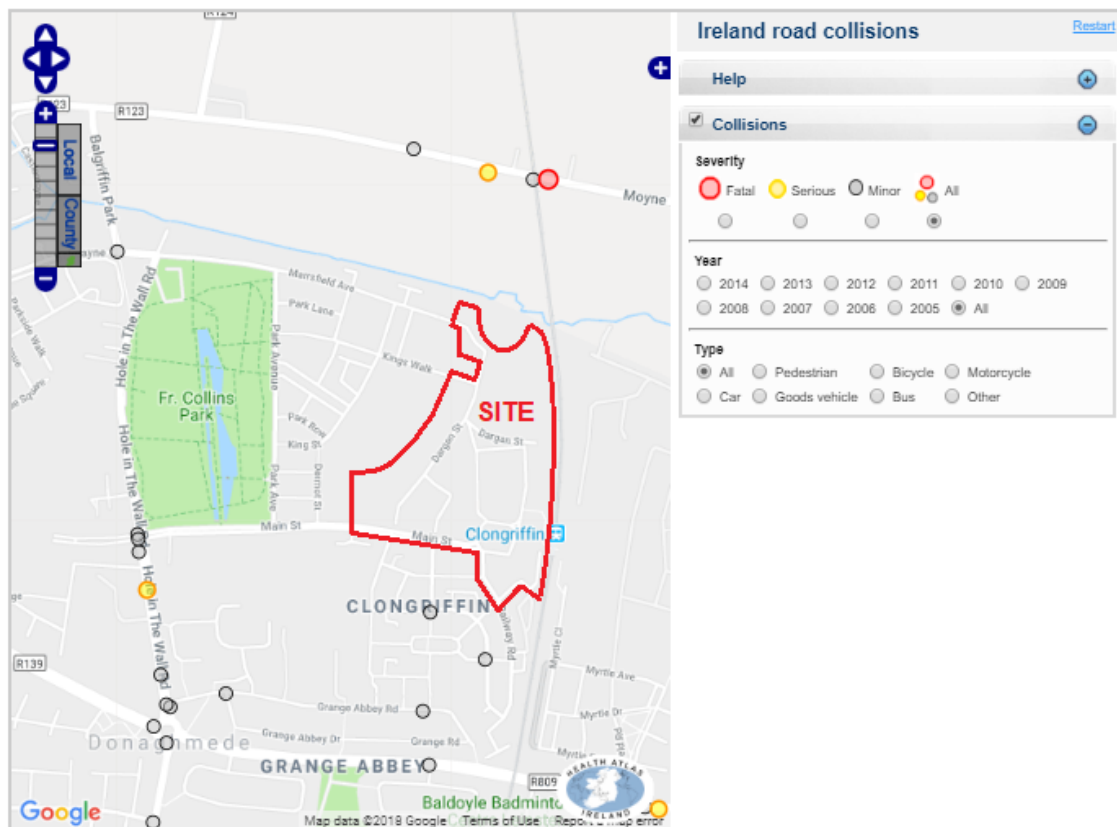


Figure 3: Collision Plot for Road Network surrounding site



It should be noted that the RSA database is not a comprehensive record of collisions, and does not include damage only collisions, hence should be reviewed in conjunction with the Local Authority / Gardaí records for the site.

#### **2.1.4 Problem – Parking**

There was no information provided to the Audit Team on the cumulative parking demand for the development site to determine whether any issues are likely to arise in respect of inappropriate on street parking, however the following issues were noted in respect of parking:

**2.1.4.1** Narrow cross sections on some links may restrict safe two-way movement, should demand for on street parking arise.

##### **Recommendation**

Cumulative parking demand to be assessed, with parking restrictions where necessary to prevent on street parking at inappropriate locations. All streets throughout the scheme should be sufficiently wide to permit two-way traffic movement at all times, with any links where one way movement only is permitted, to be clearly signed.

**2.1.4.2** Sharp kerb edges were also noted at some existing parking layby locations, which can present a hazard and a risk of tyre blow out if struck by moving vehicles.

##### **Recommendation**

Rounded kerb edges should be used adjacent to all parking bays, with sufficient tapers to minimise the risk that entering and exiting vehicles may strike the kerbs

**2.1.4.3** Parallel parking spaces and parking laybys are provided at some locations on links within the site, however elsewhere on links perpendicular spaces have been provided, which may result in reversing manoeuvres into the path of VRUs and turning or passing traffic, including in the vicinity of junctions where the risk of conflict is higher.

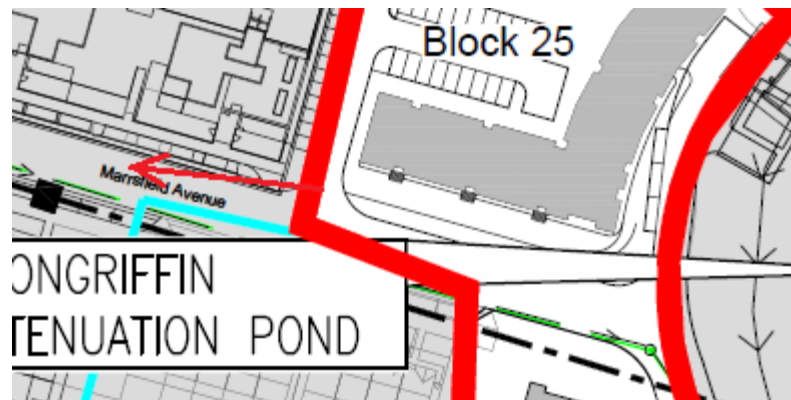
## Recommendation

Parking spaces should be configured as parallel spaces where possible. The proposed layout should ensure that vehicles will not be reversing in the vicinity of junctions where there are multiple turning movements occurring simultaneously, creating multiple potential points of conflict.

