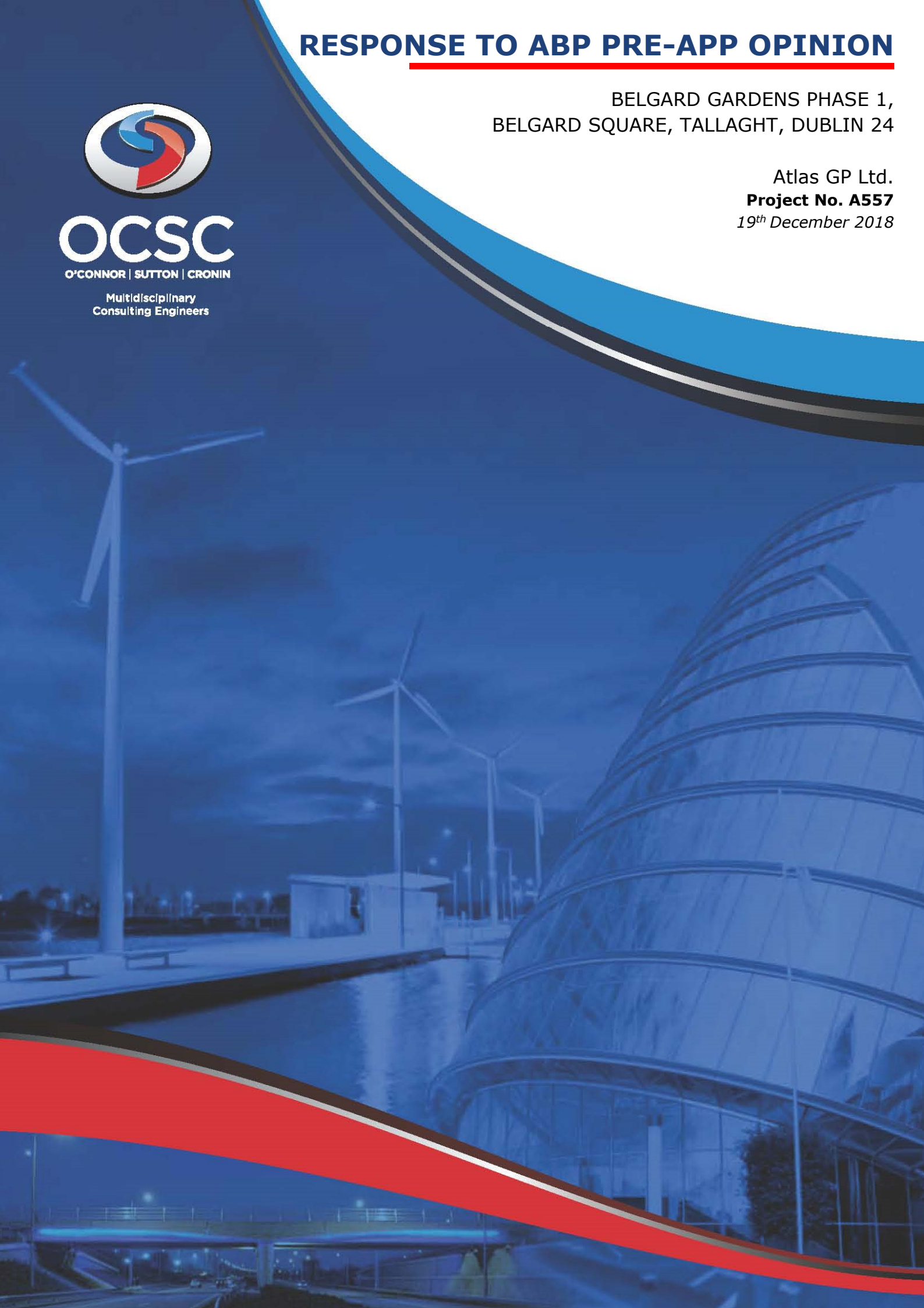
RESPONSE TO ABP PRE-APP OPINION

BELGARD GARDENS PHASE 1,
BELGARD SQUARE, TALLAGHT, DUBLIN 24

Atlas GP Ltd.
Project No. A557
19th December 2018

OCSC
O'CONNOR | SUTTON | CRONIN
Multidisciplinary
Consulting Engineers



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NOTICE

DOCUMENT CONTROL & HISTORY

OCSC Job No.:	Project Code	Originator	Zone Volume	Level	File Type	Role Type	Number	Status / Suitability Code	Revision
A557	A557	OCSC	XX	XX	RP	C	0006	A1	C02

Rev.	Status	Authors	Checked	Authorised	Issue Date
C02	**A1**	**AH & SMG**	**PR**	**TH**	**19.12.2018**
C01	A1	AH & SMG	PR	TH	12.11.2018
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P04	S2	AH & SMG	PR	TH	26.10.2018
P03	S2	AH & SMG	PR	TH	16.10.2018
P02	S2	AH & SMG	PR	TH	28.09.2018
P01	S2	AH & SMG	PR	TH	07.09.2018

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RESPONSE TO AN BORD PLEANÁLA PRE-APPLICATION OPINION

PROJECT NO. A557 **19TH DECEMBER 2018**

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1 INTRODUCTION

1.1 Appointment

O'Connor Sutton Cronin & Associates (OCSC) are preparing this report in response to the Notice of Pre-Application Consultation Opinion issued by An Bord Pleanála (pertaining to the case reference: ABP-301909-18) for construction of mixed use residential development consisting of 438 no apartments, 403 no. bed spaces for student accommodation, childcare facility, new roads, accesses and associated site works located at Belgard Gardens, Belgard Square North, Tallaght, Dublin 24. Specifically, this report seeks to address Items No. 1, No. 4, No. 5 & No. 6 of the issues to be addressed in the SHD application, with other items addressed by various other members of the design team and submitted under separate cover. Furthermore, as per the Strategic Housing Development Regulations this response also address points 1, 4, 5 of the An Bord Pleanála opinion which covers the specific info to be submitted with the SHD application.

2 SPECIFIC ISSUES TO BE ADDRESSED IN THE SHD APPLCIATION

2.1 ITEM NO. 1 PROVISION OF CAR PARKING & MOBILITY MANAGEMENT

Request

"Further consideration/amendment of the documents as they relate to the provision of car parking and mobility management within the proposed development. The documentation submitted at application stage should provide robust rational for the amount of car parking that is proposed. This should have due regard to the pattern of demand for travel that is likely to arise the occupation of the proposed development, as well as to the likely demand from households to have access to private transport even where it does not provide the primary mode for travel to work or school. The documentation should also take proper account of the prospective future development of the rest of the site, and to the prevailing patterns of car ownership in the area, whereby circa 87% if households in the country and circa 73% of households in the electoral division where the site lies reported having at least one motor car at the last census."

Response

The proposed car parking strategy takes consideration for the South Dublin County Council Development Plan 2016-2022 specifically, Tables 11.22 – 11.24 set out the maximum parking standards for car and cycle parking respectively. As noted above in request 1, "the document should also take popper account to the prevailing patterns of car ownership in the area, whereby c87% of households in

the county and c73% of households in the electoral division where the site lies reported having at least one motor car at the last census." The parking quantum proposed as part of this development is not based on existing data for the full county, rather, it has taken account of "small areas" of the census data that considers areas in the immediate vicinity of the development site only. This is considered a more accurate and robust use of the census data to establish prevailing patterns in the vicinity of the development site due to the varied nature of accommodation typologies in the county. If the data for the full county was used for comparison, this would take consideration of some areas in the county that are in suburban and rural areas, nether of which is reflected in the development site. This would therefore give rise to a larger proportion of the population both owning cars and driving to work as their primary mode of transport. It is therefore considered that basing the census data on the county rather than the small area would give a less accurate estimate of the requirement for car parking. The surrounding Small Areas which have been deemed appropriate for comparison have car ownership ranges from 8% to 49%. The 2016 Census data for these areas shows that an average of only 46% of residents in the locality currently drive to work. This shows that many residents in the area who do own a car drive infrequently. This is discussed in further detail in Section 5 of the Traffic Impact Assessment.

Given the highly accessible location of the development site and the existing level of car usage in the surrounding areas of the development site as shown in census data, there is considerable scope to reduce the quantum of car parking in line with current national policy and the Development Plan standards. *Figure 1* overleaf

shows the proximity of the site to employment, education and transport facilities in the locality of the development site. This map shows the highly accessible nature of the area and show that the scheme will function successfully with a low provision of private car parking as proposed.

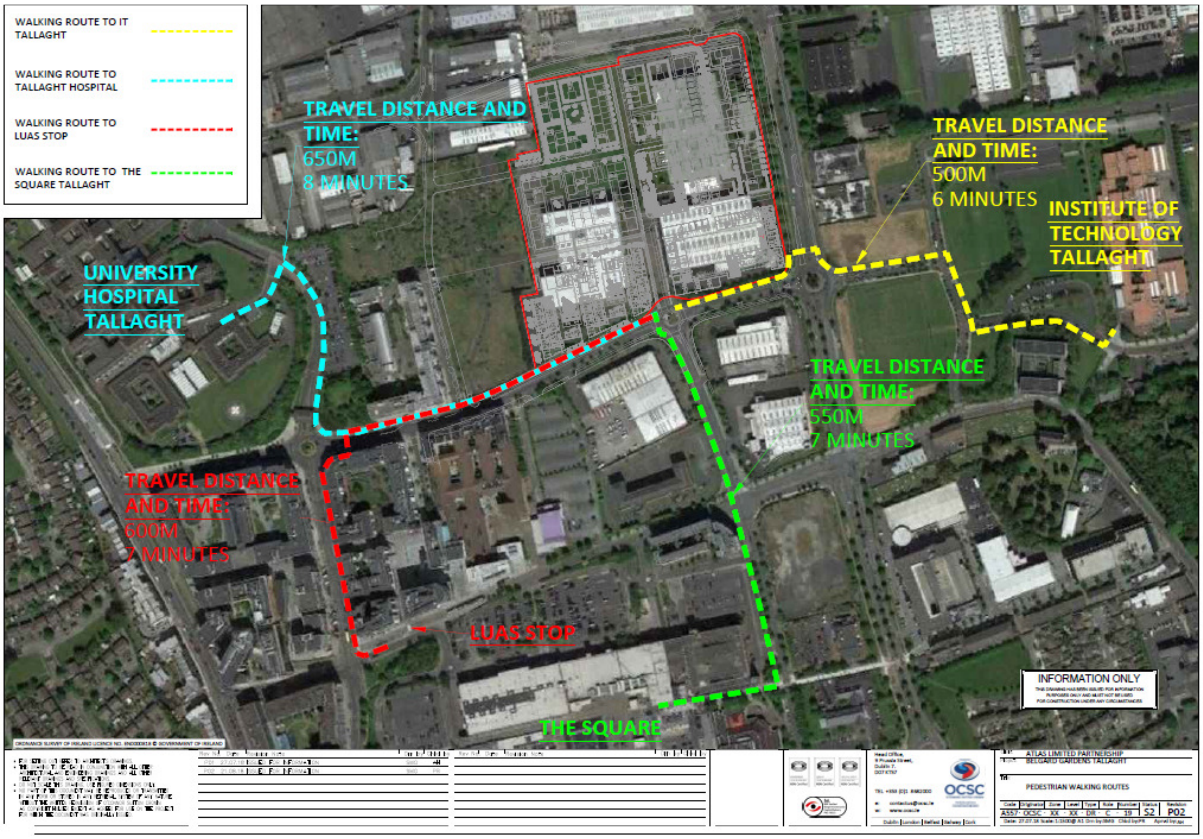


Figure 1: Pedestrian Walking Routes

There are also a number of alternative measures used to provide access to the private car for "once off trips" other than regular commuting that may require car usage. These measures include measures such as car share and commercial car hire that will be located within the development site.

It is envisaged that due to the highly accessible nature of the site and the alternative travel options located near the development site, most of the car

parking spaces provided will be used primarily as car storage. This new development provides an opportunity to ensure a positive modal shift towards sustainable modes of transport in the Tallaght area.

Several measures have been included in the Mobility Management Plan to ensure a positive modal shift away from private cars and ensure a positive modal shift. These measures include:

1. Management and co-ordination of the Mobility Management Plan;
2. Car sharing;
3. Bus use (including BusConnects);
4. Rail use;
5. Cycle and pedestrian facilities;
6. Car parking provision;
7. Management of students.

The above measures are all discussed in further detail within the Mobility Management Plan. Other measures used include car rental and car sharing schemes and the provision of designated dockless bicycle rental spaces on the site. All measures implemented will facilitate the move away from private cars and reduce the need for car storage.

Based on the above factors, and as discussed in further detail as part of the Traffic Impact Assessment as submitted as part of this application, it is proposed to provide the following quantum of car parking to serve the Phase 1 development of 438 no. apartments:

- 107 no. parking spaces at basement level for use by residents only which will include the proposed 3 no. car club vehicles;
- 22 spaces at surface level to cater for visitors and crèche pickup/drop off.

In order to provide private transport access even where it does not provide the primary mode for travel to work or school there is provision made for car club and private car rental facilities at the proposed development.

In addition to the above measures, it is proposed to put in place a Mobility Management Plan to both encourage and facilitate travel by more sustainable means, thereby further reducing the demand for travel by car and, by association, car parking.

The Mobility Management Plan that is being submitted as part of this application will be updated within 6 months of occupation upon completion of detailed travel surveys to be carried out by residents. A series of measures will then be developed using this information to help facilitate a modal shift away from private car travel towards more sustainable means, further reducing the need for car ownership.

The plan will be a living document, continually updated by the mobility manager/management company in light of the experience gained through its operation in conjunction with residents and the Local Authority.

Further consideration for the rationale for car parking can be found in the Traffic Impact Assessment and for mobility management can be found in the Mobility Management Plan that are submitted as part of the application relating to this development.

