

Shaping Guildford's Future

Sustainable Drainage and Utilities Study

Guildford Borough Council

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Acronyms

Acronym	Description
DNO	Distribution Network Operator (Electricity)
EA	Environment Agency
EV	Electric Vehicle
FTTP	Fibre to the Premises (Telecoms)
Gbps	Gigabits per Second (Telecoms)
GSP	Grid Supply Point (Electricity)
ICP	Independent Connection Provider (Electricity)
IDNO	Independent Distribution Network Operator (Electricity)

Acronym	Description
kWp	Kilowatts Peak
LDA	Leonard Design Architects
l/s	Litres per Second
MVA	Mega-Volt Ampere (Electricity)
SGF	Shaping Guildford's Future
SuDS	Sustainable Drainage Systems
UKPN	UK Power Networks (Electricity)

1. Executive Summary

Context

- 1.1 The proposals to redevelop areas of Guildford Town Centre have continued with development of an emerging masterplan focused on five key locations:
- Bedford Wharf.
 - Woodbridge Meadows.
 - Town Wharf.
 - Millbrook Car Park.
 - Millmead.
- 1.2 The emerging masterplan is seeking to deliver modern, sustainable residential dwellings, with commercial, community, leisure and parking facilities. The emerging masterplan¹ could deliver in excess of approximately 3,450 new homes, 45,000m² of new retail and office space, a 120-room hotel, and 1,350 parking spaces.
- 1.3 The scale and timeframe of the proposed regeneration provides the opportunity to define and deliver exemplary developments that are sustainable, smart and resilient. With Guildford Borough Council taking the lead in promoting redevelopment of the town centre, innovation, sustainability and a focus on local community will be central to the future plans.
- 1.4 Development of this scale will require the provision of new and significantly upgraded infrastructure, to utilise low carbon energy sources, and supply the increased electrical and clean water demands. As discussed in our first report 'Guildford Economic Regeneration Project, Infrastructure Commission Study Report' (document ref: GERP-ACM-XX-XX-RP-CE-000001, revision P03, dated 24 May 2021), these provisions present an opportunity to utilise smart technologies and systems, to build-in optimised solutions and provide a platform for building a smart city solution.

Purpose of this Report

- 1.5 This report provides an analysis relating to the following areas of infrastructure, which will influence further development of the emerging masterplan:
- Sustainable Drainage Systems, including Surface Water Pollution Control and Surface Water Overland Flood Routes.
 - Electricity.
 - Potable Water.
 - Telecommunications.
- 1.6 In relation to the first two items, this analysis provides advice regarding the spatial areas which may need to be allowed for, or safeguarded, within the emerging masterplan development sites to ensure the inclusion of critical infrastructure elements, such as surface water attenuation features and electrical transformer rooms / equipment.

Key Findings & Likely Impact on the Masterplan

- 1.7 The key findings of this study and the likely impact on the emerging masterplan are outlined below:

Surface Water Attenuation

- 1.8 The five sites identified within the emerging masterplan will need to attenuate surface water to ensure discharge is within greenfield run-off rates. This report summarises our findings for the selected options analysed, based on a 1:100-year storm event, including a 40% allowance for Climate Change. Our initial analysis has provided an estimate of the volume of surface water attenuation which is anticipated to be accommodated on each individual site.

- 1.9 We have also provided a summary of the extent of roof-based attenuation for the site options based on 70% of the proposed building roof areas being available for a sustainable roof system. The remaining volume will need to be accommodated on podium areas (if available) or through ground-based attenuation features.

- 1.10 Within the main Sustainable Drainage Systems section of this report, we have shown the results of a sensitivity test undertaken to highlight how these volumes might increase should the Climate Change factor be increased in the future by the Environment Agency.

- 1.11 In addition, we have also included further roof-based attenuation analysis, based on roof area availability of 80%, 60% and 50%.

Likely Impacts on the Masterplan

- 1.12 It is anticipated that each of the identified development sites within the emerging masterplan will require a large volume of surface water attenuation storage to be allowed for within the site extents.

- 1.13 Surface water discharge rates will need to be carefully managed and the masterplan will need to ensure sufficient space is allowed within the development sites for a range of appropriate SuDS features.