**2.1.4.4** A number of vehicles are parked within the carriageway on Marrsfield Avenue at the scheme tie-in, as shown in figure 4. Parked vehicles are obstructing the carriageway and creating obstructions in the visibility splay to the right from the new junction with the access into Block 25, as highlighted in figure 5. Parking spaces were also noted in close proximity to a number of other junctions throughout the site, where parked vehicles are likely to create obstructions and increase the risk of pulling out type incidents and right angled collisions, as well as rear shunt collisions.



**Figure 4: Parked vehicles obstructing visibility towards location of new access point**



**Figure 5: Parked vehicles in visibility splay**

### **Recommendations**

Visibility splays throughout the site should be clear and unobstructed at all times at all junctions throughout the site, in accordance with traffic speeds, with on street parking to be restricted or removed where necessary. Sufficient unobstructed forward visibility and stopping sight distance should be provided towards vehicles potentially reversing from parking spaces. All spaces to be clearly marked out with appropriate lining and road markings, to avoid potential obstruction of the carriageway, and potential misinterpretation by motorists.

#### **2.1.5 Problem – Drainage Generally**

There was no information provided for proposed drainage within the site. Ponding was noted at some locations, particularly where pavement condition was poor (see Photo in Figure 6, which is at the junction of Belltree Avenue / Lake Street). Ponding was also noted on existing footways throughout the site, which can present a slip hazard for pedestrians. The new layout will need to be adequately drained to prevent the risk of ponding and the resultant increase in skidding or loss of control collisions during wet and icy conditions. Details for the attenuation pond at the north of the site have not been shown, and should also be considered at detailed design stage



**Figure 6: Ponding at Junction**



**Figure 7: Ponding in carriageway**

## Recommendations

Proposals for drainage to be clarified at detailed design stage, with all gullies and manhole covers throughout the scheme to be kept out of the desire line for two-wheeled vehicles and VRUs wherever possible. Finished levels of all chamber covers and gullies to be flush with surrounding carriageway to minimise hazards. Suitable crossfall should be provided on all footways throughout the scheme area to minimise the risk of standing water. Detailed design should include for suitable fencing and access to the attenuation pond to the north of the site.

### 2.1.6 Problem – Pavement Condition Generally throughout Scheme

The pavement condition on newly constructed sections of the network within the development area was generally good, however poor pavement condition, inclusive of incomplete surfacing, potholes and joints and loose debris within the carriageway, was noted at a number of locations within the network, predominantly in the areas to the southeast of the site and along Marrsfield Avenue where construction activity has led to further pavement deterioration, and including areas of pavement within footways.



**Figure 8: Unfinished carriageway on Station Street**



**Figure 9: Debris on footways/ poor carriageway condition & ponding on Railway Rd**

### **Recommendations**

Carriageway and pavement condition to be assessed throughout the site, with pavement repair and resurfacing to be provided where necessary. Detailed design drawings should show details for all areas of new surfacing, to include suitable joints between pavements, which should be kept out of the wheel track for two-wheeled vehicles.

#### **2.1.7 Problem – Fencing, Kerb and Access Details adjacent to pond**

The details for the link to the east of block 25 at the north of the site are unclear, as the plan does not show kerb continuity and appears to show parallel parking spaces in the centre of the link. The priority and form of control at the two links to each side of block 25 are also unclear, as highlighted in figure 10. There is an existing substation at this location, and it is unclear if the substation will be retained, and if so, how access to and from the substation will be provided, as there is no provision for a turning circle at the northern end of the link, as shown in figure 11.

Figure 11 also shows a cul-de-sac link to the west of block 26 which will impact on the area of the existing attenuation pond, and there is no provision for earthworks and accommodation for the new pond area. There is also no provision for a turning circle or space for vehicles to turn at the northern end of this link. The priority and form of control at the other two junctions on the link surrounding the attenuation pond are also unclear, and there is no provision for fencing to protect VRUs from the water hazard and steep embankments, or for maintenance access to the pond.