The provision of car parking for future phases of the development will be based on the Phase 1 and a similar approach will be used to promote sustainable modes of transport and reduce reliance on single car use. The ratio of car parking for future phases will be in line with Phase 1 where ratio of 0.3 car parking spaces per residential unit will be provided.

2.2 ITEM NO. 4 PROVISION OF CYCLE FACILITIES

Request

"Further consideration/amendment of the documents as they relate to the provision of cycle facilities. The documentation submitted at application stage should demonstrate that the cycle facilities along streets are designed in accordance with the National Cycle Manual and that they provide an acceptable quality of service with continuity and suitable priority across junctions; that they avoid conflict between cyclists and pedestrians; and that they allow access to destinations on both sides of the street for cyclists. Segregated facilities should only be provided where the criteria set out at Section 1.7 of the Manual have been met. The documentation should show cycle parking in secure and convenient locations across the development to meet the needs of the occupants and visitors and in various formats that are accessible and easy to use by cyclists with the range of physical capacities that would be expected in a residential scheme. The documentation should indicate how the amount of cycle parking would comply with the relevant guidance set out in the development plan. Section 5.5 of the National Cycle manual and section 4.15 of the apartment design standards."

Response

All cycle facilities are designed in accordance with the National Cycle Manual (NCM). Widths of all cycle lands have been designed in accordance with section 1.5.2 of the NCM. The cycle lanes provided will have a high quality of service as set out in section 1.4 of the NCM. The cycle infrastructure provided as part of this development was designed in consultation with the NTA. The cycle network has

been designed to integrate into the wider area and provided connections through the site between IT Tallaght and Tallaght University Hospital

The width of the cycle tracks allow for 2 abreast cycling and it is proposed to provide a high quality pavement in the cycle tracks that provides for level separation, change of colour and a high ride quality. The cycle tracks provided will be 2m wide in accordance with the NCM's width calculator. The track will be vertically separated from the carriageway and footpath, as per Section 1.9.3 of the NCM the kerb here will also ensure the visually impaired may navigate the footpath safely.

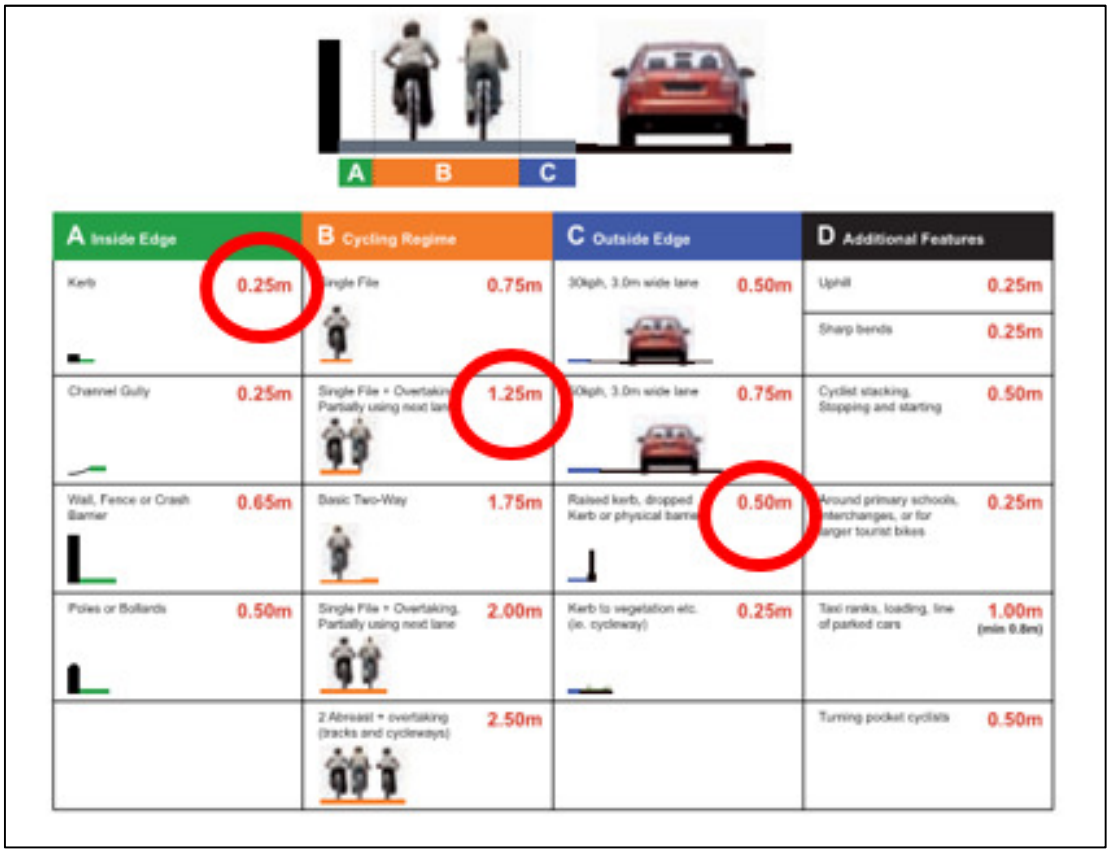


Figure 2: National Cycle Manual Width Calculator

Some of the internal roads have also been designed as shared streets in accordance with the NCM. The internal road running west-east that connects with the future Cookstown Industrial Estate Link Road and has been designed as a shared street according to the NCM's guidance graph.

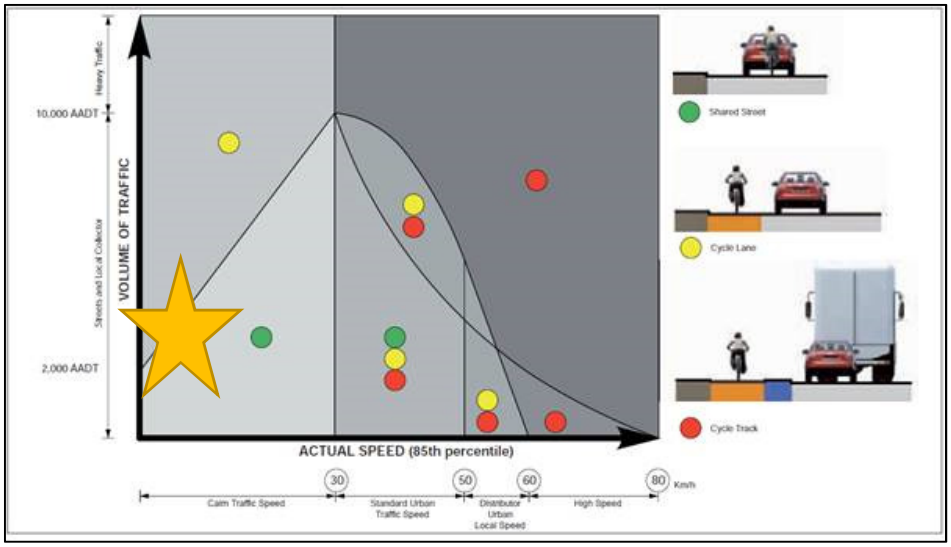


Figure 3: National Cycle Manual Guidance Graph

These streets are achieved by using no change in materials between roads and footpaths, no road markings, narrow streets and tighter corner radii. This will result in lower speeds of vehicles and an increase in pedestrian and cyclist's priority.

Toucan crossings are to be provided at 2 junction's external of the development site, this will reduce the number of conflicts along the cycle routes provided. The number of HGV movements into the development site conflicting with cyclists is expected to be negligible. As per section 1.4 of the NCM, the cycle infrastructure provided as part of this development provides a quality of service of Level A+.

Architects layouts submitted as per of this planning application shown that cycle parking has been provided for occupants and visitors at secure and convenient locations throughout the site.

High quality cycle infrastructure has been provided as part of the proposed development, this includes segregated cycle tracks along Belgard Square North, along the main link roads of the development site and provided shared space within the development site. The cycle infrastructure provided can be seen in drawing A557-OCSC-XX-XX-DR-C-1200-A1-C01 and an extract of this drawing can be seen below in *Figure 4*. This extract shows the cycle infrastructure provided at the new development entrance and the link provided to ITT.

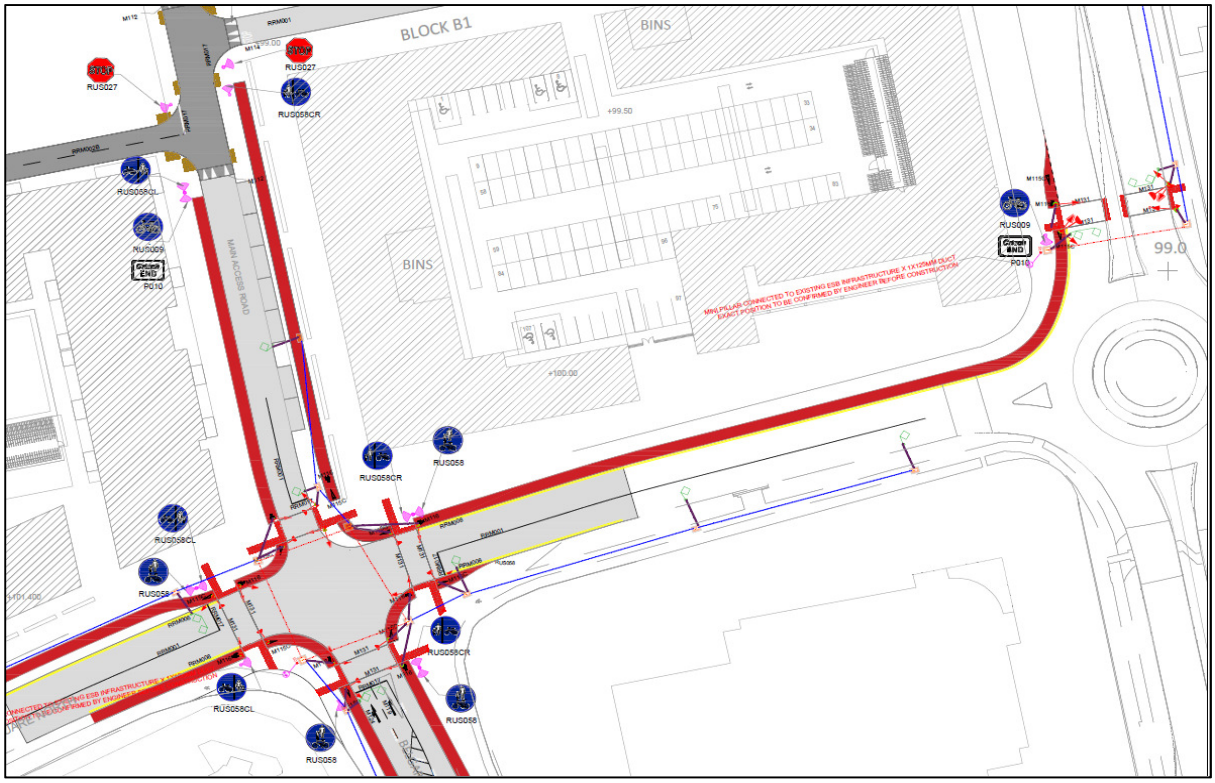


Figure 4: Cycle Infrastructure

It is proposed to provide a total of 1227 cycle parking spaces to serve the Phase 1 development, and an additional 20 dockless bike rental spaces, which is well in excess of the Development Plan standard and will allow for a very high degree of

bicycle ownership across the development. The targets set out in *Smarter Travel – A Sustainable Transport Future* are for a modal split of 10% cyclists by 2020 while the existing modal splits for the Electoral Division of Tallaght-Springfield are currently below 3%. This level of parking provided will increase the modal share of cycling for the local area.

This development provides a quality of service of Level A+. This quality of service as described in the NCM depend on several factors including pavement condition, width of cycle track number of conflict points, junction delay and HGV influence. *Figure 4* shown previously shows that cyclists have been provided with high quality Toucan crossings in order to reduce conflict points. The quality of the pavement can be seen in drawings A557-OCSC-XX-XX-DR-C-0114 and A557-OCSC-XX-XX-DR-C-0115 and an extract of these drawings can be seen below and overleaf in Figure 5 Figure 6 respectively. This shows that the cycle tracks will be made of high quality material that will provide a comfortable ride for cyclists and increasing the attractive of this form of transport.