Electricity

- 1.14 The electrical supply to Guildford Town Centre is provided from the UKPN owned Guildford Primary substation, located on Woodbridge Road (A322). The five sites identified within the emerging masterplan will require an electrical supply delivered off the UKPN networks.

- 1.15 UKPN has advised that there is minimal capacity available at the Guildford Primary substation with the existing Guildford Grid at 33kV currently having approximately 5MVA of electrical capacity available for future developments.

- 1.16 UKPN may be able to advise on the extent of electrical capacity which might become available following demolition of existing buildings at the Shaping Guildford's Future masterplan sites.

- 1.17 A key item to note is that as the UK continues to target sustainable developments to support a transition to a net zero economy and resilience to the future impacts of climate change the pressure on all the UK electricity networks is at unprecedented levels.

- 1.18 This report also provides details on an initial analysis that we have undertaken on the number of, and size of electrical transformers which are anticipated to be required at each of the development sites. Consideration for these will need to be included within the emerging masterplan.

Likely Impacts on the Masterplan

- 1.19 The key impact on the Masterplan is a risk that sufficient electrical supply capacity is not available from UKPN without extensive and costly reinforcement of their network. Any requirement for reinforcement may need to be forward funded by the Developer and could also require extensive lead-in times to deliver. In addition, a new 132/33kV Primary substation may be required, land for which will need to be identified and purchased by a third-party (GBC / private developer) as this would not be undertaken by UKPN.

- 1.20 The Masterplan will also need to allow for sufficient space within the development buildings / public realm area, to locate new secondary substations and the associated cable routes.

¹ No information provided on Millmead

Potable Water

- 1.21 The potable water supply to Guildford Town Centre is provided from the Thames Water owned potable water network. The five sites identified within the emerging masterplan will require a potable water supply delivered off the Thames Water network.
- 1.22 Thames Water has undertaken an initial capacity check on their network based on the information we supplied. They have confirmed that they are unable to confirm the capacity for the full development and will need to carry out modelling to confirm whether reinforcement of their network is necessary to deliver the capacity required.
- 1.23 The outcome of the modelling will inform whether potable water capacity for a particular development site is available in their existing network or whether reinforcement will be required. Thames Water estimate that they will require 6-months to undertake the modelling.
- 1.24 Should the modelling confirm that reinforcement is required then Thames Water will design and build the necessary improvements. The design phase is estimated to take 6-months, with a further 6-months to build, though this is subject to the extent of the reinforcement works the modelling may identify.

Likely Impacts on the Masterplan

- 1.25 The key potable water impact on the Masterplan is a risk that sufficient supply is not available from Thames Water without extensive and costly reinforcement of their network. Any requirement for reinforcement may also require extensive lead-in times to deliver.
- 1.26 In modelling each site individually, they would need to consider the cumulative demands for any local or strategic network reinforcement.
- 1.27 Changes in the water demand for firefighting purposes arising from the planned redevelopment have not been considered as part of this assessment, as this will require a specialist company to undertake hydrant testing.

Telecommunications

- 1.28 For residential developments exceeding 20 properties or commercial only sites exceeding 20 units, Openreach will currently install full Fibre to the Premises (FTTP) free of charge, including any reinforcement of their network that this will require.
- 1.29 For mixed use developments, such as SGF, where there are developments with residential units exceeding 20 properties, but possibly less than 20 commercial units, Openreach will likely still install FTTP for free, but discussions would be required to confirm once the design has reached a more developed stage.
- 1.30 This technology currently supports speeds up to 1Gbps. Openreach will likely require wayleave agreements to allow them to access and maintain their equipment on private land, such as blocks of flats where the tenant is not the landowner.
- 1.31 Some commercial sites may require a more resilient fibre connection to maintain connection in the event of a failure in the Openreach network. Openreach offer two resilient options for commercial customers depending on their individual requirements. These options will be discussed and priced with individual developers once the design has reached a more developed stage.

