MMOS

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CONSULTING CIVIL & STRUCTURAL ENGINEERS

Flood Risk Assessment

Rev. 04

Residential Development at 348 Harold's Cross Road,

Dublin 6W

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Project Reference 18_322

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Revision	Date	Issue	Author	Checked By
0	26.09.19	Issue for Information	DOS	MM
1	04.10.19	Issue for Planning review	DOS	MM
2	26.05.20	Issue for Planning review	DOS	MM
3	15.06.20	Issue for planning review	DOS	MM
4	26.06.20	Issue for Planning	DOS	MM

1.0 Introduction

Murphy Matson O' Sullivan Consulting Engineers Ltd. were requested by AAI Kenilworth Ltd to carry out a Flood Risk Assessment (FRA) for the proposed part 2, part 5-storey Shared Living facility over basement (with plant/servicing facilities at Basement level) at 348 Harold's Cross Road, Dublin 6W.

This FRA has been prepared in accordance with the Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management' published in November 2009 by the Office of Public Work (OPW) and the Dept of Environment, Heritage and local Government (DoEHLG). This FRA addresses points 2(i), 2(ii) 2(iii) and 2(iv) of Box 5.1 in section 5.15 of the Guidelines.

Other sources of information, attached as appendices, used to compile this FRA include:

- OPW website, www.floodmaps.ie;
- OPW Eastern CFRAM Study - Poddle Fluvial Flood Event Map (Current);
- Dublin City Council Development Plan 2016-2022 (Strategic Flood Risk Assessment).
- Greater Dublin Strategic Drainage Strategy Report (incl. TD vol. 6 - Basements)

2.0 Site Location and Description

The development is located on Harold's Cross Road, Dublin 6W. Figure 1 below shows the site location.

Figure 1 – Site Location Map

The site is located on Harold's Cross Road, Dublin 6W and is circa 3 Km south of Dublin City Centre. The site area is approx. 0.23 Ha, including some adjoining lands in the control of DCC, incorporated to allow for improvements to the adjoining public realm. The Applicant's landholding, which currently accommodates a car showroom and maintenance garage, measures c. 0.216 Ha and is accessed directly off Harold's Cross Road. See fig. 1 for location. The site for the proposed scheme has an existing Car Dealership (part single -part double storey) with large sheds, associated small outbuildings and existing hardstanding and yard areas to the rear, surrounded by a circa 2m - 3m ht. boundary wall. The existing buildings are to be demolished for the construction of a Shared Living building. This building is to consists of 201 bed spaces set out over 174no. bedrooms with shared kitchen/living facilities, communal facilities, a gym, and supporting uses. The development is set out in 1 main building 'L' shaped in plan, with plant, laundry and storage rooms at basement level and communal facilities at the split-level Ground Floor. There are bedrooms and associated kitchen facilities to the front (east) end of Ground Floor level. This building is proposed to be part 2 – part 5-storeys over basement (with the top-level penthouse over with setbacks). The development has no car parking proposed and is to be serviced by bus route and will accommodate 210no. bike spaces.

Refer to Shipsey Barry Architects drawings for general layouts, sections and elevations.

The existing site levels vary from +35.20m AOD at the western (rear) end of the site to +33.1m AOD at the eastern end (front, Harold's Cross Road side). The site topography generally falls west to east, circa 2m. The proposed development incorporates a Lower Ground floor level (00) at split levels of +35.175m AOD (western end), +33.75m AOD(central) & +33.400m AOD (eastern end). The main entrance on the eastern end is proposed at +33.400m. The proposed Basement Level is at +30.06m AOD. Refer to fig's 2 & 3 and architects' drawings for details.

The site boundaries are as follows:

- North – Laundry Lane roadway.
- South – Kenilworth Manor roadway.
- East – Harold's Cross Road.
- West – Rosary Park Clubhouse (Harold's Cross Boys Football Club).