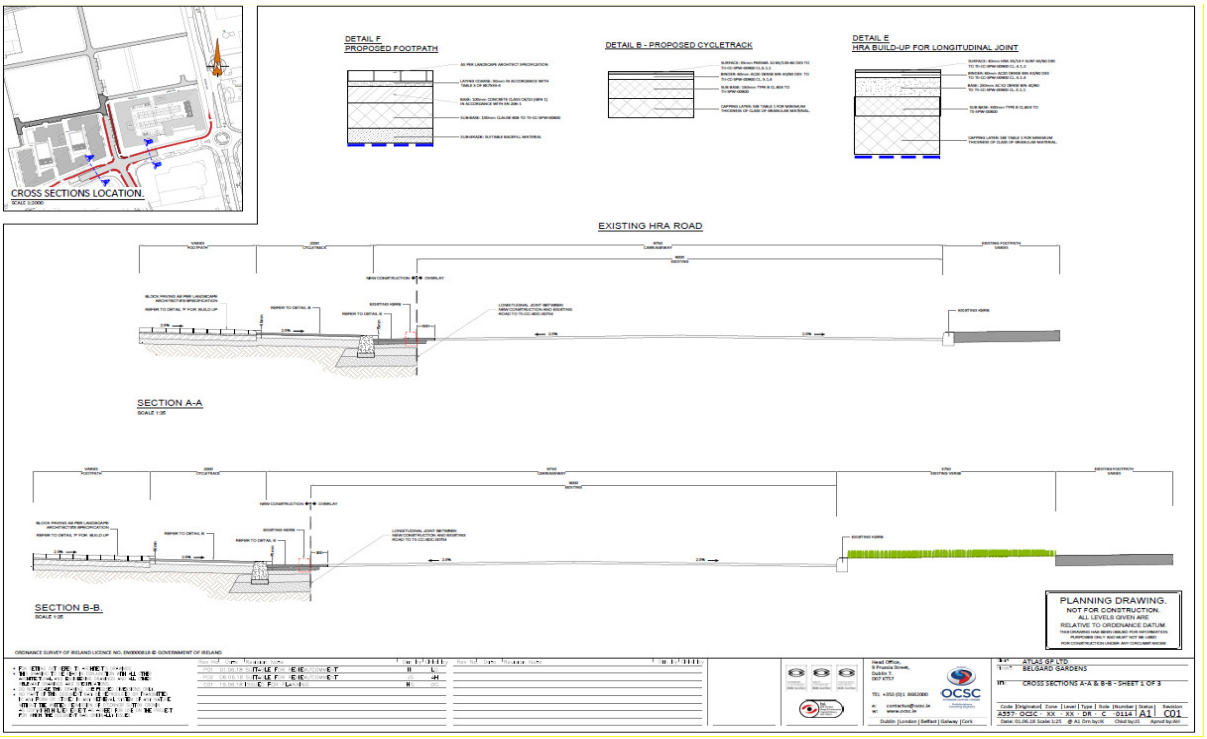


Figure 5: Cross Sections Belgard Square North

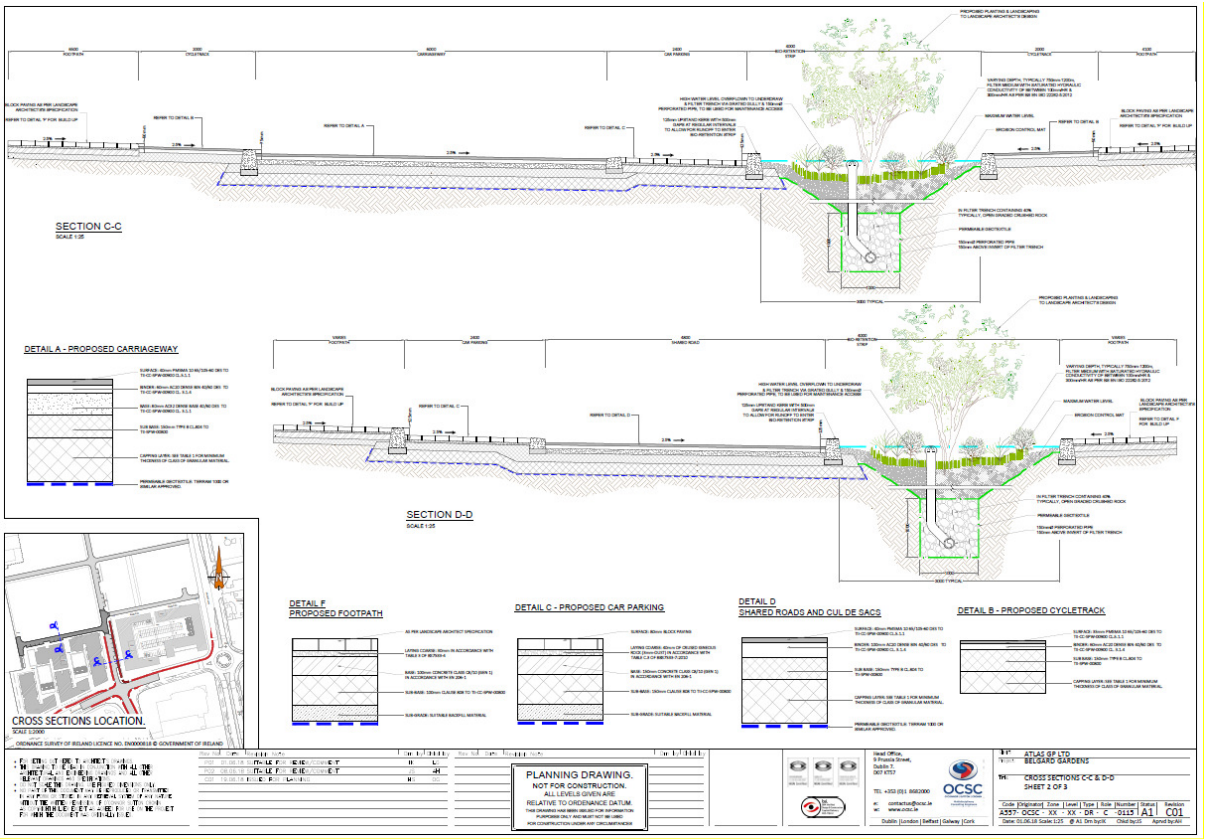


Figure 6: Cross Sections Belgard Gardens

It is noted that within Institute of Technology Tallaght (ITT) there area circa 250 cycle parking spaces. In discussion with ITT facilities manager (Paul Campbell) he noted that based on his experience the close proximity of the development to the campus would encourage walking more than cycling. It was also noted that the 250 cycle parking spaces were rarely near full uptake. The rate of cycle parking provided was provided based on the above conversation with the ITT. 1227 cycle spaces have been provided as part of Phase 1 development.

As part of the cycle strategy, it is acknowledged that the Apartment Guidelines are seeking to allow for a high degree of access to travel by bicycle even where it is not a primary mode of transport. Taking this into consideration, combined with the aforementioned cycle modal share level and future targets, it is proposed to allocate 20 no. cycle parking spaces at the Phase 1 development for use by a dockless cycle rental scheme such as Bleeper Bikes. Users can access an interactive map through an app to indicate available bikes locally and return them to an approved location elsewhere. The benefit of such a scheme is that each bike can facilitate multiple different users across the course of a day meaning access to a bicycle is maintained without the need to own a bike. This is particularly relevant where cycling is viewed as a secondary mode of travel, which is the case in many instances as people at the development will also choose to walk and use local public transport. This is also in line with the Apartment Guidelines which allow for a deviation from its stated standard based on "*factors such as location, quality of facilities proposed, flexibility for future enhancement/enlargement, etc.*"

Bicycle parking, in line with the Development Plan and the Apartment Guidelines will be provided in safe, secure and convenient locations, an example of this can be seen in the below *Figure 7* overleaf.

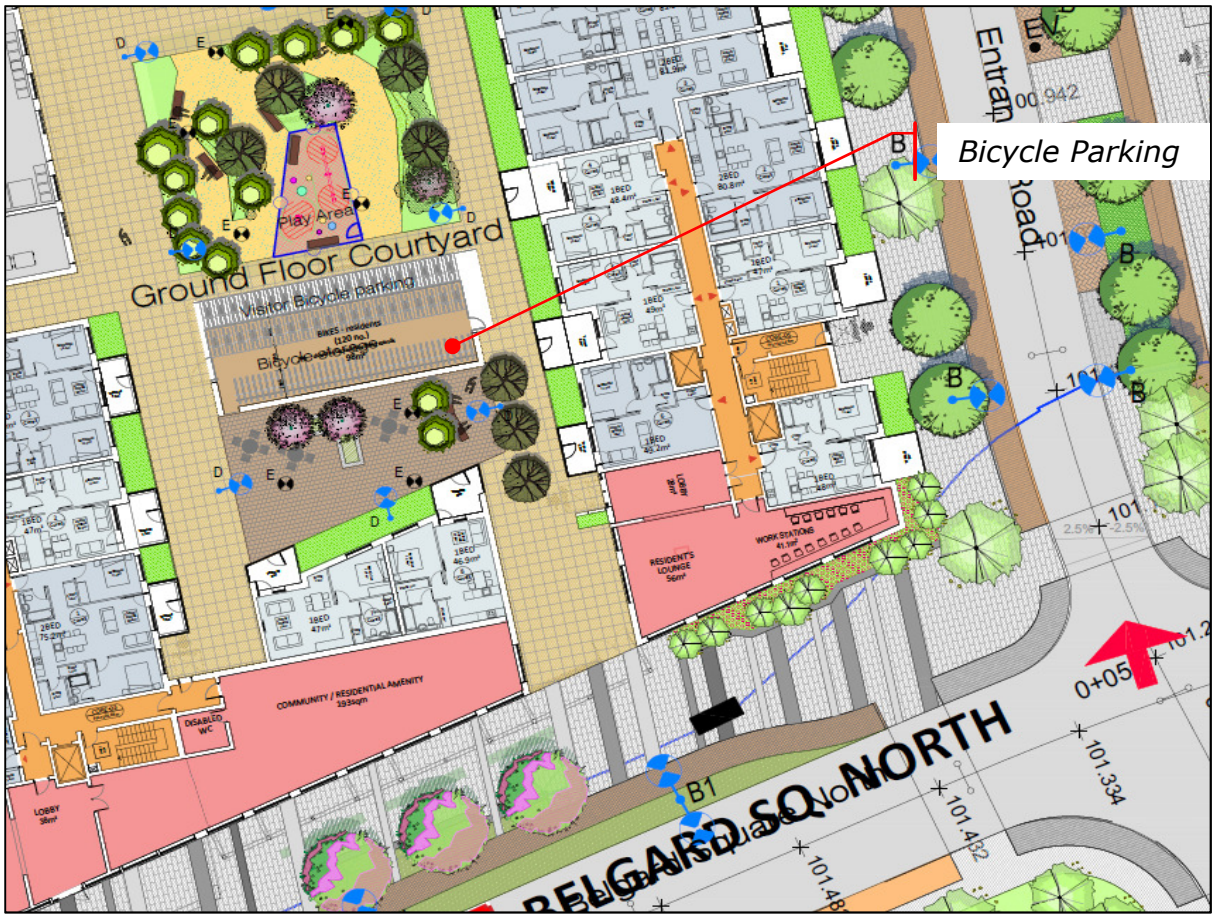


Figure 7: Bicycle Parking Location

A range of different cycle parking/storage options will be provided as part of the development. Different types of storage will be provided for visitors and residents to ensure parking will be provided for all and will include a range to cater for different ages, users and ability. The most common type that will be provided is a Sheffield stand (see image below in Figure 8) and these will be used wherever possible. This type of stand slows bikes to stand freely without getting wheels damaged.

Figure 8: Sheffield Bicycle Stand

In order to achieve the required density of cycle as per the development standard and apartment guidelines as noted previously, stacker systems will be required in order to achieve the required number of cycle parking spaces.

Figure 9: Vertical and Stacker Option Bicycle Stand

In this case, the proposed development will have a mix of residents, so ease of use must be considered. The stacked or vertical option would be quite difficult for example a parent with a child or a younger person. The current proposals is

for a mix of stand types at locations more suitable to each, for example, the student accommodation can have higher density vertical options more fit for young students but not for residential. For the residential, more traditional type Sheffield type stands will be provided.

Further consideration for the rational for cycle parking can be found in the Traffic Impact Assessment that is submitted as part of the application relating to this development.

2.3 ITEM NO. 5 DEVELOPMENT & INFRASTRUCTURE PHASING FOR PHASE 1

Request

"Further consideration/amendment of the documents as they relate to the phasing of development on the site and its integration with the development and regeneration of the town centre. The documentation should indicate the timeframe in which the proposed development would proceed and that the infrastructure required to support and facilitate development on the rest of the application site and on neighbouring land was provided in a timely manner. The documentation should also demonstrate that the layout and design of the development would be compatible with the proper and sustainable development of adjoining land."

Response

No additional infrastructure, outside of this application, is required to facilitate this development. It is however noted that other plans are under consideration by South Dublin County Council in the vicinity of this site and a high degree of connectivity is planned to integrate with these.

The tendering process will run in tandem with the planning process and it is intended to appoint a contractor in early 2019. Allowing a reasonable period for mobilisation and site set up, it is expected that demolition work on site will commence by Q1 2019. The demolition contract is estimated to be complete within 8 months. The construction works will start in Q3 2019 with the projected completion of the buildings by Q4 2021. Phase 1 construction will be split in

sections. It is envisaged that the construction will begin with access road. Construction will then begin on the western residential blocks. The construction of Phase 1 will predominately work from west to east with some overlap of blocks. This will allow unimpeded access to the works and minimise the opportunity for cross overs of new construction and conflict of working area requirements.

The extent of the North – South road for taking in charge will be constructed most likely between Q2 2021 and Q4 2021 but in any case no later than 3 years after commencement of construction. This is to ensure that the critical infrastructure for the development and the wider City of Tallaght is delivered for South Dublin County Council in a timely manner. The duration of three years from commencement is also reasonable to allow the project to support the delivery of this infrastructure in a financially sustainable way. It is noted that earlier delivery of this expensive piece of infrastructure would put an onerous burden on the project and could be too early in the project lifecycle to effectively contribute to the city requirements. Phase 1 construction is split below into 5 stages and these have been set out in the following diagrams.