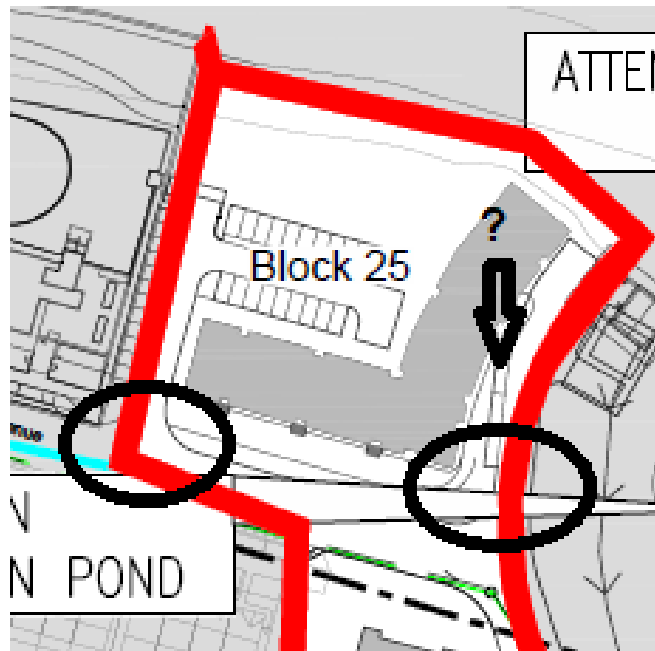


Figure 10

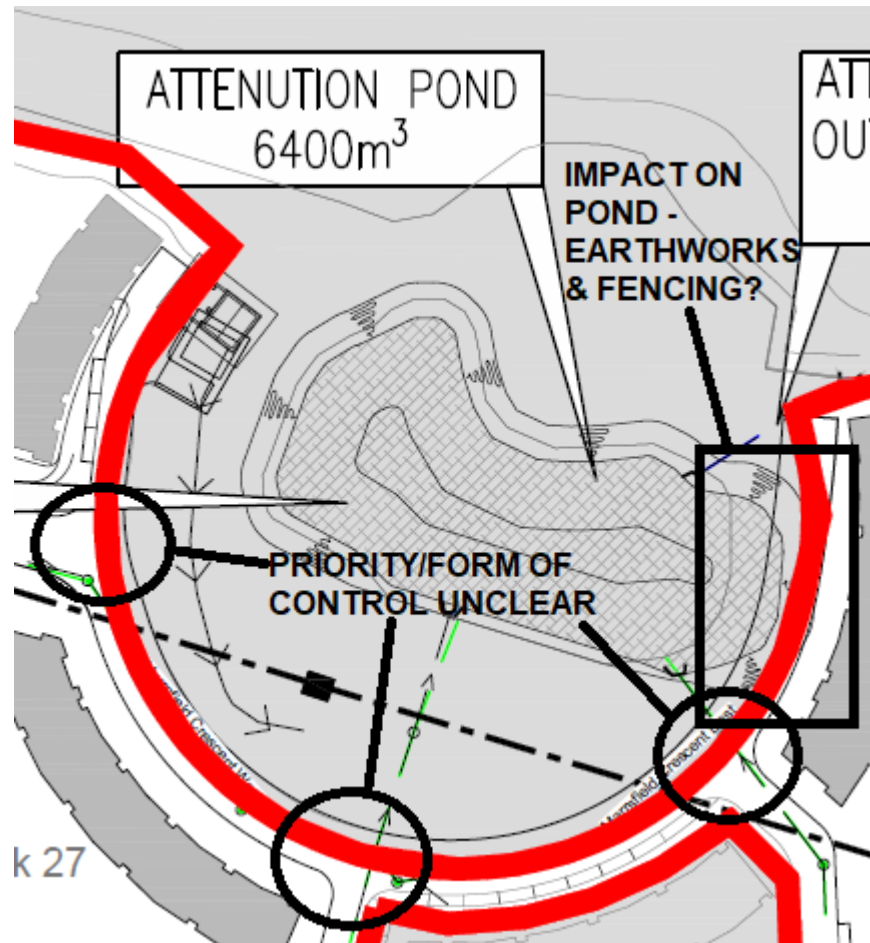


Figure 11

### Recommendations

The layout and form of control at all intersection points and junctions throughout the site should be clearly shown on detailed design plans, with cross section and kerb details to be provided, to include dropped kerbs to facilitate vehicular access where necessary. Kerb continuity should also be shown in Railway Lane, and surrounding Block 28 adjacent to Station Street, where no kerblines have been shown between the building line and carriageway. Suitable turning circles should be provided on all cul-de-sac links throughout the site, and provision should be made for service and maintenance vehicle access where necessary. Detailed design should include for impact on the attenuation pond at the north of the site with provision for suitable fencing, earthworks and access.



### 2.1.8 Problem – Traffic Calming and Vehicle Speeds

There is no provision for traffic calming within the proposed layout, including on long straight links throughout the site. There are existing raised tables in the vicinity of Station Square and on Main Street, and speed humps were noted on Railway Street, Lake Street and on Marrsfield Avenue, where the risk of inappropriate vehicle speeds is higher on the latter due to the relatively wide cross section on approaches to the site. There are 30 km/hr speed limit signs provided on Marrsfield Avenue, as shown in the photo in figure 12, and on Main Street, however there is no provision for suitable repeater signage elsewhere on the road network throughout the site.



**Figure 12: Speed Limit Signage and speed humps on Marrsfield Avenue**

#### **Recommendations**

Provision should be made for suitable traffic calming features on long straight links, at appropriate spacing, to assist vehicles in maintaining low speeds on all links throughout the area. Further details of all proposed traffic calming features to be provided at detailed design stage to include cyclist/motorcyclist and VRU friendly layouts, with a similar layout to be provided throughout the development site, ideally consistent with all adjacent phases of residential development to ensure predictability and to minimise road user confusion. All traffic calming features involving raised surfaces to be accompanied by appropriate warning

signage and road markings, to ensure visibility during the hours of darkness. Consistent and regular speed limit repeater signage or suitable Slow zone signage to be provided at safe locations throughout the site.