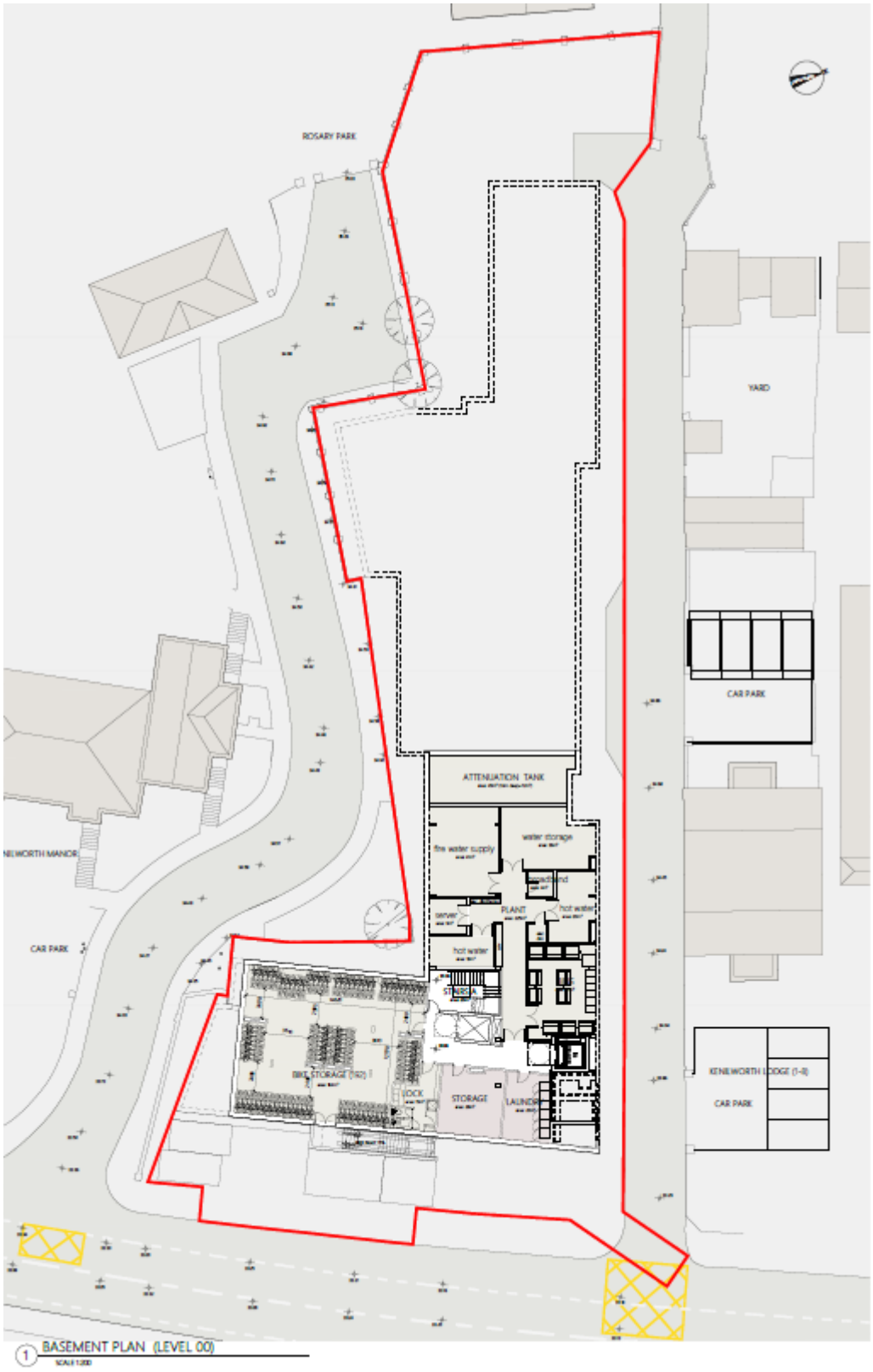


Figure 2 – Architectural Basement Plan Lvl. 00

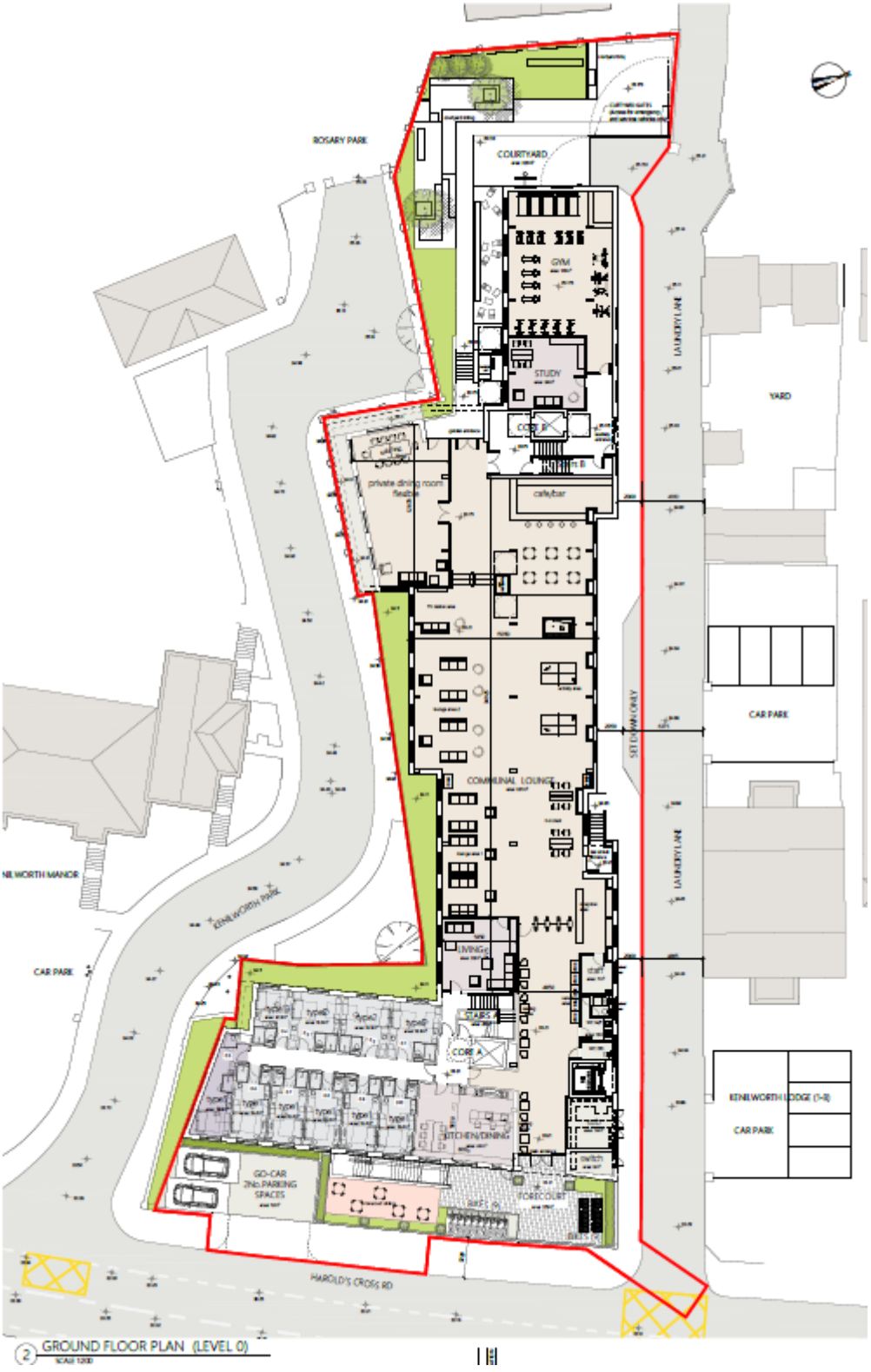


Figure 3 – Architectural Ground Floor Plan Lvl. 0

3.0 Flooding Context of Proposed Development

3.1 The Planning System and Flood Risk

'The Planning System and Flood Risk Management: Guidelines for Planning Authorities', published in November 2009, describe flooding as *a natural process that can occur at any time and in a wide variety of locations* (as per the key messages box in Chapter 2 of the Guidelines).

Flooding can often be beneficial, and many habitats rely on periodic inundation. However, when flooding interacts with human development, it can threaten people; their property and the environment (as per sections 2.6 - 2.12 of the Guidelines). Flooding may be from rivers, the sea, groundwater, sewers or overland flow caused by intense or prolonged periods of rainfall. Climate change effects suggest that the frequency and severity of flooding is likely to increase in the future.