1. Construction of the access roads;

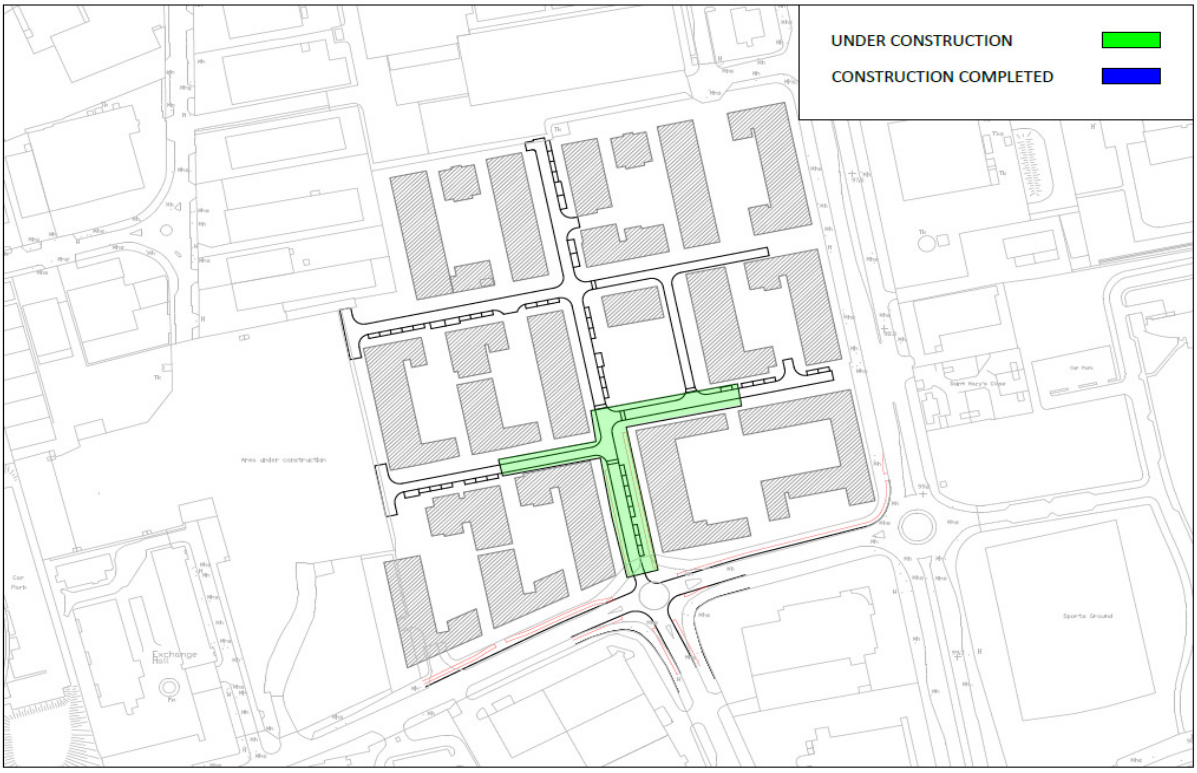


Figure 10: Construction Sequence Stage 1

2. Construction of the western blocks;

Figure 11: Construction Sequence Stage 2

3. All west blocks in phase 1 under construction and centre block on eastern side;

Figure 12: Construction Sequence Stage 3

4. **All blocks from previous section 3 that were under construction are now complete, podium slab on east side of Phase 1 under construction along with plaza and remainder of access roads as part of Phase 1. A temporary car park provides 108nr. spaces for residents**

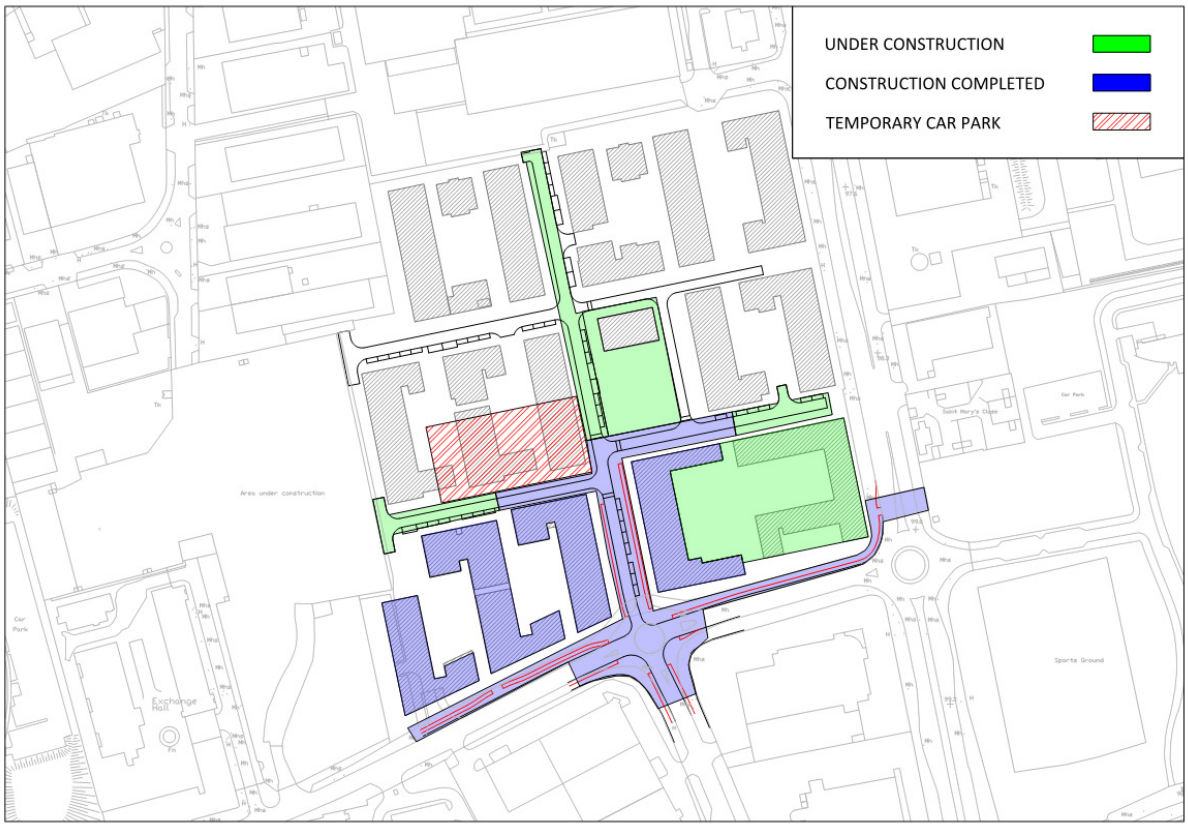


Figure 13: Construction Sequence Stage 4

As noted previously the construction of buildings is expected to be completed by Q4 2021. The full extents of the North South road will be completed between Q2 2021 and Q4 2021. All works as part of Phase 1 of the proposed development are expected to be completed in the final quarter of 2021.

5. Completion of Phase 1

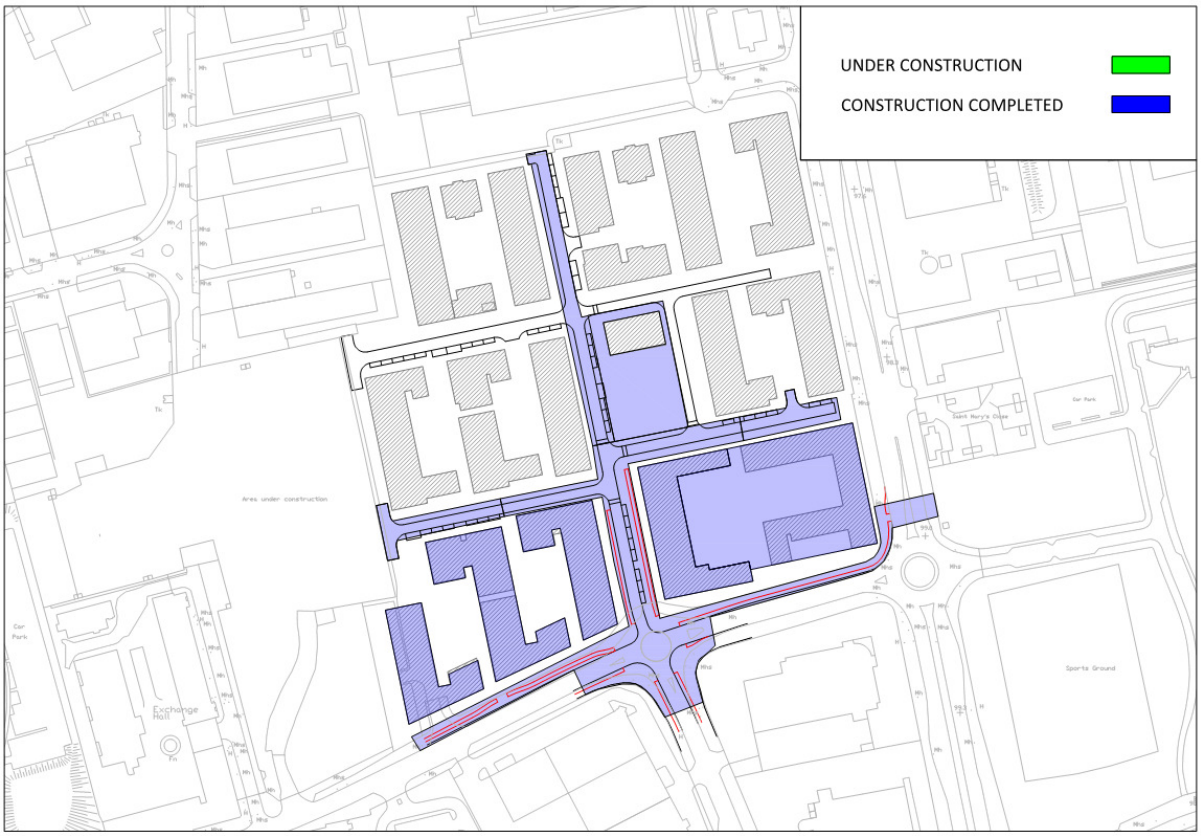


Figure 14: Construction Sequence Stage 5

It is noted that the traffic management plan will be developed for the scheme and this will be discussed with the Area Engineer for SDCC. It is also noted that due to the proposal to change the entrance junction type and carry out works on the public road the builder will have to apply for road opening licences through the MapRoad Roadworks Licensing website. All works on the public road will be carried out in accordance with the "Guidelines for Managing Openings in the Public Road" published by the Department of Transport (2017).

Further consideration for the rational for site development and the sequencing of construction works can be found in the Construction Methodology and Phasing

Management Plan that is submitted as part of the application relating to this development.

2.4 ITEM NO. 6 WATER SUPPLY AND DRAINAGE INFRASTRUCTURE

Request

"Further consideration of the documents as they relate to water supply and drainage infrastructure. The documentation submitted at application stage should be sufficient to demonstrate that the proposed surface water infrastructure would be adequate to cater for the proposed development and whether the council had indicated its agreement or otherwise to the proposals in this regard."

Response

OCSC met with SDCC Water Services (Mr. Brian Harkin and Mr. Chris Galvin) on 14th August 2018 at SDCC offices; to discuss and agree the content of the documentation submitted as part of this application, with regards to water supply and drainage infrastructure. Further subsequent discussions, in the form of email and telephone correspondence, took place in order to clarify the proposed surface water drainage design strategy. Refer to a copy of the email correspondence in **Appendix A** of this report.

It is noted that OCSC have received a letter of feasibility from Irish Water outlining confirmation that there is sufficient capacity within the water main and wastewater infrastructure to service the proposed development. The meeting with SDCC, on August 14th 2018, was primarily to discuss and agree the principles of the proposed drainage strategy of which SDCC Water Services Dept. were in agreement.

The following 3nr. concerns, which were itemised within the SDCC planning report, were discussed at the noted meeting along with the proposals to address:

1.1 It is unclear what proposed area is hardstanding, what proposed area is permeable area and what proposed area is greenfield with their respective runoff coefficients.

Response: OCSC outlined, at the above referenced meeting, that a summary of the existing hardstanding area is described within **Section 3.3.1** of the **Engineering Services Report**, which outlines that approximately 75% (5-hectares) of the overall existing site area is currently hardstanding with the remaining 25% (approximately 1.6 hectares) being green open space. This is also shown on OCSC drawing **A557-OCSC-XX-XX-DR-C-0505**, which provides an overview of the existing site area. This drawing was also presented at the noted meeting and subsequently emailed to SDCC drainage department.

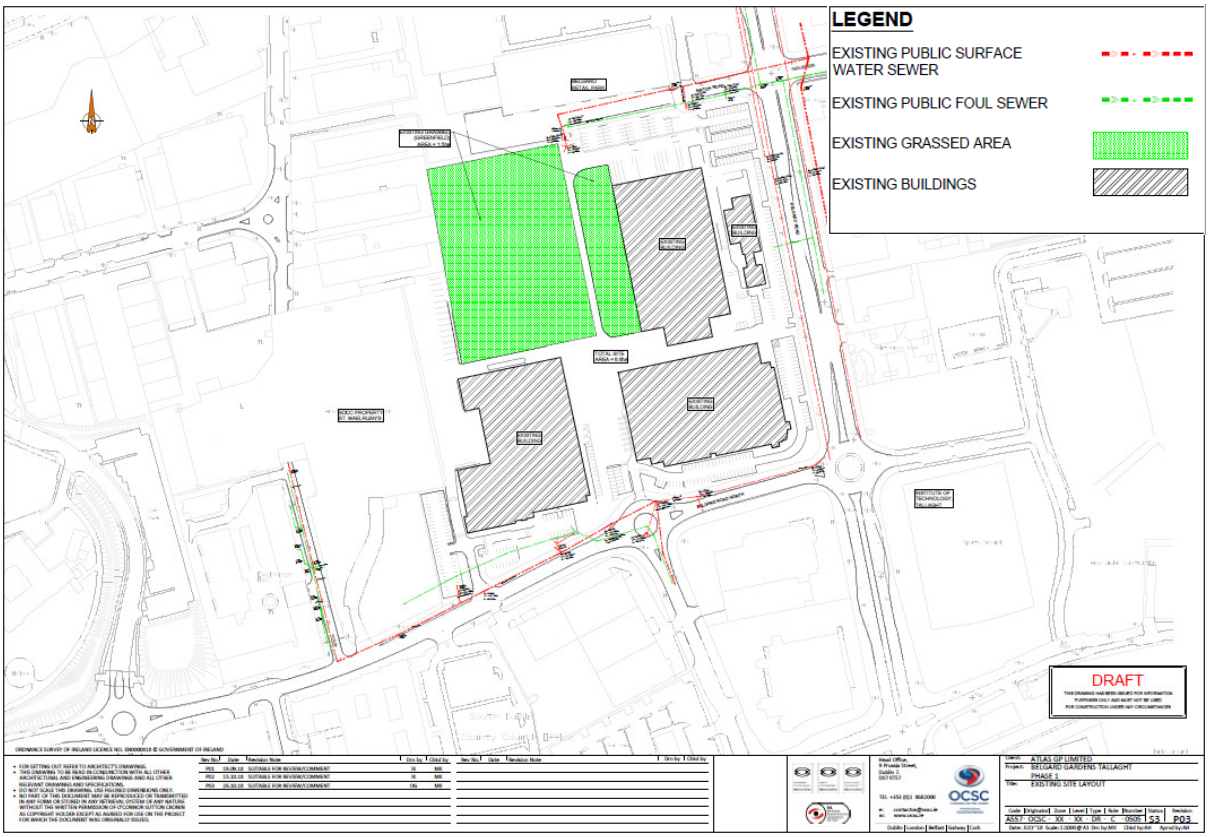


Figure 15: Overview of Existing Green Areas

Drawing A557-OCSC-XX-XX-DR-C-0506 was also issued to SDCC, which outlines the proposed sub-catchments within the overall site, along with identifying the proposed green roof and bio-retention areas. Refer to Figure 15 for overview.