### 2.1.9 Problem – Landscaping

There were no details provided on proposed landscaping throughout the site. Inappropriately placed landscaping can increase collision risks for all road users by creating potential obstructions in visibility splays, with an example of where this is occurring shown in figure 13. Inappropriately placed landscaping can also reduce intervisibility between pedestrians and motorists, and can also potentially obscure relevant signage, with an example of where this is currently occurring shown in figure 14. Dense tree foliage can also reduce the effectiveness of street lighting, leading to a potential increase in collision risks during the hours of darkness, and landscaping located too close to VRU routes can also lead to slippery conditions due to fallen leaves. A number of existing tree pits were also presenting potential trip hazards in pedestrian desire lines.



**Figure 13: Landscaping presenting an obstruction in junction visibility splay**



**Figure 14: Potential issues with landscaping**

### **Recommendations**

Landscaping proposals should be clarified at detailed design stage, taking into account all potential issues raised above. Trees to be located sufficiently clear of pedestrian zones to prevent slippery conditions due to fallen leaves, and in locations which do not obstruct clear forward visibility of any relevant signage or compromise lighting. Landscaping development over time should also be considered, as mature vegetation can become overgrown and present further obstructions to visibility.

#### **2.1.10 Problem – Site clearance**

Details of site clearance have not been included on the preliminary design layout to indicate the impact on existing feature displaced by the works. It was noted that a number of existing items of street furniture are located too close to the carriageway edge which presents a potential hazard to passing traffic, particularly in the vicinity of tight radii, where narrow cross section width may inhibit safe two-way movement of traffic.



**Figure 15: Fencing Located too close to carriageway (note narrow cross section on bend)**

### **Recommendations**

The location of all street furniture (lighting columns, bollards, traffic sign poles, fencing, landscaping/plant pots etc) to be placed sufficiently clear of the carriageway to ensure the risk of being struck by passing vehicles is minimised, and at a location which does not obstruct VRU movement. The recommended minimum clearance of 450mm from edge of carriageway is advisable in an urban area, however a relaxation is likely to be acceptable in a built up residential zone subject to a lower speed limit of 30 km/hr, provided low vehicle speeds can be maintained.

## **2.2 JUNCTION LAYOUT AND ALIGNMENT**

### **2.2.1 Problem – Restricted Visibility Splays**

In addition to landscaping, it was noted that boundary treatments and building lines at a number of the existing junctions within the development site are restricting clear forward visibility at bends or presenting restrictions within visibility splays to the left and/or right, resulting in an increased risk of pulling out type incidents or side swipe collisions, and potentially reducing intervisibility between VRUs and motorists. The building line shown in figures 17 and 18 will restrict clear forward visibility towards oncoming traffic, at a location where a yield triangle appears to indicate

yield control, which requires a more onerous visibility splay, although there is no provision for yield signs. Parked vehicles were also noted within visibility splays at a number of proposed and existing junctions within the site, as mentioned previously, which would also restrict clear forward visibility towards oncoming traffic.



**Figure 16: Building Line restricting forward visibility on Dargan Lane**



**Figure 17: Building Line restricting forward visibility adjacent to Block 12  
(note also ponding issues and tactile layout)**



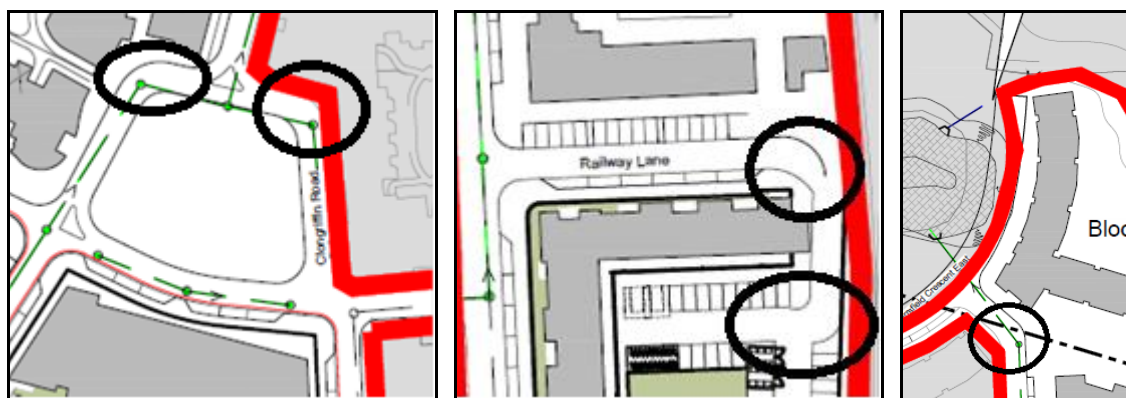
**Figure 18: Building Line restricting forward visibility at Yield Control**

## Recommendations

Landscaping proposals and boundary treatments for the site to be clarified at detailed design stage, with a maximum height of 1.05m to be provided where possible, particularly adjacent to locations where vehicles may be reversing from driveways or parking spaces. Visibility splays to be clear and unobstructed at all times in accordance with traffic speeds, with final kerbing and building line details to be developed to ensure that obstructions within the visibility splays are minimised to the left or right at any of the junctions throughout the site.