The Guidelines describe good flood risk practice in planning and development management and seek to integrate flood risk management into the planning process, thereby assisting in the delivery of sustainable development. Planning authorities are directed to have regard to the guidelines in the preparation of Development Plans and Local Area Plans, and for development control purposes. For this to be achieved, flood risk must be assessed as early as possible in the planning process.

Paragraph 1.6 of the Guidelines states that the core objectives are to:

- *Avoid inappropriate development in areas at risk of flooding;*
- *Avoid new developments increasing flood risk elsewhere, including that which may arise from surface run-off;*
- *Ensure effective management of residual risks for development permitted in floodplains;*
- *Avoid unnecessary restriction of national, regional or local economic and social growth;*
- *Improve the understanding of flood risk among relevant stakeholders; and*
- *Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.*

The guidelines aim to facilitate 'the transparent consideration of flood risk at all levels of the planning process, ensuring a consistency of approach throughout the country'. The guidelines work on a number of key principles, including:

- *Adopting a staged and hierarchical approach to the assessment of flood risk; and*
- *Adopting a sequential approach to the management of flood risk, based on the frequency of flooding (identified through Flood Zones) and the vulnerability of the proposed land use.*

3.2 Vulnerability of Proposed Development

Under the guidelines, the proposed development (Dwelling Houses, student halls of residence and hostels) is classified as a 'Highly Vulnerable Development' (refer to Table 3.1 of the Guidelines).

3.3 Flood Zoning

Flood zones are described as follows in of the guidelines (refer to section 2.23 of the Guidelines).

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined for the purposes of these Guidelines:

Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and

Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

3.4 Tidal Flooding

The site location (distance from tidal body) and elevation is such that it is not affected by tidal water bodies and as such the risk of tidal flooding is negligible. The proposed Ground floor level is +35.175m/+33.75m/+33.400m AOD with the lowest entrance level facing onto Harold's Cross Road on the eastern elevation at +33.400m AOD (circa 300mm above adjacent Harolds Cross Road level). The 0.1% (1 in 1000 year) AEP (Annual Exceedance Probability) Flood Water Level of the River Liffey, the nearest tidal body at circa 3 Km away, is +3.38m AOD.

3.5 Fluvial Flooding

Fluvial flooding refers to the channel capacity of a watercourse being exceeded during higher flows. There is no major watercourse located near to the site. The Office of Public Works (OPW) website, www.floodmaps.ie, shows records of any flood events in chosen areas. Refer to Appendix A for Records of Flooding in the vicinity of the site. A review of these Flood records indicates that there are no records of fluvial flooding incidents in the general area of the site.

The nearest river to the site is the Poddle River which flows south west to north east approx. 350m north west of the site. The Eastern CFRAM (Catchment Flood Risk Assessment & Management) identifies areas at risk of flooding and provides assessment as to probability of flooding in an area. Refer to Eastern CFRAM study drawing E09 POD_EXFCD_FO_04 in Appendix B. The map, detailing Poddle River Fluvial Flooding Extents and includes the Harold's Cross area identifies no risk of Fluvial flooding in the area of the site. The nearest monitoring point is node label 09PODD002811 which has a 0.1% AEP Water Level (OD) of 31.05m. This is 2.35m below the lowest Ground Floor Entrance level- +33.400m (through which any flooding might occur to ground level or basement level below).

3.6 Pluvial Flooding

Pluvial or surface water flooding is the result of rainfall generated flows that arise before runoff can enter a watercourse or sewer. As stated above in section 3.5 previous flood events in the area can be reviewed on the OPW website www.floodmaps.ie. The historical flood mapping does not indicate any flooding events in the immediate area. There is an event recorded for 24th/25th Oct. adjacent the Poddle circa 300m NW of the site but as per recorded nodal date in section 3.5 above this is approx. 2.35m below the lowest entrance level proposed. We would note that the development of the site, which incorporates attenuation storage for surface water within the site, will reduce future SW run-off from the site into the local network.