Figure 16: Proposed Catchment Overview

The overall development site is to be served by 3nr. separate drainage catchments, as indicated on drawing ***A557-OCSC-XX-XX-DR-C-0506***. These are summarised as follows:

1. *Main Attenuation Catchment (4.93 hectares)*
   The development's main drainage network serves the entirety of the private areas, 3.15 hectares, within this Phase 1 application, along with 1.78 hectares from the future Phase 2.
2. *Taken In Charge Road (0.57 hectares)*
   The proposed North-South road is to be offered to be taken in charge by SDCC. The drainage associated with this road and the adjoining paved area, which are drained via bio-retention strips and filter trenches, is to form part of a separate drainage catchments, with outfalls to the public sewer being provided at both Airton Road and Belgard Road North.

3. *North East Corner of Site (1.14 hectares) – Future Phase 2*

   The north eastern corner of the site, which is part of the future Phase 2 development, is at a relatively lower level than the site's main drainage catchment and therefore cannot utilise a common attenuation system. Therefore, this area must be drained independently with its own limiting discharge and attenuation system. This is to be designed in detail as part of the Phase 2 application.

For the purpose of the overall network design, we have considered all external (roads & landscaping) areas as being 100% impermeable; giving a winter global runoff coefficient, C_v, of 0.84, in accordance with the HR Wallingford and Modified Rational Method for runoff. This is as the soft landscaping areas are subject to change and cannot be accurately calculated; ensuring an upper bound attenuation volume is provided. The green roof areas are inputted into the drainage network design program using input Time Area Diagrams, which is detailed further in ***Section 3.4.5*** of the **Engineering Services Report**. A summary of the differing catchments, sub-catchments and design input method is shown in the table below.

	Gross Area (hectares)	% Area Impermeable	Design Input Method
CATCHMENT 1 (Phase 1 and part of Phase 2)			
Roof Areas			
Intensive Green Roof	0.38	100	Time Area Diagram
Extensive Green Roof	1.39	100	Time Area Diagram
Other Roof Area	0.43	100	Contributing Area
Podium Soft Landscaping	0.14	100	Time Area Diagram
External Areas			
Private Road (Incl. parking)	0.29	100	Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.10	100	Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	2.20	100	Contributing Area
Catchment 1 Total	**4.93**		
CATCHMENT 2 (Phase 1)			
Taken In Charge Road	0.23		Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.07		Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.26	100	Contributing Area
Catchment 2 Total	**0.57**		
CATCHMENT 3 (Phase 2)			
Roof Areas			
Intensive Green Roof	0.20	100	Time Area Diagram
Extensive Green Roof	0.17	100	Time Area Diagram
Other Roof Area	0.10	100	Contributing Area
Podium Soft Landscaping	tbc		
External Areas			
Private Road (Incl. parking)	0.14	100	Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.03	100	Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.50	100	Contributing Area
Catchment 3 Total	**1.14**		
Overall Catchment Area	**6.64**		

Table 1 – Catchment Type and Area overview

The above design approach was discussed with SDCC Drainage Department and issued by email for comment. It was discussed how the proposed drainage design approach differs, from the more conventional method of simply applying a runoff coefficient to catchment areas, due to the significant varying SuDS measures of intensive and extensive green roofs along with bio-retention strips and filter drains.

The design approach, which utilises the integrated MicroDrainage MDSuDS Network Design computer software, by Innovyze Solutions (formerly XP Solutions), is detailed fully in ***Section 3.4*** of the Engineering Services Report.

The Green Roof Design function within the software allows for attenuation of rainwater through the proposed green roofs by simulating the rainfall to the individual roof catchments over an extended time of concentration (120min) as opposed to applying a reduced runoff coefficient at a standard time of concentration. All other areas within the development have been considered '100 % impermeable' but with the global runoff coefficient of 0.84 for winter rainfall events, as outlined earlier, for the purpose of sizing the underground gravity drainage network and attenuation system. This design approach was discussed in detail with SDCC Water Services and it was agreed that an 'executive summary' of the approach would be submitted to South Dublin County Council Water Services Department for comment. Refer to **Appendix A** for a copy of the email correspondence with SDCC Water Services Department.

1.2 What areas are to be taken in charge, if any?

Response: Please refer to OCSC drawing **A557-OCSC-XX-XX-DR-C-0119** for an overview of the areas to be taken in charge. Further to discussions with South Dublin County Council, it is proposed that the development's management

company are to enter into agreement with SDCC; so that the maintenance of the proposed landscaping, and therefore drainage associated with the proposed taken-in-charge roads, will be undertaken by the development's management company. This was discussed and agreed in principle by Brady Shipman Martin (landscape architects) with South Dublin County Council.

1.3 Without this information, it is difficult to determine what attenuation is required for the site.

Response: Further to the response to Item 1.1 above, the design approach, which was used in determining the attenuation volume as part of an overall integrated drainage network comprising intensive green roofs, extensive green roofs, bio retention strips with filter drains under, as well as conventional pipe and underground storage system, is detailed extensively in ***Section 3.4*** of the Engineering Services Report. It was agreed at the above noted meeting with SDCC Water Services that an executive summary, containing key inputs / outputs, be submitted to SDCC Drainage Department for comment. This was submitted, by email, to SDCC Drainage Department on 12th September 2018, with further information issued by email on 14th September 2018 and 25th October 2018 following a request from SDCC. A copy of this email correspondence is included in **Appendix A** of this report.

3 SPECIFIC INFORMATION TO BE SUBMITTED WITH THE SHD APPLICATION

3.5 ITEM NO. 1 MOBILITY MANAGEMENT PLAN

Request

"A mobility management plan, which would include specific and quantifiable measures to facilitate the demand for travel and for parking arising from the development including, as appropriate, proposals to provide access to off-site car parking facilities for residents of the proposed apartments, and information as to where the responsibility would lie for the ongoing implementation of each measure."

Response

A Mobility Management Plan is provided as part of the planning application which includes such measures as:

1. Management and co-ordination of the Mobility Management Plan;

   This will include conducting travel surveys, implementing schemes to encourage sustainable travel, acting as an information point, negotiating with public transport providers and ongoing promotion of the plan.

2. Car sharing;

   Car-sharing will be promoted through various other means such as reserved parking specifically for car-sharers and through a car sharing database to encourage car sharing among staff/residents. Information on local taxi services will be provided.

3. Bus use;

The Mobility Management Plan will encourage and facilitate the use of the numerous existing bus facilities operating in the local area and any future services that may come on-stream.

Timetables and information on routes, ticket prices etc. will be kept on hand at all times and made available. The Mobility Manager will also promote and distribute information on any special tickets available such as tax-saver tickets, integrated ticket systems etc. on an ongoing basis. All information will be updated on a regular basis, with staff/residents being informed of any changes/disruptions to services.

4. Rail use;

The Mobility Manager for each stage will keep information on hand at all times regarding ticket prices, frequency of services, routes etc. for all existing services. Again, information on any ticket offers such as tax-saver tickets, integrated ticket systems etc. will be made available and promoted on an ongoing basis. All information will continue to be updated regularly, with staff/residents being informed of any changes/disruptions to services or any new services which may come on line.

5. Cycle and pedestrian facilities;

Phase 1 of the masterplan development will include the provision of 1227 cycle parking spaces which is significantly in excess of the current Development Plan requirements. These spaces will be located in secures and sheltered areas.

The Mobility Manager will continue to promote cycling through various schemes and promotions which may include:

- 'Bike to Work Week';
- Cycle safety training;
- Site visits from trained mechanics to check/repair bikes;

- Discounts on bikes and accessories from various stores;
- On-site pool bike scheme;
- Provision of high visibility vests.

6. Car parking provision;

The completed development will provide a total of 129 car parking spaces to serve the Phase 1 development, with 104 to be dedicated for use by residents, 3 to be provided for use by car clubs to be established on-site and 22 at surface level for set down and visitor parking. 5% of the parking provided will be dedicated to disabled users.

The proposed 3 no. car club spaces will be help facilitate a cultural shift away from car ownership and, by association, car travel, by maintaining access to a car for resident's occasional use while more sustainable modes are used for day to day travel needs. This facility will be monitored in terms of usage and demand and the number of vehicles available increased as appropriate.

Alternative parking options locally are available but come at an associated cost will serve as a disincentive to travel by private car.

7. Management of students;

At the start and end of each college year/term, there is expected to be relatively large number of students arriving and departing the site within a short time period. Given the nature of the activity, this is likely to result in significant numbers of students being brought to the development by car to transport belongings in bulk.

In order to prevent an influx of vehicles to the site at any one time, an appointment system will be put in place by the management company whereby tenants are allocated a specific time interval for arrival and unloading/loading and departure at the site. This will be cognisant of respective start/end of terms

dates for different tenants and continuously be monitored by on-site staff for the duration of these periods.

During these peak periods, it is envisioned that the surface visitor car parking can be temporarily re-allocated to serve the tenants drop off/collection.

Further consideration for the specific and quantifiable measures to be implemented as part of this development in relation to demand for travel and for parking arising from the development can be found in the Mobility Management Plan that are submitted as part of the application.

3.6 ITEM NO. 4 DMURS/NCM COMPLIANCE REPORT

Request

"A report prepared by a suitably qualified and competent person demonstrating specific compliance with the requirements set out in the Design Manual for Urban Roads and Streets and the National Cycle Manual for all streets, including the revised junction to replace the roundabout on Belgard Square North and the proposed crossing of the Belgard Road."

Response

The design of the local road network has been designed in accordance with the Design Manual for Urban Road and Streets and the National Cycle Manual throughout. All roads have been designed with a "sense of place" and in the design has a particular focus on pedestrian and cyclists. The design of the site has a good regard for permeability through the site that will increase the level of connectivity of the surrounding area. The site also allows for future improvement of bus services along Belgard Square North in line with DMURS and Smarter Travel. These changes have been discussed with the NTA and agreed with South Dublin County Council Roads section.

The roads will be classified in accordance with table 3.1 of DMURS.

DMURS Description	Roads Act/NRA DMRB	Traffic Management Guidelines	National Cycle Manual
Arterial	National	Primary Distributor Roads	Distributor
Link	Regional (see note 1)	District Distributor Local Collector (see Notes 1 and 2)	Local Collector
Local	Local	Access	Access

Notes

Note 1: Larger Regional/District Distributors may fall into the category of *Arterial* where they are the main links between major centres (i.e. towns) or have an orbital function.

Note 2: Local Distributors may fall into the category of *Local* street where they are relatively short in length and simply link a neighbourhood to the broader street network.

Table 3.1: Terminology used within this Manual compared with other key publications.

Figure 16: DMURS Road Classification

The Design Speed will be 10-30kph for the internal roads and 50 kph for the external roads. DMURS Chapter 4 (P64) states *"The design speed of a road or street must not be up-designed so that it is higher than the posted speed limit".*

The speed selected is in compliance with Table 4.1 of DMURS.

PEDESTRIAN PRIORITY VEHICLE PRIORITY

FUNCTION	CENTRE	N'HOOD	SUBURBAN	BUSINESS/ INDUSTRIAL	RURAL FRINGE
ARTERIAL	30-40 KM/H	40-50 KM/H	40-50 KM/H	50-60 KM/H	60-80 KM/H
LINK	30 KM/H	30-50 KM/H	30-50 KM/H	50-60 KM/H	60-80 KM/H
LOCAL	10-30 KM/H	10-30 KM/H	10-30 KM/H	30-50 KM/H	60 KM/H

CONTEXT

Table 4.1: Design speed selection matrix indicating the links between place, movement and speed that need to be taken into account in order to achieve effective and balanced design solutions.

Figure 17: DMURS Design Speeds

The carriageway width is selected from Figure 4.55 of DMURS (refer excerpt below).