2. Introduction

- 2.1 AECOM has been commissioned by Guildford Borough Council (GBC) to provide infrastructure advice to support the development of a new masterplan for Shaping Guildford's Future (SGF) to facilitate the economic regeneration of the area.
- 2.2 Guildford Borough Council's stated aim² is:

The Council's ambition is to breathe new life into the town by opening up the riverside, reducing congestion, improving alternative, sustainable and affordable transportation as well as making the centre a more attractive place to live, work and visit.
- 2.3 The Guildford Town Centre Stage 1 Strategic Spatial Masterplan Report (May 2021), developed by Leonard Design Architects, is available on the Shaping Guildford website and since publication the masterplan has continued to be refined in five key locations:
 - Bedford Wharf.
 - Woodbridge Meadows.
 - Town Wharf.
 - Millbrook Car Park.
 - Millmead.
- 2.4 This second infrastructure study prepared by AECOM has been produced to detail an analysis relating to the following areas of infrastructure, which will influence further development of the emerging masterplan.
 - Sustainable Drainage Systems.
 - Electricity.
 - Potable Water.
 - Telecommunications.
- 2.5 This Sustainable Drainage and Utilities Study has sought to undertake and report on the following tasks:
 - Review the emerging masterplan to consider the anticipated surface water attenuation that may be required to manage surface water discharge to greenfield run-off rates.
 - A sensitivity check on Climate Change allowances should the Environment Agency raise the allowance from the current 40%.
 - An analysis of site-wide surface water attenuation based on a range of available roof-space for green/blue roof systems.
 - An analysis, based on details within the emerging masterplan on the anticipated electrical demand for each location and discuss these demands with UKPN.
 - Report on the findings following a meeting with UKPN on the challenges with electrical capacity within Guildford and further up-stream on the UKPN network.
 - An analysis, based on details within the emerging masterplan on the anticipated potable water demand for each location and discuss these demands with Thames Water.
 - Report on the findings following receipt of a Thames Water review of the potable water demand and the modelling work they will need to undertake to confirm capacity within their existing network, or reinforcement that they may need to undertake.
 - Provide further detail on telecommunications for the emerging masterplan sites.
- 2.6 As mentioned, this is a second infrastructure study prepared by AECOM, and reference should also be made to our first report titled 'Guildford Economic Regeneration Project, Infrastructure Commission Study Report' (document ref: GERP-ACM-XX-XX-RP-CE-000001), revision P03, dated 24 May 2021.

² <https://shapingguildford.co.uk/>

The Emerging Masterplan

- 2.7 This study has been based on the 'Guildford Masterplan, Areas Summary' (dated March 2022) being developed by Leonard Design Architects (LDA) and received by AECOM in March 2022. A copy of this report is included in Appendix A.
- 2.8 In addition, we have also AutoCAD model file ref 1120-LDA-PR-LL-20104-WIP, which was received from LDA on 20 April 2022 to estimate the roof areas shown in the table below and potential ground-based areas for other forms of surface water attenuation features.
- 2.9 Table 2-1 shows a summary of the site options being developed for the emerging masterplan:

Table 2-1: Summary of the Emerging Masterplan Site Options

Option	No. of Buildings	Roof Area (m²)	Residential (No.)	Office / Civic / Retail (m²)	Hotel (m² / No. of Rooms)	Residential Car Park Spaces	Public Car Park Spaces
Bedford Wharf							
EA Alignment	10	15,966	865	28,368	4,800 / 120	260	N/A
LDA Alignment	10	17,430	954	26,763	4,800 / 120	287	N/A
Woodbridge Meadows							
Phase 1	7	17,016	1,797	6,571	N/A	540	N/A
Phase 1 & 2	9	20,522	2,151	8,464	N/A	646	N/A
Town Wharf							
Little 'C'	7	6,262	259	10,954	N/A	78	N/A
Millbrook Car Park							
Option A	2	1,695	88	N/A	N/A	30	244
Option B	4	2,560	92	N/A	N/A	40	300
Option C	4	2,176	87	N/A	N/A	40	300
Option D	3	2,363	91	N/A	N/A	40	300
Option E	3	2,080	78	N/A	N/A	40	300
Millmead							
Reuse the Existing Building	2		Unknown	Unknown	N/A	Unknown	Unknown
Low Rise Town-homes	7		Unknown	Unknown	N/A	Unknown	Unknown
Option B – Undercroft Parking	7		Unknown	Unknown	N/A	Unknown	Unknown
Option C	5		Unknown	Unknown	N/A	Unknown	Unknown
Option D	5		Unknown	Unknown	N/A	Unknown	Unknown

Source: 'Guildford Masterplan, Areas Summary' (dated March 2022) by Leonard Design Architects