### 2.2.2 Problem – Junction / Link Geometry and vehicular swept paths

There was no swept path analysis provided to the Audit Team to demonstrate that the proposed layout will safely accommodate the swept paths of all anticipated vehicles with adequate margins of safety. The current geometry and cross section width appears restrictive on some links, particularly in the vicinity of tight radii on Lake Street and Clongriffin Rd, with examples shown in figures 19 to 22, and there has been no provision for cross section widening on any of the tight bends, which may present difficulties for safe two-way movement of larger vehicles. There are splitter islands also shown at some locations, as shown in figure 19, which will restrict some turning movements, however there were no details provided on proposed direction of circulation or permissible movements throughout the site. Elsewhere, splitter islands appeared to be located at kerblines, as shown in figure 23.



Figures 19-21



**Figure 22**



**Figure 23**

A number of the internal roads within the site are narrow, e.g. Dargan Street, as shown in figure 24, and the Audit Team consider that the restrictive geometry may present head on and side swipe collision risks for larger vehicles travelling on these links. Elsewhere, larger vehicles attempting to turn at junctions where geometry is restricted may potentially be in direct conflict with oncoming vehicles, or with vehicles waiting to turn from the minor roads, resulting in head on or side swipe collision risks.





**Figure 24**

Pedestrians and VRUs are also considered more vulnerable on tight corner radii, as larger vehicles turning at these locations are more likely to mount footways and encroach into the pedestrian zone. There is evidence of this occurring on newly constructed links and junctions within the completed Clongriffin development. Pavement condition is likely to deteriorate significantly over time at such locations, leading to an increase in VRU vulnerability and a risk of trip hazards.

### **Recommendations**

The geometry of each of the access junctions and internal link roads should be reviewed, and swept path analysis should be completed to demonstrate that the turning movements of all anticipated vehicles can be safely accommodated within the proposed layout with adequate margins of safety. Safe two-way movements should be possible on all links, including at bends and junctions, and the design should ensure that turning vehicles are not encroaching significantly over the centreline of the carriageway into the path of oncoming vehicles, or mounting the kerb to avoid conflict with vehicles waiting to turn from the minor roads. Details for proposed splitter islands and permissible direction of travel should be clarified at detailed design stage. Pedestrians should be allocated sufficient road space at all times within the urban streetscape, in line with the aspirations of DMURS, and ongoing monitoring of final link and junction layout and operation is advisable.

### **2.2.3 Problem – Traffic Volumes and Lack of formal control at junctions**

There are no details provided for the form of control for many of the proposed junctions within the scheme, as mentioned previously, which may give rise to motorist confusion regarding priority

and rights of way. The configuration at some existing junctions is also unclear, with an example shown in figure 25, where there are very well worn and virtually illegible stop markings and no entry markings provided on the carriageway at the junction opposite, but no provision for stop signs or no entry signs. There was no information provided to the Audit Team on anticipated traffic volumes through the area, to determine whether the geometry and configuration of all proposed junctions is sufficient to cater for anticipated demands, or whether the provision of right turn reservoirs or signalisation might be required.



**Figure 25: Ambiguous Form of Control at Existing Junction**

### **Recommendations**

Clarification to be provided on the proposed form of control at all junctions through inclusion of standard marking and signage where necessary. Details should be provided on anticipated traffic volumes and turning movement proportions, as well as proportions of

vehicle types including HGVs and cyclists, to demonstrate that all proposed geometry will cater for anticipated demands.

## 2.2.4 Problem – Insufficient Stagger distance

There appears to be insufficient stagger distance between a number of links throughout the site, with examples shown in figures 26-29.



Figures 26-29

## Recommendations

The geometry of the proposed layout should be reviewed to ensure there is sufficient stagger distance between junctions where necessary.

## 2.3 NON-MOTORISED USER PROVISION

### 2.3.1 Problem – Pedestrian Facilities Generally

There were a number of general observations made on potential and existing issues for pedestrians within the current design proposals as follows:

- Footway details are generally unclear throughout the site, with footways appearing discontinuous or non-existent at a number of locations on the completed network and the proposed network. A number of potential trip hazards were also noted within existing footways surrounding the site.
- There were a number of steps noted within the site area where there is no provision for suitable tactile paving layout at the tops and bottoms to alert visually impaired pedestrians

to the presence of the hazard, most notably on some of the steps adjacent to the Clongriffin Railway Station.



**Figure 30: Lack of Tactile Guidance at steps/hazards**

- There is no provision for dropped kerbs and tactile paving throughout the scheme area, to facilitate safe crossing of the carriageway by visually or mobility impaired pedestrians, and kerb upstands significantly in excess of the recommended minimum of 6mm were noted on some existing desire lines at junction mouths throughout the scheme, presenting a trip hazard on pedestrian desire lines. Existing tactile configuration is also poor at a number of locations, with tactile absent or not lining up with tactile on the opposing side, with an example shown in figure 31, which is on Dargan Street. Non-abled pedestrians are vulnerable at such locations, with a higher risk of being brought into the carriageway in direct conflict with motorised traffic. Dropped kerbs are provided at some locations, but tactile paving is absent.