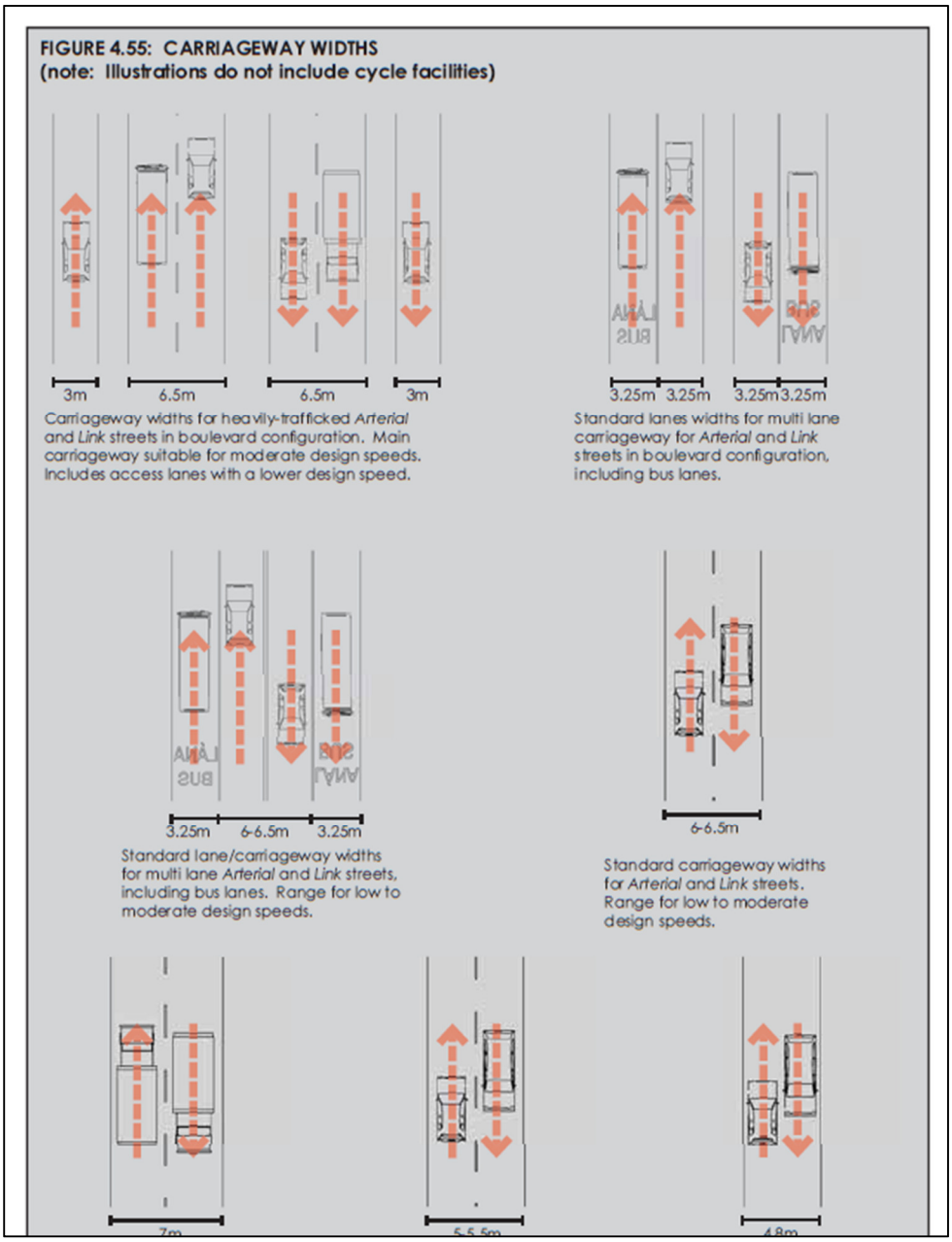


Figure 18: DMURS Carriageway Widths

All footways provided as part of this development will be a minimum of 2m in line with DMURS. Verge and rear strip widths will be determined from DMURS Section 4.3.1. Verges and strips have been combined with SuDS measures. This has been developed as part of the design of the drainage system.

The alignment of the roads has been designed so that the various geometric elements including horizontal and vertical curvature, super elevation and sight distance have at least the minimum values consistent with the chosen design speed of the road. This is as set out in Section 4.4 *Carriageway Conditions* of DMURS. A standard carriageway cross fall of 2.5% has been adopted throughout with super elevation applied on internal roads to facilitate draining them to SuDS measures, it is noted that the adverse camber is allowable under DMURS designs in accordance with Table 4.3. A cross fall of 2.5% has been used for footpaths and cycle facilities.

HORIZONTAL CURVATURE

Design Speed (km/h)	10	20	30	40	50	60
Minimum Radius with adverse camber of 2.5%	-	11	26	56	104	178
Minimum Radius with superelevation of 2.5 %	-	-	-	46	82	136

VERTICAL CURVATURE

Design Speed (km/h)	10	20	30	40	50	60
Crest Curve K Value	N/A	N/A	N/A	2.6	4.7	8.2
Sag Curve K Value	N/A	N/A	2.3	4.1	6.4	9.2

Table 4.3: Carriageway geometry parameters for horizontal and vertical curvature.

Figure 19: DMURS Geometric Elements

The development's junctions have been designed with the primary principle of providing safe and consistent layouts in order to present a uniformity of approach to drivers and other road users. In addition junctions will have sufficient capacity to accommodate design year peak traffic flows thus optimising network capacity.

Internal junctions have been created at points appropriate to the development masterplan. In accordance with DMURS 4.4.1 these roads have widths ranging

from 5m to 6m. Given the local access nature of these roads, and in the interest of predictability of junction type, these junctions will form simple cross roads or priority T-junctions as appropriate.

All of the above is discussed in more detail in the Engineering Service Report produced by OCSC.

CYCLE FACILITIES

The cycle facilities have been designed by OCSC to create a legible environment in accordance with the National Cycle Manual June 2010 (NCM). In this scheme there are four principle areas that cycle facilities have been provided. They are existing external roads, the new north-south taking in charge road, the shared street to the west incorporating the cycle linkage from ITT to Tallaght University Hospital and other streets. A key factor in the design of the cycle facilities is that the NCM guidance states that all dedicated cycle facilities should have a horizontal or vertical separation from pedestrian facilities (in roads with high traffic they must also be separated from vehicles vertically). During discussions with the NTA it was noted that it is their preference that vertical separations are incorporated into the design where the cycletrack is adjacent to the footpath. This is the approach that OCSC have taken. It is however noted that SDCC expressed a preference for no vertical separation.

External Streets

Running along the northern kerbside of Belgard Square North an off-road cycle track has been designed. This cycle track is 2m wide in accordance with the NCM's width calculator. The track is vertically separated from the carriageway and footpath, as per Section 1.9.3 of the NCM the kerb here will also ensure the visually impaired may navigate the footpath safely.

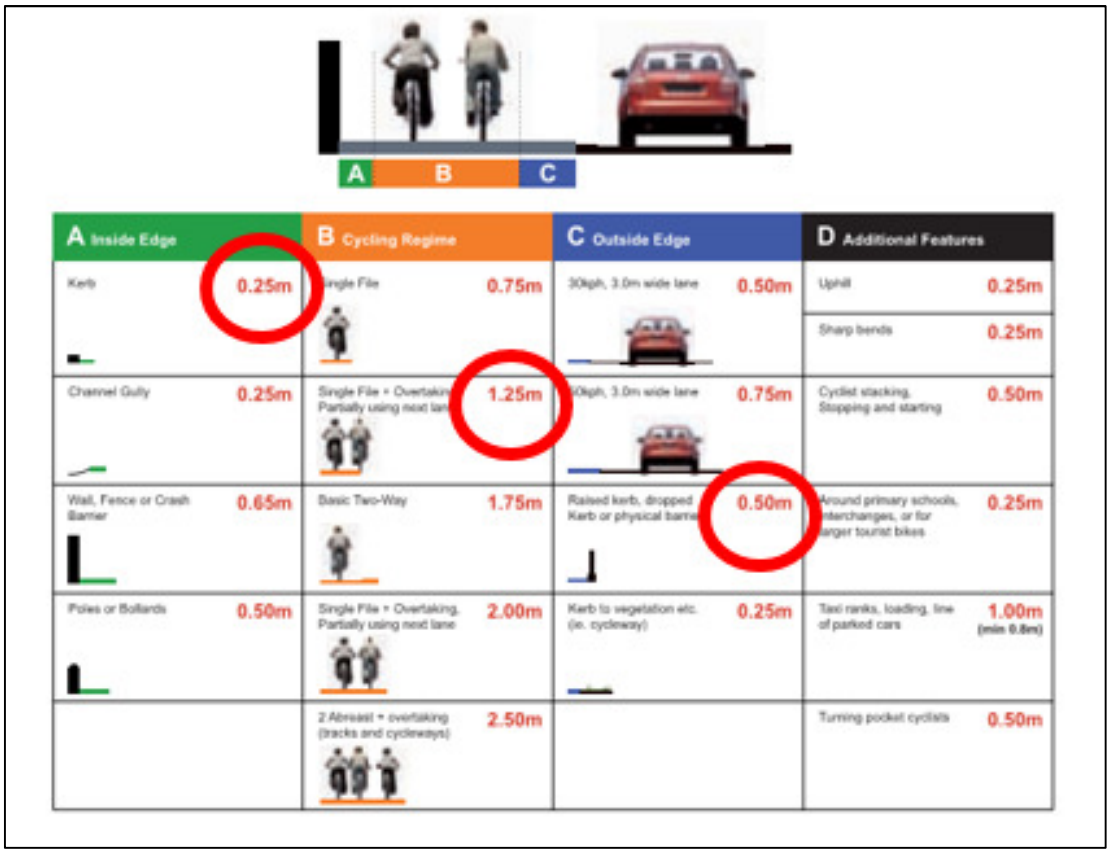


Figure 20: National Cycle Manual Width Calculator

The Shared Street

The internal road running west-east that connects with the future Cookstown Industrial Estate Link Road and has been designed as a shared street according to the NCM's guidance graph.

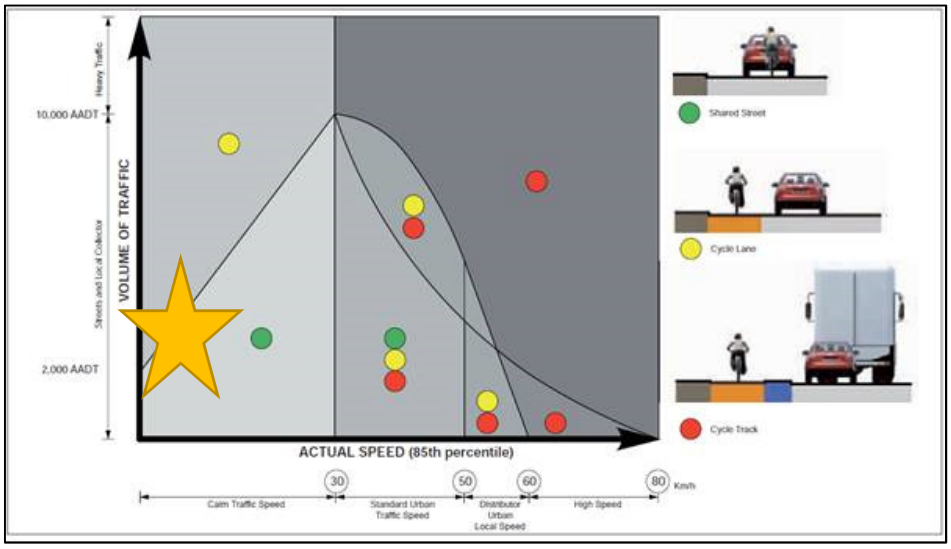


Figure 21: National Cycle Manual Guidance Graph

These streets are achieved by using no change in materials between roads and footpaths, no road markings, narrow streets and tighter corner radii. This will result in lower speeds of vehicles and an increase in pedestrian and cyclist's priority.

Traffic Lights

There are two sets of traffic lights as part of the development. The pedestrian crossing at Belgard Roundabout and the new signalised junction at the site entrance. The junction designs will be contained in the planning submission. The junctions will be controlled with SCOOT and MOVA capabilities as required by SDCC Traffic Section.

The new signalised junction at the development entrance removes the existing uncontrolled crossings at this junction. The new toucan crossings provide as part of this junction provide increased levels of priority for both pedestrians and cyclists in the area of the development site. The toucan crossing has been designed in accordance with the National Cycle Manual, DMURS and the Traffic Signs Manual chapter 9.

The new signalised crossing on the Belgard Road has also been designed as a toucan crossing and will provide a link for pedestrians and cyclists from IT Tallaght though the development site to Tallaght Hospital. This toucan crossing has been designed in accordance with the National Cycle Manual, DMURS and the Traffic Signs Manual chapter 9.

Further consideration for the demonstrating specific compliance with the requirements set out in the Design Manual for Urban Roads and Streets and the National Cycle Manual can be found in the Engineering Services Report.

3.7 ITEM NO. 5 INTEGRATION WITH BUS INFRASTRUCTURE

Request

"Details as to how the proposed development would facilitate existing and proposed bus services in the area, with particular reference to the proposals made by the NTA for the BRT project and BusConnects."

Response

The existing carriageway on Belgard Square North has been widened in order to provide enough road width for a future segregated Bus Lane provided through BusConnects. BusConnects indicates a future bus corridor in the area and the kerb line has been set back to accommodate this future infrastructure. This section of carriageway can be seen in drawing A557-OCSC-XX-XX-DR-C-0701. This was achieved through consolation with the National Transport Authority and takes cognisance of future BRT projects and BusConnects. The proposed new development looks to tie in with future plans for enhances in bus services for the wider area and looks to future proof for these upgrades in service on Belgard Square North/Belgard Road.

Anthony Horan **ShaneMcGivney**

Associate Director **Engineer**

Chartered Engineering MIEI **MIEI**

(BE, P.Cert RSA, P. Dip. PM) **(ME, BEng)**

For OCSC MULTIDISCIPLINARY CONSULTING ENGINERS

Appendix A

Correspondence with South Dublin County Council Water Services Department

Mark Killian

From: Brian Harkin <bharkin@SDUBLINCOCO.ie>
Sent: 31 October 2018 15:21
To: Mark Killian
Cc: Chris Galvin
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Categories: Submitted to Gekko - Received

Mark,
I acknowledge receipt of your email.
Thank you.

Brian Harkin
Snr Executive Engineer
Water Services
Tel: 01-414 9000 Ext 4234

From: Mark Killian [mailto:mark.killian@ocsc.ie]
Sent: Tuesday 30 October 2018 08:52
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Brian,

As requested, please find a copy of CIRIA guideline C644 attached. Refer to Section 10.3 for information on runoff coefficients, as outlined in earlier email.