Dublin City Council has developed pluvial flood risk maps as part of the Dublin City Council Development Plan 2016-2022. The Strategic Flood Risk Assessment gives Pluvial Hazard which are a high level aid rather than a site specific indicator of the potential for pluvial flooding occurring on site. See Appendix C for Composite Flood Map which identifies the site as being in Flood Zone C.

3.7 Drainage System Flooding

Drainage system flooding is defined as flooding resulting when flow entering a drainage system exceeds its discharge capacity and the system becomes blocked and/or can't discharge due to a high water level in the receiving watercourse or outfall.

External to the site there is a 150mm diam. combined gravity sewer in Laundry Lane which outfalls to a 450mm combined gravity sewer running north eastwards in Harold's Cross Road (information received - Irish Water Webmap from DCC). The GDSDS for 2031 does not indicate hydraulic issues with the local drainage network. The proposed development will limit storm water outfall to 2 l/s (by attenuation on site) for peak storm event, thus reducing the impact of the site to the network with future development. This compares favourably with the existing peak run-off rate from site of circa 35 l/s, giving a much-reduced site discharge to the existing SW system should the site be developed.

Internal to the site, storm water from the upper roof areas will drain, via RW outlets, gullies, downpipes and suspended SW drainage pipework, to a gravity network of below ground surface water sewers on the perimeter of the site. These sewers will drain by gravity to an onsite attenuation facility proposed in the Basement level, near the centre of the site. Attenuation capacity is designed for a 1 in 100 year storm event + 20% allowance for climate change. Attenuation will be provided by a 72m3 below ground storage facility (RC waterproof tank). Attenuated outfall from this system will fall by gravity to the public 450mm diam. combined sewer via the existing manhole in the Harolds Cross Road directly north east of the site. Surface water outfall from the attenuation tank is to be restricted by a hydrobrake. The small site area (0.216 Ha.) gives a theoretical greenfield run-off rate less than 2 l/s. However, a run-off rate of 2l/s is used to calculate attenuation capacity as this is the lowest recommended hydobrake restrictor run-off rate commercially available. The peak stormwater discharge is therefore to be restricted to 2.0 l/s

The proposed development includes a Basement level for plant, storage and laundry facilities at +30.06m AOD. This level is between 3m and 4.5m below the varying external ground levels surrounding the site but is below the invert level of the public combined sewer in the adjacent Harold's Cross Road (IL = +31.06m AOD) and is below the invert level of the 150mm combined sewer in Laundry Lane (IL = +33.550m AOD). However this basement area will be constructed as a monolithic concrete box (with RC retaining walls and concrete basement slab) and with tanked waterproof membrane sealing the basement area against ground water ingress. This tanking system will extend up to the local areas of Ground Floor level that are below the surrounding road and hardstanding level (by min. 300mm above external Ground Level).The only route to flooding of the basement will be via the Ground Floor entrance which is at +33.400m AOD and via the stepped access points to the basement. These stepped areas are to be raised a minimum of 300mm above the surrounding hardstanding and are to have local sump/pump systems for surface water collected within the stairways at basement level. The system will be fitted with non-return

valve (or anti-backflow device) to ensure there is no back-flooding of the Basement area. This will provide for surcharge management to isolate the basement from any potential sewer surcharge.

As the Basement Level of +30.06m area cannot discharge foul sewage by gravity to the public sewer in Harold's Cross Road, it is intended to pump foul outfall (from Laundry room) up to the gravity foul sewer proposed at External Ground Floor level. A collection chamber and pump station will be required at Basement Level, with duty and stand-by pumps and with volume of chamber sized for 24 hour storage of foul water discharging from Basement Level. The system will be fitted with non-return valve (or anti-backflow device) to ensure there is no back-flooding of the Basement area. This will provide for surcharge management to isolate the basement from any potential sewer surcharge.

Non-return valves shall be incorporated into the SW system at points of entry of the gravity sewers into the attenuation tank to ensure against backflow in any exceedance event. Note also that an overflow outlet will be built within the attenuation system, designed to allow outfall out to the Harold's Cross Road, should exceedance occur. Also a generator will be provided as part of the overall design to ensure that the drainage pumps in the basement for foul drainage are operational at all times.