**Figure 31**

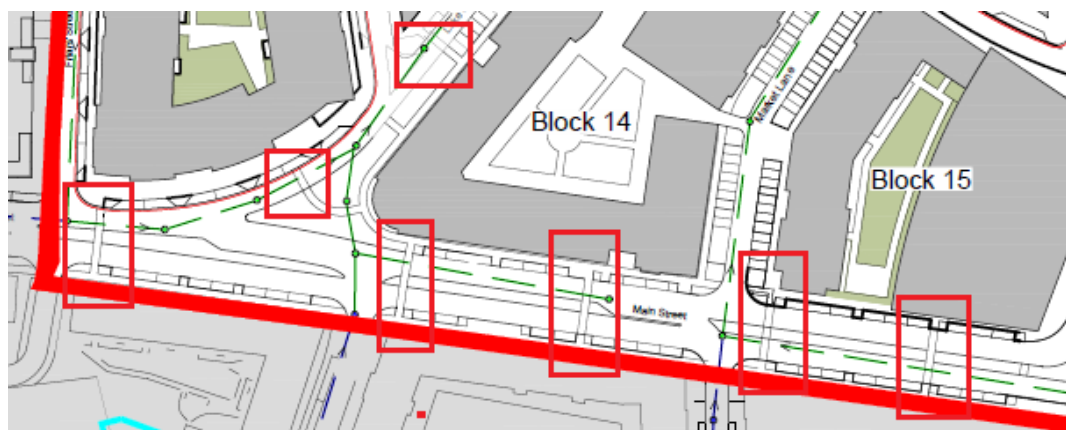
- Pedestrians will be vulnerable at a number of locations where vehicular swept paths are likely to encroach significantly into pedestrian zones, and tyre tracks were noted on site demonstrating that vehicles are mounting the kerbs, as mentioned previously.
- Existing trees and landscaping is noted adjacent to some existing footways in the area, which can present hazards, reduce intervisibility and reduce the effectiveness of street lighting, as mentioned in Item 2.1.9.
- Pedestrians are vulnerable within the drop off zone area at the Clongriffin Railway Station (see Photo presented in Figure 32, where there is no turning circle provided at the end of Station Hill for vehicles, who will need to perform a reverse manoeuvre at a point of potential conflict with VRUs where they are being directed to cross through provision of dropped kerbs and tactile paving). There is also a Kassel kerb provided along the southern side of the link at this location, however there is no space for reversing for buses

at this location without potential for conflict with pedestrians. The layout at this location should be reviewed with pedestrian safety prioritised where possible.



**Figure 32: No Turning Circle adjacent to Railway Station entrance**

- Solid lines are shown across the carriageway at a number of locations on Main Street and Lake Street, which may represent proposed pedestrian crossing points, however there were no details provided at these locations, including form of control, configuration and width. It was noted that a number of these potential crossing points are located too close to adjacent junction and parking bays, where intervisibility may be reduced.



**Figure 33**

### **Recommendation**

Likely pedestrian demands, desire lines and volumes should be determined in conjunction with issues raised above, with footway repair provided where necessary, along with safe, continuous

unobstructed facilities to cater for demands, with an absolute minimum footway width of 1.2m. Dropped kerbs and tactile paving should be provided at any point where pedestrians could come into potential conflict crossing the path of vehicles, with a maximum upstand of 6mm, and all tactile paving to line up with paving on the receiving side of the crossing. Clear visual contrasts to be provided at any locations where the risk of conflict with motorised traffic is highest or where there is no clear delineation adjacent to carriageway edges, with formal controlled crossings to be considered where necessary at a suitable offset from adjacent junctions, and away from locations where intervisibility could be compromised by parked vehicles. Appropriate blister surfacing should be provided on any manhole covers within tactiles, with tactile paving to be provided at the top and bottom of steps where necessary.

### **2.3.2 Problem – Cyclist Facilities Generally**

There was no information provided on anticipated cyclist volumes and desire lines for the development, and there are no on or off road cycling facilities shown anywhere within the scheme layout, with cyclists expected to share road space on a limited cross section where risks will be higher. It was noted that there are no formal cycling facilities provided within the road network surrounding the site at present, aside from on Main Street where facilities are discontinuous.

#### **Recommendation**

Likely cyclist demands, desire lines and volumes should be examined to determine the need for formal cycling facilities, with safe facilities to be provided where necessary to cater for demands arising and to maximise VRU safety in line with the aspirations of DMURS.

## **2.4 ROAD SIGNS, MARKINGS AND LIGHTING**

### **2.4.1 Problem – Lighting**

There was no lighting design provided to the Audit Team to demonstrate that the proposed development will operate safely with adequate lumination during the hours of darkness.

#### **Recommendation**

Lighting proposals to be clarified at detailed design stage, with all columns to be located to the rear of footway wherever possible at a location which does not obstruct pedestrian desire lines or

reduce effective footway widths to less than the absolute minimum of 1.2m. Columns at all locations should be sufficiently setback from the carriageway to minimise the risk of being struck by passing or turning vehicles.

#### **2.4.2 Problem – Signing and Lining Generally**

A number of general lining and signing issues were noted on the preliminary design drawings for the scheme as follows:

- Appropriately located advanced warning signage will be required for all minor road junctions ahead in each direction.
- Advanced warning signage will be required sufficiently in advance of all vertical deflection/traffic calming features and changes in levels with reflectorized dragons teeth markings to be provided to ensure visibility during the hours of darkness.
- Clear signage will be required for all routes where there is no through road (e.g. into the links where there is underground carparking) or where one way operation only is permitted.
- An existing central reservation on Main Street will preclude right turns out of the junction with Market Lane. Suitable signs should be provided to ensure vehicles do not turn in the wrong direction on Main Street.
- A number of signs are missing from poles in the Station Square area, and the existing one-way layout at this location is not clear to all motorists. Signs are also missing from poles along Main Street – appropriate signs to be provided / reinstated.
- Caution Children at play signs are advisable adjacent to all open space / green areas throughout the scheme
- Keep left reflectorized or luminated bollards are absent from a number of splitter islands throughout the scheme, most notably around the one-way system at Station Square. Signs are also missing from poles at this location, as shown in figure 34.