- 2.10 A breakdown of the Site Options is provided in Appendix B.
- 2.11 It should be noted that this study is based on initial conceptual information received from LDA. Therefore, the assessments presented in this report should be considered 'high-level' for the purpose of space planning the emerging masterplan development sites to ensure the inclusion of critical infrastructure elements, such as surface water attenuation features and electrical transformer rooms / equipment.
- 2.12 We understand that the estimated delivery timeframe for the identified development sites is:
 - Bedford Wharf Spring 2029 to end 2023
 - Woodbridge Meadows Phase 1 from the start of 2031

- Town Wharf End of 2031
- Millbrook Car Park Summer 2027
- Millmead Spring 2027

3. Sustainable Drainage Systems

Introduction

- 3.1
- The proposed development sites identified to be delivered as part of SGF should seek to deliver a variety of ‘Green Sustainable Drainage Systems (SuDS)’ methods which are appropriate for the context / condition of the individual development site(s). There should be an ambition for each proposed development site to maximise the use of SuDS features to manage surface water runoff by controlling the surface water discharge rate, volume and water quality. They will also help control pluvial flood risk from the proposed developments, promote habitat, amenity and biodiversity within the sites and provide pollution mitigation. A key ambition for new developments is to focus on infiltration into the existing ground where this is compatible with ground conditions, flood levels and previous uses however, where this is not suitable then a ‘store and release’ into sewer or water course should be adopted.
- 3.2
- Future developments should seek to design high quality public parks, open spaces, and streets which deliver a highly ambitious sustainable drainage strategy. The strategy should develop a SuDS system based on managing water and resiliency at the source, while being deliverable in phases and, not reliant on full development build-out to operate effectively and efficiently.

Guildford Borough Council Objectives

- 3.3
- The Guildford Borough Local Plan³ has defined its stated aim in relation to surface water infrastructure on all new developments, within Policy P4: Flooding, Flood Risk and Groundwater Protection Zones. This policy states that:

(2) Development in areas at medium or high risk of flooding will be permitted provided that:

f). Site drainage systems are appropriately designed, taking account of storm events and flood risk of up to 1 in 100-year chance with an appropriate allowance for climate change.

(5) All development proposals are required to demonstrate that land drainage will be adequate and that they will not result in an increase in surface water run-off. Proposals should have regard to appropriate mitigation measures identified in the Guildford Surface Water Management Plan or Ash Surface Water Study. Priority will be given to incorporating SuDS (Sustainable Urban Drainage Systems) to manage surface water drainage, unless it can be demonstrated that they are not appropriate. Where SuDS are provided, arrangements must be put in place for their management and maintenance over their full lifetime.
- 3.4
- The surface water strategy for the proposed development site will include open SuDS and bioretention features which seek to provide water quality uplift in accordance with the CIRIA C753 SuDS manual, GBC and SCC policies and other statutory legislation (such as the Water Environment (Water Framework Directive) (England and Wales) Regulations) applicable at the time of commencing detailed design.

Surrey County Council SuDS Design Guidance

- 3.5
- Surrey County Council⁴ provide the following planning advice on their website in regard to principles to be evidence within a drainage strategy for a Brownfield Site.

Brownfield Sites should be limited as close to greenfield rates as is reasonably practicable. If greenfield rates cannot be achieved, clear written evidence must be submitted as to why a lower rate cannot be achieved. Information will be considered on a site by site basis. For brownfield sites robust justification could include; analysis of storage requirements required to achieve greenfield runoff rates in comparison to a site area, a cost analysis, spatial or level constraints.

Discharge rates should never exceed the rates prior to redevelopment for the corresponding Q1, Q30 and Q100 year storm rates.

³ <https://www.guildford.gov.uk/localplan/2015-2034>, adopted 25 April 2019
⁴ <https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-drainage/drainage-guidance#section-5>

SuDS Hierarchy

- 3.6
- Proposed developments being brought forward within the SGF development opportunity areas should seek to deliver the most sustainable form of SuDS within their surface water management strategies. Table 3-1 provides a simple summary of the SuDS hierarchy as illustrated in the Surrey County Council Guide to Sustainable Drainage in Planning⁵:

Table 3-1: SuDS Hierarchy

Sustainability Level	SuDS Technique	Flood Reduction	Pollution Reduction	Wildlife & Landscape Benefit
Most Sustainable (Preferred)	Green/Living Roofs & Walls	✓	✓	✓
	Infiltration: - Infiltration trenches & basins - Soakaways: (standard or crate system)	✓	✓	✓
	Filter strips and Swales	✓	✓	✓
	Basins and ponds: - Wetlands - Balancing Ponds - Detention Basins - Retention Basins - Conveyance Swales	✓	✓	✓
	Permeable Surfaces & filter drains: - Gravelled areas - Porous paving	✓	✓	✗
Least Sustainable	Tanks & Piped Systems: - Crated Attenuation - Tanks - Oversize pipes	✓	✗	✗

Assessment Methodology

- 3.7
- We have undertaken an assessment of the five development sites identified within the LDA masterplan (March 2022) to determine the requirement for SuDS and the forms of SuDS which could be delivered. Within our assessments, we have also shown the results of sensitivity testing so it can be seen how changes in Climate Change allowances, or use of the development area, may affect how surface water could be attenuated on the development sites.
- 3.8
- We have adopted the following methodology for our assessments on the five development sites:
 - We have estimated the pre-development (greenfield) run-off rate which the individual site will need to restrict surface water discharge to. This has been calculated using a 1:100-year storm event, including a 40% allowance for Climate Change.
 - From the estimated 1:100-year (plus Climate Change) greenfield run-off estimate, we have calculated the volume of surface water attenuation that each development may need to accommodate within the extent of the site, based on the current Architectural layout.
 - We have also undertaken a sensitivity test to highlight how the attenuation volumes might increase should the Climate Change factor be increased in the future by the Environment Agency.
 - We have estimated the volume of surface water attenuation which could be accommodated at roof level.
 - Sitting at the top of the SuDS Hierarchy is to attenuate surface water on green / living roofs, through the use of green / brown / blue roof systems.

⁵ <https://www.surreycc.gov.uk/community/emergency-planning-and-community-safety/flooding-advice/more-about-flooding/suds-drainage/drainage-guidance>

- For the basis of this assessment, we have assumed the use of the Polypipe Civils Permavoid Modular Cell 150⁶ geocellular interlocking system (A datasheet for this system is shown in Appendix D) can be accommodated on the building roofs. This system allows for 150mm depth of water to be attenuated on building roofs and includes a 95% void ratio and the ability to install a green roof above the system.
- As the SGF masterplan is in the early stages of development, a detailed roof layout is not available to estimate the area that could be available for surface water attenuation. We have therefore estimated the attenuation volume that the Polypipe Civils Permavoid Modular Cell 150 could provide, based on four scenarios of available roof area (80%, 70%, 60% and 50%).



Figure 3-1: Polypipe Civils Image (<https://www.polypipe.com/civils/gi/blue-green-roofs>)

4. We have allowed for surface water attenuation to be included within site podiums (Bedford Wharf only) and have allowed for 80% of the podium being available for installation of the Polypipe Civils Permavoid Modular Cell 150 system.
5. Lastly, we have estimated the remaining surface water attenuation volume which will need to be accommodated at ground level.
- 3.9 The following sections provide the outcome of our assessment.

Bedford Wharf

- 3.10 There are two options that have been developed by LDA for the Bedford Wharf site. Both options are similar in size and development quantum, with the key difference being the alignment of the proposed River Wey flood defence line. Figure 3-23-2 shows the LDA Options prepared as part of the masterplan development.