Refer to MMOS Engineers drawings in Appendix D for full details of proposed drainage system.

3.8 Groundwater Flooding

Groundwater flooding occurs when the level of water stored in the ground rises, as a result of prolonged rainfall, to meet the ground surface and flows out over it. Groundwater flooding tends to be local and results from interaction of site-specific factors such as tidal variations. There is no record of ground water flooding in the vicinity (ref. OPW Flood Maps). The sub-surface soil conditions on this site are known to be fill overlying sandy clayey gravel overlying a stiff gravelly clay. The ground water levels are expected at relatively high levels (>1m below GL). The proposed development below ground will have a tanked retaining wall (monolithic with the basement concrete slab) to its perimeter and will be designed to stop any entry of groundwater using tanked construction methodology such as waterbar joints, puddle flange connections and waterproof membrane layer technology.

4.0 Flood Risk Assessment

4.1 Consequences of Flooding and Residual Risk on Occupancy of Site

Flooding of the site would risk the occupants of the Lower Ground Floor level. Note there are no bedrooms within the Lower ground floor level. Residual flood risks to the site include;

- Local overland flows from blockage of gullies or exceedance flows to the local drainage system.
- Failure of on-site foul and surface water drainage and attenuation system.

4.2 Proposed Flood Protection and Mitigation Measures

The proposed development incorporates a flood resilient design for the below ground basement level (at +30.06m AOD). This level is circa 3m to 4.5m below the surrounding external ground entrance levels (ranging from +33.400m to +35.5m AOD). Habitable areas (amenity and plant/servicing facilities but not bedrooms) are proposed at basement level.

All drainage and service pipes, ducts and opes in the external walls below external ground entrance levels in the proposed development will be flood proofed by means of non-return valves and proprietary water-proof seals.

Surcharge Management using prevention devices will be used to isolate the basement floor level below the external entrance levels from external sewer surcharge. All internal foul water drainage will be pumped from the basement floor level and will have non-return valves (or anti-backflow device – Type 3 Anti Flood Device incorporating an alarm to warn the Building Management of external sewer surcharge) to prevent any back flow in the event of external flooding. All manholes associated with the basement foul will be flood proof by means of being double sealed and lockable. Foul water drainage outfalling at basement level will have 24-hour storage capacity as part of the design. The basement external walls and floor will be monolithic reinforced concrete construction and incorporate a waterproof membrane to be fully water resistant. This tanking system will extend up to the local areas of Ground Floor level that are below the surrounding road and hardstanding level (by min. 300mm above external Ground Level). The only route to flooding of the basement will be via the Ground Floor entrance which is at +33.400m AOD.