**Figure 34**

- Road markings are very well worn and illegible at a significant number of locations throughout the existing network within the site. Old road markings are also visible at a number of locations, and have not been fully removed.
- 'Stop' signs have been provided at a number of existing junctions throughout the scheme, but are absent at others.
- 'Stop' road markings and accompanying stop line have been provided at some junctions throughout the existing completed road network within the study area, but are absent from others.
- It was noted that there are no bus stop markings at some locations, e.g. on Main Street., and standard bus stop layout is also absent (e.g. Kassel kerbs, red paving). Existing bus laybys and loading bays are not shown on the preliminary design layout, e.g. figures X and Y, and it is unclear whether these are to be retained in the proposed layout.



**Figure 35**



**Figure 36**

- The layout at Station Hill is misleading, with both lanes marked for buses only, but no warning signage from either direction on Station Street to prevent vehicles turning onto the link (see Photo in Figure 37 – poles are present, but there is no accompanying signage).

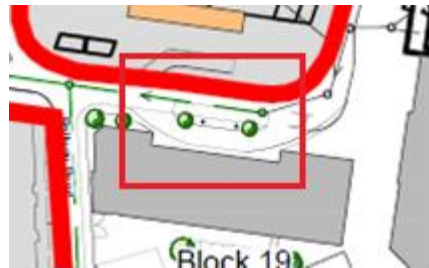


**Figure 37: Road Markings Showing Bus Access Only**

- The design proposals appear to show provision for reconfiguration of the existing kerb line and relocation of the bus stop at the location shown in figure 38, which is along the southern kerb of Main street to the south of Station Square, however there is no provision for suitable lining and signing guidance regarding permissible movements and vehicles (e.g. bus only) at this location. The building line also appears to be located very close to the kerb edge, as shown in figure 39, which would preclude provision of a safe dwell area or alighting area for bus passengers, and would prevent safe movement of pedestrians on the footway in this area.



**Figure 38**



**Figure 39**


### **Recommendation**

A review of existing and proposed signage and lining is advised, with a detailed signing and lining schedule to be produced at detailed design stage, to address issues identified above. All signs should be located in clear view of the motorist, clear of any obstruction from other relevant signage, vegetation or street furniture, and in a location which does not obstruct footways, visibility splays or obstruct the swept paths of vehicles, with a minimum advisable clearance of 450mm from the edge of sign face to the edge of running lane, which can potentially be reduced on low speed links. Multiple signs to be mounted on poles where possible to minimise street clutter, with sufficient overhead clearance provided adjacent to likely pedestrian and cyclist desire lines. High reflectivity to be provided for all signs and markings to ensure clear visibility during the hours of darkness.

### 3. AUDIT TEAM STATEMENT


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We certify that we have visited the site and examined the drawings and information supplied. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the safety of the scheme. The problems identified have been noted within the report, together with suggestions for improvements which are recommended to be studied for implementation. No one on the Audit Team has been otherwise involved with the design of the measures audited. This audit has been carried out in accordance with TII GE-STY-01024 December 2017.

Signed:   
\_\_\_\_\_

Date: 8/8/19

MIRIAM O'BRIEN

Signed:   
\_\_\_\_\_

Date: 8/8/19

ANTHONY SUMNER

## APPENDIX A – ROAD SAFETY AUDIT BRIEF CHECKLIST

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Have the following been included in the audit brief?: *(if 'No', reasons should be given below)*

	Yes	No
1. The Design Brief	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. Departures from Standard	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Scheme Drawings	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Scheme Details (e.g. signs schedules, traffic signal staging)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5. Collision data for existing roads affected by scheme	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6. Traffic surveys	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7. Previous Road Safety Audit Reports and Designer Responses/Feedback Form	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8. Previous Exception Reports	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9. Start date for construction and expected opening date	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10. Any elements to be excluded from audit	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Any other information?</b>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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**APPENDIX B – SITE PHOTOGRAPHS**