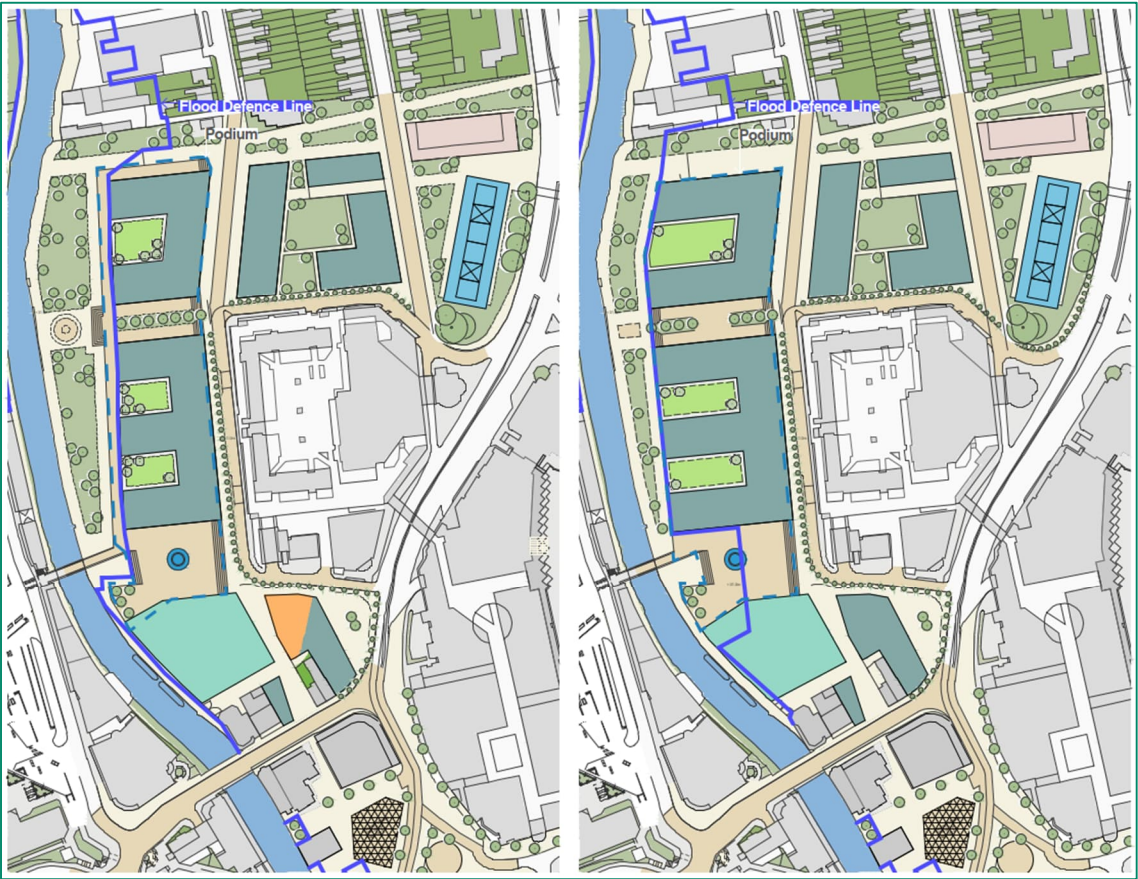


Figure 3-2: LDA Bedford Wharf Options (EA Alignment on the left, LDA Alignment on the right)

Surface Water Attenuation

- 3.11 On the basis of the two options prepared by LDA, and development red-line boundary area of 47,126m², we have estimated that the proposed development will need to restrict surface water discharge to a maximum greenfield runoff rate of 6.6 l/s, based on a 1:100-year storm event. In order to achieve a greenfield runoff rate of 6.6 l/s, the development will need to attenuate surface water within the development footprint.
- 3.12 Based on an initial assessment, the Bedford Wharf site will need to accommodate approximately 4,700m³ of surface water attenuation within the development footprint. This volume has been determined based on the overall Bedford Wharf development red-line boundary area of 47,126m². Table 3-2 shows the attenuation volume for each option, including the sensitivity test undertaken on how these volumes could increase should the Climate Change factor rise in the future.

Table 3-2: Bedford Wharf Surface Water Attenuation Storage Volume

Attenuation Storage Volume including Climate Change Allowance at:				
Option	40%	50%	60%	70%
EA Alignment	4,689m ³	5,104m ³	5,522m ³	5,939m ³
LDA Alignment	4,720m ³	5,138m ³	5,558m ³	5,978m ³

- 3.13 There are a range of options available to developers to achieve surface water attenuation on the development. The following section provides options for SuDS on the proposed Bedford Wharf development.

⁶ <https://www.polypipe.com/civils/permavoid-85150>

Bedford Wharf Sustainable Drainage System Options

Green Roofs and Podium Deck Storage

- 3.14
- The Bedford Wharf development options provide 13,352m² (EA Alignment) and 14,967m² (LDA Alignment) of building roof area which could be partially used to accommodate a sustainable roof system. An element of roof area will not be available for a sustainable roof system as other building elements (such as MEP equipment) will also need to be accommodated on the roof.