Regards,
Mark

From: Mark Killian
Sent: 25 October 2018 17:48
To: 'Brian Harkin' <bharkin@SDUBLINCOCO.ie>
Cc: 'Chris Galvin' <cgalvin@SDUBLINCOCO.ie>; Anthony Horan <anthony.horan@ocsc.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Brian,

Further to our most recent phone call, I have amended the catchment overview table to provide typical runoff coefficients that would be representative of the catchment areas:

	Gross Area (hectares)	% Area Impermeable	Design Input Method	Typical Equivalent Runoff Coefficient
CATCHMENT 1				
Roof Areas				
Intensive Green Roof	0.38	100	Time Area Diagram	0.1
Extensive Green Roof	1.39	100	Time Area Diagram	0.4

Other Roof Area	0.43	100	Contributing Area	0.84
Podium Soft Landscaping	0.14	100	Time Area Diagram	0.1
External Areas				
Private Road (Incl. parking)	0.29	100	Contributing Area	0.84
Bio Retention Area (with Filter Trench Underneath)	0.10	100	Contributing Area	0.84
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	2.20	100	Contributing Area	0.84
Catchment 1 Total	**4.93**			
CATCHMENT 2				
Taken In Charge Road	0.23		Contributing Area	0.84
Bio Retention Area (with Filter Trench Underneath)	0.07		Contributing Area	0.84
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.26	100	Contributing Area	0.84
Catchment 2 Total	**0.57**			
CATCHMENT 3				
Roof Areas				
Intensive Green Roof	0.20	100	Time Area Diagram	0.1
Extensive Green Roof	0.17	100	Time Area Diagram	0.4
Other Roof Area	0.10	100	Contributing Area	0.84
Podium Soft Landscaping	tbc			
External Areas				
Private Road (Incl. parking)	0.14	100	Contributing Area	0.84
Bio Retention Area (with Filter Trench Underneath)	0.03	100	Contributing Area	0.84
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.50	100	Contributing Area	0.84
Catchment 3 Total	**1.14**			
Overall Total Area	**6.64**			

As discussed and as detailed in earlier emails, we have developed the integrated network design model, for the proposed surface water drainage network, using MicroDrainage design software, by Innovyze Inc, which simulates the overall drainage network including the sub-catchment bio-retention strips and filter trenches and allows for design of green roofs using the MDSuDS plug-in. The below hyperlinks will provide further information from their website.

http://www.innovyze.com/products/microdrainage/
http://www.innovyze.com/products/microdrainage/mdsuds/

This software simulates the green roof areas by inputting its runoff to the main network as a Time Area Diagram, while the bio-retention strips and filter trenches attenuates the runoff from the road and adjacent paved areas prior to entering the main SW drainage network. This all accumulatively results in an overall beneficial impact on the required main attenuation storage volume required, when simulated along with the main drainage network as part of the same overall integrated drainage network.

We hope that this further clarifies the proposed drainage design however, please do not hesitate to contact me, should you require any further information.

Regards,
Mark

From: Mark Killian
Sent: 25 October 2018 17:18
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>
Cc: Chris Galvin <cgalvin@SDUBLINCOCO.ie>; Anthony Horan <anthony.horan@ocsc.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Hi Brian,

Thanks again for your time on the phone earlier and we understand your approach regarding the attenuation size, if it was to be derived as a singular 'end of line' attenuation.

Wallingford Procedure's Modified Rational Methodology suggests typical global runoff coefficients of 0.84 for winter rainfall events and 0.75 for summer rainfall events on typical catchment areas (houses, roads and pavements). We have applies these runoff coefficients to all hardstanding areas.

Typical runoff coefficients are outlined in accepted green roof guidance e.g:

- Ciria Guideline C644;
- DCC's Green Roofs Over Dublin;
- The Green Roof Organisation's Code of Practice for the UK;
- FLL's Guidelines for the Planning, Execution and Upkeep of Green Roof Sites

An extract from CIRIA C644 provides the following typical runoff coefficients, based on the FLL guidelines:

Table 10.1 *Coefficient of discharge for green roofs (FLL, 2002)*

	Runoff coefficient (%)	
Roof construction	Roof gradient up to 15°	Roof gradient greater than 15°
Greater than 500 mm substrate depth	10	n/a
250–500 mm substrate depth	20	n/a
150–250 mm substrate depth	30	n/a
100–150 mm substrate depth	40	50
60–100 mm substrate depth	50	60
40–60 mm substrate depth	60	70
20–40 mm substrate depth	70	80

Please note, as discussed previously, that we are proposing intensive green roofs (typical substrate >500mm) and extensive green roofs (100mm substrate) as part of the proposed development, which would therefore have an equivalent runoff of 10% and 40% respectively, based on the above. We however, have used a different design approach as discussed previously.

As our proposed development contains a significant number of SuDS features, such as intensive and extensive green roofs, bio-retention strips with filter drain under (Refer drawing **A557-OCSC-XX-XX-DR-C-0506**, attached again for reference), all of which act as interception for initial rainfall and varies the time of concentration entering the drainage network, we have provided a more detailed design approach, with several sub-attenuation areas as well as the main attenuation.

Our design approach, as outlined in more detail in the earlier emails, involved developing an integrated drainage network model, which inputs the rainfall runoff from the green roof areas, using the Green Roof calculator in the MicroDrainage design software, as a Time Area Diagram. This, rather than applying a significantly reduced runoff coefficient, better represents the rainfall acting on a green roof further to research that was carried out at Sheffield University Green Roof Centre, which is where the UK's Code of Practice for Green Roofs was developed.

Further, all road areas drain laterally to bio-retention strips, which both delays the time of concentration and attenuates the flow to the main drainage network, upstream of the main attenuation area (i.e. provides sub-catchment attenuation, prior to the main attenuation and thus having an overall beneficial effect on the overall volume required).
All these areas use a runoff coefficient of 0.84 for Winter rainfall and 0.75 for Summer rainfall, again as part of the developed network design model and as per Modified Rational Method for hardstanding areas. The bio-retention and filter drains also throttle the rainfall runoff and provide attenuation for their contributing catchments.

The green roof areas, bio-retention (with filter trench), and the main drainage network (which contains the main attenuation area) all form part of the same integrated network design model, using the industry standard MicroDrainage Network computer software, by Innovyze Inc (outlined in further detail in earlier emails); resulting in the proposed attenuation volumes being required.

The results of the network model simulation (MicroDrainage) indicate that no flooding is evident for the critical 1%AEP design rainfall event (including climate change allowance).

We hope that the above provides further clarification on your request.

Regards,
Mark

From: Brian Harkin [mailto:bharkin@SDUBLINCOCO.ie]
Sent: 25 October 2018 15:39
To: Mark Killian <mark.killian@ocsc.ie>
Cc: Chris Galvin <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

To: Mark Killian OCSC Engineers Dublin

Would you provide estimates of run off coefficients for each surface type in proposed development.

If I use a run off coefficient of 0.8 for all areas then the attenuation system is significantly undersized.

If you provide more information of run off coefficients for each surface type then I can better assess the application.

Brian Harkin
Senior Executive Engineer
Water Services
Tel: 01-414 9000 Ext 4234
SDCC

From: Mark Killian [mailto:mark.killian@ocsc.ie]
Sent: Wednesday 26 September 2018 11:38
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>; Chris Galvin <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Hi Brian / Chris,

Just following up on the emails below, as I am conscious of our client's willingness to submit to ABP soon.

Is it possible to get confirmation of SDCC's approval of our drainage design?

Please do not hesitate to contact me, should you require any further information. I can also make myself available, should you wish to discuss further over a meeting?

Thanks,
Mark

From: Mark Killian
Sent: 21 September 2018 12:08
To: 'Brian Harkin' <bharkin@SDUBLINCOCO.ie>; 'Chris Galvin' <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Hi Brian / Chris,

Have you had the chance to review our drainage design proposal below any further? I have attached a copy of the finalised drainage design drawings for further context.

We would appreciate if you could please advise of SDCC's satisfaction of our design and / or advise of any further comment.

Please do not hesitate to contact me, should you require any further information.

Regards,
Mark

From: Mark Killian
Sent: 18 September 2018 17:16
To: 'Brian Harkin' <bharkin@SDUBLINCOCO.ie>; 'Chris Galvin' <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Hi Brian / Chris,

Further to the correspondence below and our previous meeting at your office, have you any further queries in relation to the design concept and information provided for the surface water drainage at the proposed Belgard Road development?

We are currently finalising our revised Engineering Services Report and Drainage Design Drawings for planning submission and would like to ensure that SDCC Water Services are satisfied with our approach.

Thanks,
Mark

From: Mark Killian
Sent: 14 September 2018 11:23
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>; Chris Galvin <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Hi Brian,

1. Green Areas / Hardstanding

As outlined below, the existing total site area is 6.6 hectares, which consists of approximately:

- 1.6 hectares grassed area;
- 2.2 hectares building structure;
- 2.8 hectares road and car parking.

The breakdown of the proposed development is a little more complex than simplifying it into grassed / hardstanding, as previously discussed at our meeting. This is why we have approached the design using the MicroDrainage (including MDSuDS and Green Roof Calculator) Integrated Network Design so that we could incorporate the green roofs, bio-retention areas with filter trenches and the storage feature as part of a complete design.

The table below is a breakdown of the proposed areas, separating the roof, road and others and with reference the 3nr. catchment areas (Refer to the drawing A557-OCSC-XX-XX-DR-C-0506, attached again for reference):

1. Catchment 1 is the development's main drainage network, which incorporates all of Phase 1 and the majority of Phase 2.
2. Catchment 2 is the proposed north-south road, through the centre of the site that is to be taken in charge. We are proposing to keep the drainage system (bio-retention and filter trench) separate to the main network. Previous discussions with Parks Dept have indicated that the proposed building management team will maintain these bio-retention areas; for consistency with the overall development area.
3. Catchment 3 is the north east corner of the site that is relatively lower than the remaining site, which must be independent of the other network due to the relationship[of the proposed FFLs and the main network attenuation's maximum water level.

For the purpose of the network design, we have considered all external (roads & landscaping) areas as being 100% impermeable; giving a global runoff coefficient of 0.84. This is as the soft landscaping areas are subject to change and cannot be accurately calculated; ensuring an upper bound attenuation volume is provided.

As discussed previously, and outlined below, the methodology for the green roof design is based on the inputted Time Area Diagram, which result in the runoff from these areas entering the main network in a similar manner to the performance of a green roof as opposed to a paved area.

Please note that the Phase 2 areas are subject to detailed design prior to its planning submission however, we have accounted for maximum hardstanding in relation to our network design.

	Gross Area (hectares)	% Area Impermeable	Design Input Method
CATCHMENT 1			
Roof Areas			
Intensive Green Roof	0.38	100	Time Area Diagram
Extensive Green Roof	1.39	100	Time Area Diagram
Other Roof Area	0.43	100	Contributing Area
Podium Soft Landscaping	0.14	100	Time Area Diagram

External Areas			
Private Road (Incl. parking)	0.29	100	Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.10	100	Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	2.20	100	Contributing Area
Catchment 1 Total	**4.93**		
CATCHMENT 2			
Taken In Charge Road	0.23		Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.07		Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.26	100	Contributing Area
Catchment 2 Total	**0.57**		
CATCHMENT 3			
Roof Areas			
Intensive Green Roof	0.20	100	Time Area Diagram
Extensive Green Roof	0.17	100	Time Area Diagram
Other Roof Area	0.10	100	Contributing Area
Podium Soft Landscaping	tbc		
External Areas			
Private Road (Incl. parking)	0.14	100	Contributing Area
Bio Retention Area (with Filter Trench Underneath)	0.03	100	Contributing Area
Landscaping (Public Space Incl. Pavement / Trees / Plants …etc)	0.50	100	Contributing Area
Catchment 3 Total	**1.14**		
Overall Total Area	**6.64**		

2. Attenuation

The following attenuation volumes are to be provided, which have been estimated through the MicroDrainage Network Design computer; to ensure that there is no flooding throughout the development during the 1% AEP design rainfall event (Including a 10% increase for Climate Change allowance):

Catchment 1 (Main Network)
Filter Trench Under Bio-retention Areas: 150m^3
Underground Storage (1-in 30yr): 750m^3
Above Ground Storage (1in 30-yr <x> 1-in 100yr): 700m^3

Catchment 2 (to be taken in charge road)
Filter Trench Under Bio-retention Areas: 115m^3

Catchment 3
To be determined through detailed design of Phase 2

I hope the above clarifies our proposals a bit better.

Thanks and please do not hesitate to contact me, should you have any further queries.

Regards,
Mark

From: Brian Harkin [mailto:bharkin@SDUBLINCOCO.ie]
Sent: 13 September 2018 09:10
To: Mark Killian <mark.killian@ocsc.ie>
Cc: Chris Galvin <cgalvin@SDUBLINCOCO.ie>
Subject: RE: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Mark,
Thank you for your email.

Questions.

1 What is the before and after:
- Green area/ grass Hectares
- Hardstanding areas Hectares
- Site area Hectares

2 What is the proposed
- Surface water attenuation provided m^3
- Surface water attenuation required m^3

Thank you

Brian

From: Mark Killian [mailto:mark.killian@ocsc.ie]
Sent: Wednesday 12 September 2018 16:01
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>; Chris Galvin <cgalvin@SDUBLINCOCO.ie>
Subject: FW: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 2

Brian / Chris,

Drainage Layout drawing, as submitted for planning, attached for reference.

We would appreciate if you could please review and advise of further comment and / or approval, prior to our submission to An Bord Pleanala.

Regards,
Mark

From: Mark Killian
Sent: 12 September 2018 15:58
To: Brian Harkin <bharkin@SDUBLINCOCO.ie>; 'Chris Galvin' <cgalvin@SDUBLINCOCO.ie>
Subject: A557 - Belgard Gardens - Proposed Drainage Strategy Overview (SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18) email 1 of 3

Hi Brian / Chris,

In relation to the proposed Belgard Gardens, Phase 1 development, at Belgard Square North (*SDCC Ref: SPP001/18, ABP Ref: ABP-301909-18*) and as previously discussed at the meeting held at your offices on Tuesday 7th August 2018, we provide an overview summary of the proposed Surface Water Drainage Infrastructure Strategy, with reference to the attached drawings and documents; as follows:

1.0 Development Phasing

The proposed mixed-use development is to be phased in two separate planning applications, **Phase 1** and **Phase 2**.