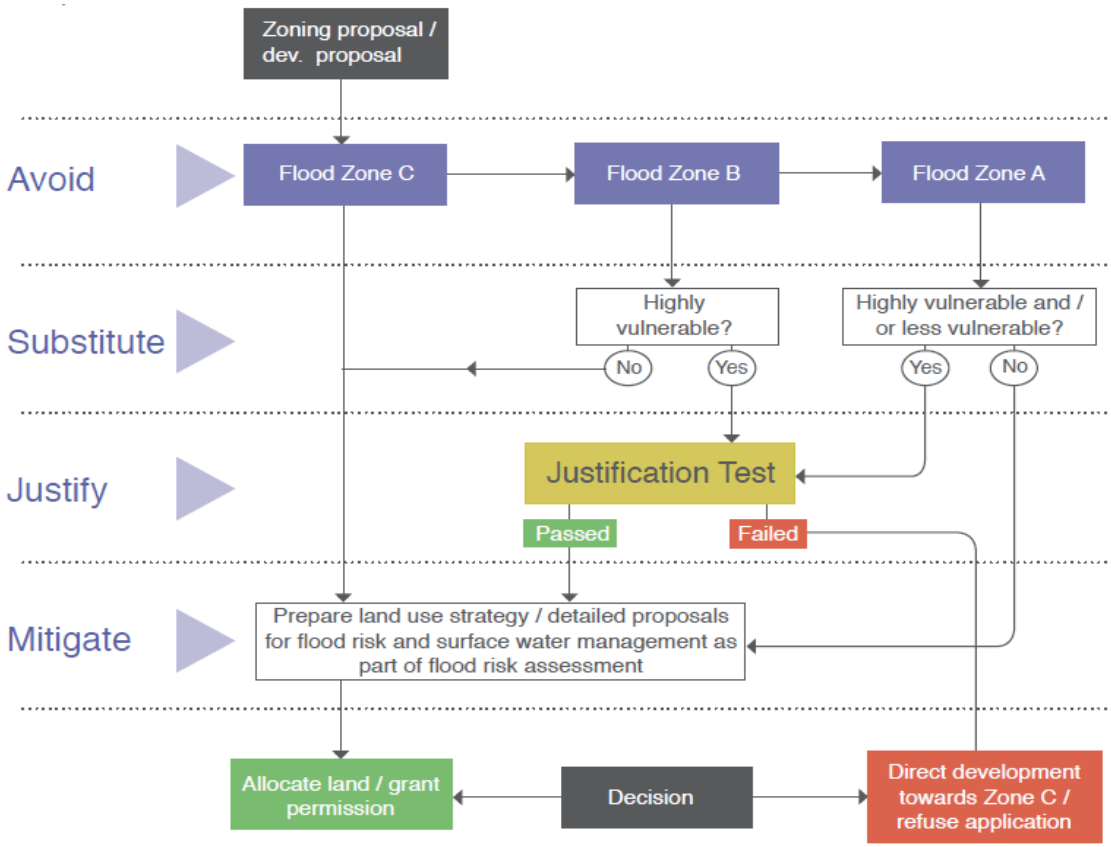
All surface water collected on the main building roofs and courtyard areas at Ground Floor level and above will be routed to discharge by gravity to the public combined sewer via the attenuation facility. There are 2no. stepped access points to the basement from external ground floor level. These stairs are to be raised a minimum of 300mm above the surrounding hardstanding at their head and are to have local sump/pump systems for surface water collected within the stairways at basement level. The system will be fitted with non-return valve (or anti-backflow device) to ensure there is no back-flooding of the Basement area. This will provide for surcharge management to isolate the basement from any potential sewer surcharge.

The lowest general public access and egress from the site will be from the Ground floor level of +33.400m, which is circa 400mm above the road level outside the entrance (+33.000m). The perimeter of the site will be bunded, with a minimum 300mm high wall above the highest external ground level at the perimeter of the site, to prevent any overland surface water flow from entering the site. Appropriate maintenance and management of the relevant storm infrastructure will minimise the risk of siltation and operational failure. Attenuation Hydrobrake to include a bypass door for mechanical operation in event of blockage or failure. System to be alarmed to signal any blockage or problems to the system. The building will have 24-Hour maintenance cover on site. Development to incorporate an electricity generator for use in case of general electricity outages in the area. This will ensure the continual operation of pumps at Lower Ground Floor level. All pumps to be Dual and assist systems, i.e. back up pumps for operation provided should one pump fail. Telemetry and alarm systems to provide warning for maintenance team.

In the event of an extreme or severe flood event a flood awareness plan will be developed and implement by the building management company. This will follow a similar format to a fire escape strategy. Warnings of impending floods will be communicated to the building users. Where possible, building users will remain in the building until the flood recedes. Occupants in the Basement will be moved to the Ground Floor level. Note, as previously stated, there are no bedrooms proposed at Basement level. Where building users leave the building, they will do so in advance of the flood with the knowledge of the time range for the flood event.

5.0 Justification Test

The sequential approach is illustrated as following in The Planning System and Flood Risk Management Guidelines for Planning Authorities.



It is clear the following applies:

- The site is in Flood Zone C;
- The Development is highly vulnerable;
- A justification test is not required and Mitigation measures are provided as outlined above.

6.0 Conclusion

The flood risk assessment for the Proposed Shared Living Accommodation building has shown the site to be within Flood Zone C and therefore no Justification test is required. The residual risks of flooding can be managed by incorporation of good building practice in the design and construction of the Basement and Ground Floor levels and associated drainage systems, and by maintenance and management of the property as outlined in section 4. As outlined above the development has been demonstrated to be in compliance with the core objectives of the Planning System and Flood Risk Management Guidelines.