- 3.15
- Table 3-3 summarises the extent of roof-based attenuation based on four scenarios of available roof area (80%, 70%, 60% and 50%). Details of the attenuation volume per building are shown in the tables in Appendix C.

Table 3-3: Bedford Wharf Options Roof Based Surface Water Attenuation Summary

Option	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
		80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
EA Alignment	13,352	10,682	1,522	9,346	1,332	8,011	1,142	6,676	951
LDA Alignment	14,967	11,974	1,706	10,477	1,493	8,980	1,280	7,484	1,066

- 3.16
- Bedford Wharf includes podium areas around buildings One Estate Block #1, Odeon Block #6 and Bedford Road Surface Car Park Block #1. The podium area provided is 4,778m² (EA Alignment) and 3,509m² (LDA Alignment).
- 3.17
- Based on the use of the Polypipe Civils Permavoid Modular Cell 150 within the podiums, and an allowance of 80% of the podium being available for installation of this system, an additional surface water attenuation volume of 545m³ (EA Alignment) and 400m³ (LDA Alignment) could be accommodated above ground level.

Ground Level Storage

- 3.18
- The remainder of the surface water attenuation will need to be accommodated at ground level and to the east of the River Wey flood defence feature. Table 3-4 and Table 3-5 provide the estimated Ground Level Based Surface Water Attenuation for the two Bedford Wharf options.

Table 3-4: Bedford Wharf (EA Alignment) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	4,689m³	4,689m³	4,689m³	4,689m³
Surface Water Attenuated at Roof Level	1,522m³	1,332m³	1,142m³	951m³
Surface Water Attenuated at Podium Level	545m³	545m³	545m³	545m³
Surface Water Attenuation Required at Ground Level	2,622m³	2,812m³	3,003m³	3,193m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

Table 3-5: Bedford Wharf (LDA Alignment) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	4,720m³	4,720m³	4,720m³	4,720m³
Surface Water Attenuated at Roof Level	1,706m³	1,493m³	1,280m³	1,066m³
Surface Water Attenuated at Podium Level	400m³	400m³	400m³	400m³
Surface Water Attenuation Required at Ground Level	2,614m³	2,827m³	3,040m³	3,254m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

- 3.19
- For both options, there is a large volume of surface water which will need to be attenuated at ground level. As shown in the SuDS Hierarchy (Table 3-1), there are a number of options for ground based sustainable drainage systems available which will need to be explored to strike a balance between buried and surface features.

- 3.20
- An initial assessment of the Bedford Wharf development options has identified that approximately 10,970m² (EA Alignment) and 11,530m² (LDA Alignment) of ground base hard landscaping (east of the flood defence feature) may be available for crated attenuation features.
- 3.21
- The hard landscaped areas will require below ground space to be free of attenuation features to allow for utility and drainage networks to be routed. Therefore, we have assumed that 60% of the area is available for attenuation features and that a double height Polypipe Civils Permavoid Modular Cell 150 (300mm) can be installed beneath a permeable or gravelled paving type. On this basis a volume of 1,876m³ (EA Alignment) and 1,972m³ (LDA Alignment) of surface water attenuation can be provided in crates.
- 3.22
- Based upon the above assessment, 746-1,317m³ (EA Alignment) and 642-1,282m³ (LDA Alignment) of surface water attenuation features may need to be incorporated within the remaining development area (east of the flood defence feature) through the use of swales, basins, ponds, rain gardens and other features. It should be noted however, that the use of buried crates at ground level is at the bottom of the SuDS Hierarchy (Table 3-1) and the development masterplan should seek to maximise accommodating surface water attenuation using features further up the hierarchy wherever possible.

Woodbridge Meadows

- 3.23
- There are two phases developed by LDA for the Woodbridge Meadows site. Phase 2 being a further development of Phase 1. Figure 3-33-3 shows the LDA Options prepared as part of the masterplan development.