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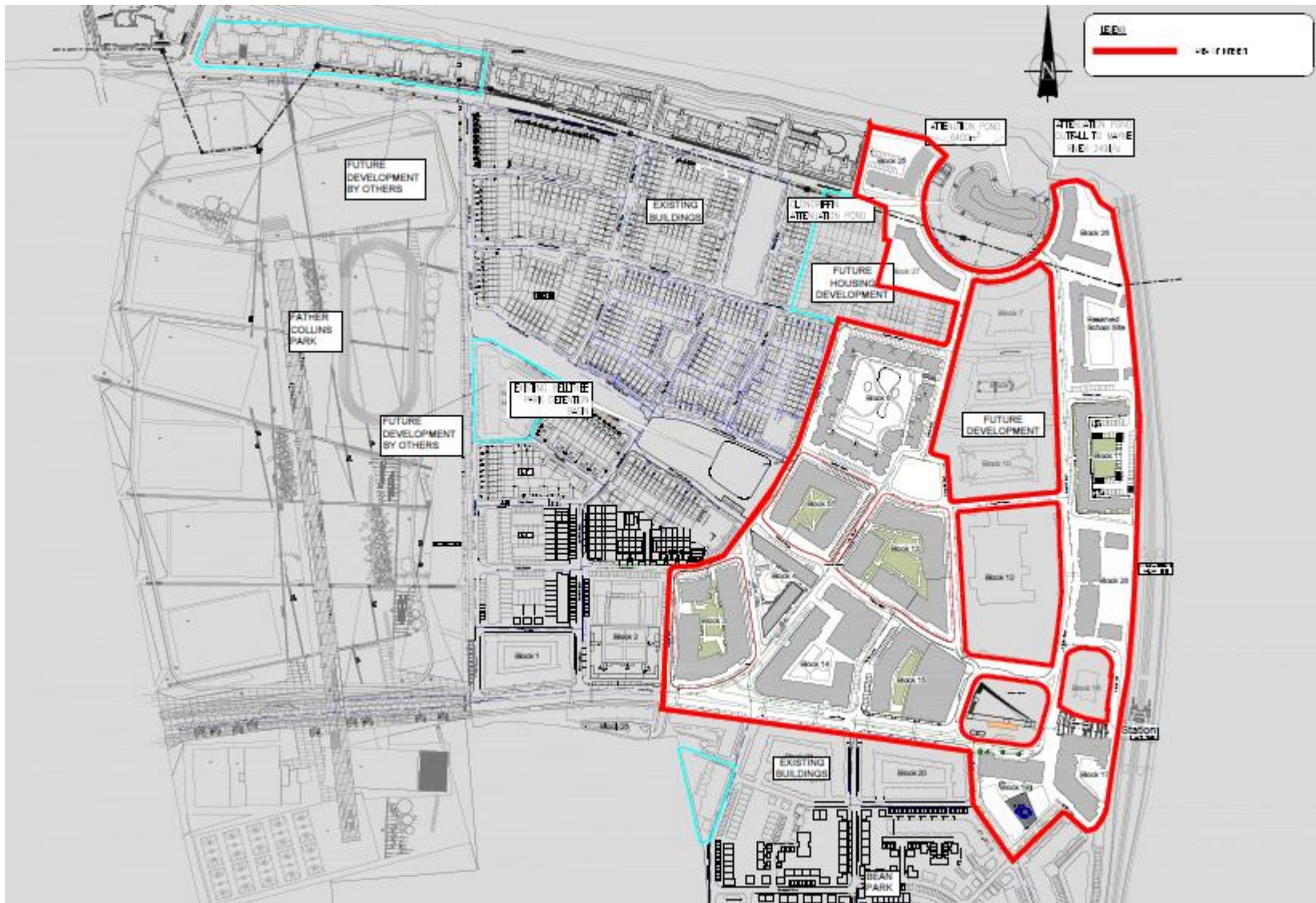












Scheme: Clongriffin Development, Dublin 13

Route No. N/A

Audit Stage: 1

Date Audit Completed: August 2019

	To Be Completed By Designer			To Be Completed by Audit Team Leader
Paragraph No. in Safety Audit Report	Problem accepted (yes/no)	Recommended Measure Accepted (yes/no)	Describe alternative measure(s). Give reasons for not accepting recommended measure	Alternative measures or reasons accepted by auditors (yes/no)
2.1.4.1	Y	Y – Noted. Refer to Traffic Plan Report <sup>1</sup>		Y
2.1.4.2	Y	Y - Rounded kerb edges are proposed for all parking bays.		Y
2.1.4.3	Y	Y - Noted. Parallel parking spaces have been set back from junctions and visibility spays have been checked. Refer to revised drawings		Y
2.1.4.4	Y	Y – where necessary within red line boundary		Y
2.1.5	Y	Y - Wearing Course still to be laid on noted road		Y
2.1.6	Y	Y Wearing course still to be laid on noted roads, with suitable joints with existing wearing course roads		Y
2.1.7	Y	Y - Refer to revised Road Signage and Line Marking Drawing, P1130		Y
2.1.8	Y	Y - Refer to revised Road Signage and Line Marking		Y

<sup>1</sup> Not provided to Audit Team at Stage 1. To be reviewed at Stage 2, detailed design

		Drawing, P1130		
2.1.9	Y	Y - Refer to attached Landscape drawing		Y
2.1.10	Y	Y - Noted		Y
2.2.1	Y	Y - Noted		Y
2.2.2	Y	Y - : Refer to revised drawings and Auto Tracking drawing		Y
2.2.3	Y	Y - Refer to Road Signage and Line Marking drawing		Y
2.2.4	Y	N	The geometry of these junctions has already received planning and have been constructed. We propose to retrofit stop signs and markings and introduce raised tables at these stagger junctions	Y
2.3.1	Y	Y - This proposed infill development will address the raised items by completing pedestrian footpaths, desire lines, crossing points with drop kerbs and tactile paving, road signage and markings		Y
2.3.2	Y	Y - Refer to revised Road Signage and Line Marking drawings which highlights cycle lanes and cycle routes through the proposed Green Route		Y
2.4.1	Y	Y - A full lighting design will be agreed & implemented in accordance with DCC Lighting Department requirements		Y
2.4.2	Y	Y - Refer to Road Signage and Line Marking drawing		Y

Signed: \_\_\_\_\_ Designer Date \_\_\_\_\_

Signed:  Audit Team Leader Date 8/8/19





# UK and Ireland Office Locations