The current application, *Phase 1*, is to comprise a childcare facility, 436 residential units, 358 student accommodation units and associated residential amenity space, which are to be provided across the southern 3nr. sectors of the proposed development (refer attached layout **A557-OCSC-XX-XX-DR-C-0506**). The provision of the main north- south road, which is to be taken-in-charge and 2nr. minor access roads and the augmentation of the Belgard Square North road, which aligns the southern boundary of the development, are also to be delivered as part of this Phase 1 application.

Phase 2 of this development, which has yet to be submitted to An Bord Pleanala, is to comprise a further 1,104 residential units, 2,500m^2 commercial space (preliminary numbers only and subject to detailed design) and a civic centre across the remaining 6nr. sectors. This is to be delivered along with with all remaining roads and associated infrastructure and landscaping.

2.0 Existing Site Context

The overall site (both phases), which consists of 3nr existing industrial developments, is approximately 6.6 hectares in area, of which, approximately 75 %, i.e. 4.95 ha, is considered impermeable areas (buildings and hardstanding), with the remaining 25%, i.e. 1.65 ha considered green space (grassed / trees). Refer attached drawing **A557-XX-XX-DR-C-0505** for further context.

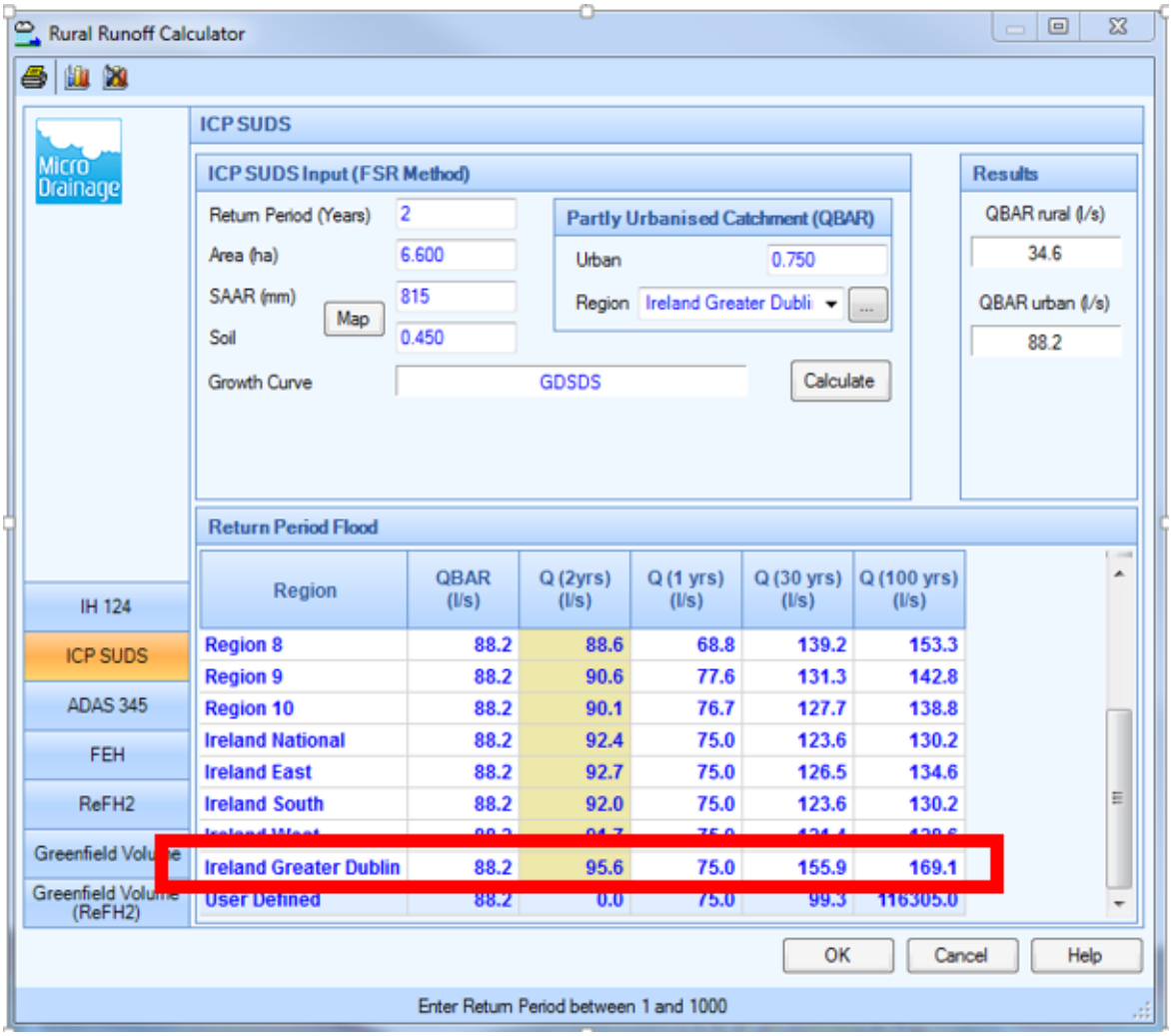
2.1 Proposed Site Context

The proposed development is to be separated into a total of 9nr. Sectors across the overall site area. As mentioned above, the *Phase 1* application is to comprise the initial 3nr. Sectors, associated landscaping and civil engineering infrastructure. Green roofs (intensive and extensive) are to be provided on all accessible roofs, with traditional flat roofs provided elsewhere (Refer Drawing **A557-OCSC-XX-XX-DR-C-0506**, attached for context).

3.0 Existing Surface Water Drainage Infrastructure

All existing roof and hardstanding, within the site boundary, currently discharges un-attenuated and un-treated flows to the public surface water drainage network via a number of locations on Airton Road, Belgard Road and Belgard Square North.

The maximum total existing rainfall runoff discharging from site has been calculated as **88.2 l/s** using the ICPSuDS $QBAR_{URBAN}$ Input, as per the Flood Studies Report (FSR Method) and as discussed at the pre-planning meetings on 26th September 2017 & 29th March 2018. Refer image below for results from Rural Runoff Design Calculator, from MicroDrainage (by Innovyze Inc.).



3.1 Proposed Surface Water Strategy (Overview of Proposals)

The overall site area is to be split into a total of 3 catchments (preliminary, pending detailed design of Phase 2) – refer attached drawing **A5757-OCSC-XX-XX-DR-0506**.

- Catchment 1 (4.9ha) – refers to the contributing catchment for the main drainage network, with the central attenuation;
- Catchment 2 (0.5ha) – refers to the contributing catchment from the road and adjacent pavement areas that are to be taken in charge;
- Catchment 3 (1.2ha) – refers to the catchment, which is within Phase 2 and is independent of Catchment 1; due to its relatively lower surface levels

	Area	% Area Impermeable	Input Method
Phase 1			
Roof Areas			
Intensive Green Roof	0.20	100	Time Area Diagram
Extensive Green Roof	0.64	100	Time Area Diagram
Other Roof Area	0.22	100	Contributing Area
Podium Courtyard	0.14	100	Time Area Diagram
Road / Pavement	0.67	100	Contributing Area
Taken in charge Road	0.50	100	Contributing Area
Landscaped / Public Space	1.09	100	Contributing Area
Total	**3.45**		

Phase 2 (Preliminary)			
Intensive Green Roof	0.39	100	Time Area Diagram
Extensive Green Roof	0.92	100	Time Area Diagram
Other Roof Area	0.35	100	Contributing Area
Road / Landscaped Area	1.49	100	Contributing Area
Total	**3.15**		

It is proposed to restrict the total rainfall runoff discharging from site to a maximum of **68.1 l/s**, which is the equivalent of the $QBAR_{URBAN}$ discharge rate for a 50% urbanised catchment, and is **a reduction on the current rate of discharge and Q (1yr)** – refer image above (Section 3.0). This is to be achieved largely through the provision of an integrated drainage network, complete with green roofs (intensive and extensive), bio-retention strips with filter drains under, a central underground attenuation storage (Stormtech, or similar approved) along with flow control chambers at the outfalls. These are summarised as follows:

Green Roofs

Intensive Green Roofs i.e. deep substrate (typically 500mm) are to be provided on all relatively low-lying roof areas. It should be noted that the proposed courtyard landscaping on podium level has been considered in a similar manner to the intensive green roof area, for the purpose of this design. These areas will typically comprise deep underlying soil and vegetation / planting, which will:

- reduce the rainfall runoff by absorption and evapotranspiration;
- reduce the runoff rate by attenuating the flows prior to entering the main drainage network and therefore not peaking at the same time as the rainfall on the more localised hardstanding area;
- improve the runoff quality by providing at-source treatment of the rainfall runoff, prior to discharging to the main drainage network.

Extensive Green Roofs i.e. shallower substrate (typically 100mm) are to be provided on higher accessible roof areas. These will typically comprise a 100mm substrate, underneath a layer of sedum moss (or similar). Some of the proposed extensive green roof areas are to contain PV Solar Panels, with gravel underneath, at the centre of the roof area but will not reduce the drainage efficiency of the green roof proposal.
The Extensive Green Roofs will provide similar outcomes to those outlined above for the Intensive Green Roof, but to a lesser extent.

Bio-Retention Strips

It is proposed to drain all road areas, and adjoining pavements, laterally to bio-retention strips that will contain a filter trench underneath. This will involve super-elevating all road profiles and providing a bio-retention strip on the 'low-side' to receive the rainfall runoff and allow it to percolate through to the filter trench underneath. These will discharge to the main drainage network, from the downstream end of the filter trench. The provision of the bio-retention strips will

- remove the need for road gullies;
- reduce the runoff rate by attenuating the flows prior to entering the main drainage network and therefore not peaking at the same time as the rainfall on the more localised hardstanding area;
- improve the runoff quality and remove the need for a fuel separator by providing at-source treatment of the rainfall runoff and hydrocarbons, prior to discharging to the main drainage network.

Attenuation

The proposed main drainage network, which has a total contributing catchment of approximately 4.9 hectares, is to discharge restricted flows to the public surface water drainage network, which will therefore require temporary storage; to attenuate the flows further to that outlined above. This will be achieved through the provision of an **in-line 750m^3 underground storage system** (Stormtech, or similar approved) along with a vortex flow control chamber (Hydro-brake Optimum, or similar). The underground storage will temporarily attenuate the rainfall runoff for rainfall events up to, and including, the **30-year design rainfall event**. More significant rainfall events will overflow

to the recessed plaza (**750m^3** volume), which has a design maximum depth of 1.25m for the 1% AEP and a 'wetted' duration of 480-minutes during the **critical 1% AEP design rainfall event**.

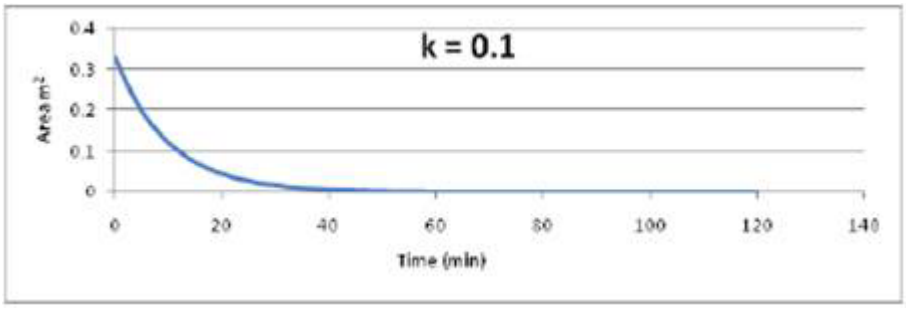
The proposed drainage associated with to-be taken-in-charge roads, with an associated contributing catchment of approximately 0.5 hectares, are attenuated through the bio-retention strips and underlying filter drains, which will also contain a flow control device at the outfall to the public surface water drainage network.

4.0 Proposed Drainage Network Simulation (Overview of computer design)

As discussed at the meeting on 7th August 2018, we have developed an integrated drainage design model for the development using the MicroDrainage computer design software, by XP Innovyze, which allows for provision of in-line filter drains and bio-retention strips, as well as Green Roof catchment design as part of their MDSuDS package.

As an overview, and as detailed within the submitted Engineering Services Report, the green roof calculator models the rainfall runoff from the green roof areas, to the main drainage network, over an extended time period during a rainfall event, rather than applying a conventional time of concentration with a reduced runoff coefficient.

This means that the roof area is considered 100% impermeable but it results in approximately the first 3-5mm (user defined) of rainfall being lost through storage and evapotranspiration, while discharging the rainfall runoff at a falling flow rate (initially fast discharge rate but slowly reduces over time); to simulate the performance of a green roof (refer graph below for indication of the unit-Time Area Diagram):



The computer design software, provided by Innovyze Inc. (formerly MicroDrainage and WinDes), carries out all designs based on the Wallingford procedure Modified Rational Method and in accordance with all best practice guidelines. The methodology within the green roof design calculator, used within the design software, has been developed in collaboration with Sheffield University and based on CIRIA C644 (Green Roof) Guidance, current best practice and research carried out at Sheffield University, the location of the Green Roof Centre.

All the above has been provided in more detail in the submitted Engineering Services Report but will be provided with more clarity in the revised submission that will be issued as part of the formal planning application. I will email you a copy of the original drainage design drawings (A557-OCSC-XX-XX-DR-C-0500 & 0501) separately due to size, as submitted initially to ABP, for context, but please note that the design levels and outfall route will are subject to a slight revision; due to development design changes.

We would greatly appreciate if you could review the above and advise of any comments and or acceptance of the design proposal?
We are anxious to smooth the process for submission to An Bord Pleanala and want to ensure that SDCC Water Services Dept. are satisfied with our proposals, prior to submission.

Please do not hesitate to contact me, should you require any further information.

Regards,
Mark Killian

Chartered Civil Engineer
MSc BE CEng MIEI

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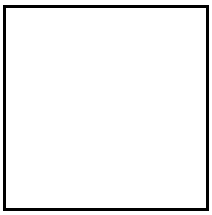

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