Figure 3-3: LDA Woodbridge Meadows Options. Phase 1 on the left, Phase 2 on the right

Surface Water Attenuation

- 3.24 We have prepared our surface water attenuation assessment for Woodbridge Meadows based on the Phase 1 and Phase 2 development layouts (not the red line boundary) prepared by LDA. On this basis, we have estimated that the site will need to restrict surface water discharge to a maximum greenfield runoff rate of 5.4 l/s (based on a Phase 1 development area of approximately 38,860m²), rising to 6.8 l/s (based on a Phase 2 development area of approximately 48,850m²). This assessment is based on a 1:100-year storm event. In order to achieve a greenfield runoff rate of 6.8 l/s, the development will need to attenuate surface water within the development footprint.
- 3.25 Based on an initial assessment, Woodbridge Meadows will need to accommodate approximately 3,615m³ of surface water attenuation within the development footprint, rising by 95m³ (to 4,610m³) when Phase 2 is considered. Table 3-6 shows the attenuation volume for each option, including the sensitivity test undertaken on how these volumes could increase should the Climate Change factor rise in the future.

Table 3-6: Woodbridge Meadows Surface Water Attenuation Storage Volume

Attenuation Storage Volume including Climate Change Allowance at:				
Phase	40%	50%	60%	70%
Phase 1	3,615m ³	3,933m ³	4,258m ³	4,583m ³
Phase 2	4,608m ³	5,014m ³	5,427m ³	5,841m ³

- 3.26 There are a range of options available to developers to achieve surface water attenuation on the development. The following section provides options for SuDS on the proposed Woodbridge Meadows development.

Woodbridge Meadows Sustainable Drainage System Options

Green Roofs and Podium Deck Storage

- 3.27 Phase 1 of Woodbridge Meadows provides 17,016m² of building roof area, increasing by 3,506m² (to 20,522m²) when Phase 2 is considered, which could be partially used to accommodate a sustainable roof system. An element of roof area will not be available for a sustainable roof system as other building elements (such as MEP equipment) will also need to be accommodated on the roof.
- 3.28 Table 3-7 summarises the extent of roof-based attenuation based on four scenarios of available roof area (80%, 70%, 60% and 50%). Details of the attenuation volume per building are shown in the tables in Appendix C.

Table 3-7: Woodbridge Meadows Options Roof Based Surface Water Attenuation Summary

Option	Roof Area (m ²)	Roof Area Available (%) and Volume of Attenuation (m ³)							
		80% (m ²)	Volume (m ³)	70% (m ²)	Volume (m ³)	60% (m ²)	Volume (m ³)	50% (m ²)	Volume (m ³)
EA Alignment	17,016	13,613	1,940	11,911	1,697	10,210	1,455	8,508	1,212
LDA Alignment	20,522	16,418	2,340	14,365	2,047	12,313	1,755	10,261	1,462

- 3.29 The Woodbridge Meadows masterplan does not include any podium areas around the buildings where surface water attenuation could be provided.

Ground Level Storage

- 3.30 The remainder of the surface water attenuation will need to be accommodated at ground level. Table 3-8 and Table 3-9 provide the estimated Ground Level Based Surface Water Attenuation for the Woodbridge Meadows phases.

Table 3-8: Woodbridge Meadows (Phase 1) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	3,615m ³	3,615m ³	3,615m ³	3,615m ³
Surface Water Attenuated at Roof Level	1,940m ³	1,697m ³	1,455m ³	1,212m ³
Surface Water Attenuated at Podium Level	0m ³	0m ³	0m ³	0m ³
Surface Water Attenuation Required at Ground Level	1,675m ³	1,918m ³	2,160m ³	2,403m ³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

Table 3-9: Woodbridge Meadows (Phase 2) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	4,608m ³	4,608m ³	4,608m ³	4,608m ³
Surface Water Attenuated at Roof Level	2,340m ³	2,047m ³	1,755m ³	1,462m ³
Surface Water Attenuated at Podium Level	0m ³	0m ³	0m ³	0m ³
Surface Water Attenuation Required at Ground Level	2,268m ³	2,561m ³	2,853m ³	3,146m ³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

- 3.31 For both options, there is a large volume of surface water which will need to be attenuated at ground level. As shown in the SuDS Hierarchy (Table 3-1), there are a number of options for ground based sustainable drainage systems available which will need to be explored to strike a balance between buried and surface features.
- 3.32 An initial assessment of the Woodbridge Meadows masterplan has identified that approximately 10,447m² (Phase 1) of ground base hard landscaping may be available for crated attenuation features. This increases by 3,486m² (to 13,933m²) when considering Phase 2.
- 3.33 The hard landscaped areas will require below ground space to be free of attenuation features to allow for utility and drainage networks to be routed. They also need to be relatively large usable areas, rather than narrow paths behind buildings. Therefore, we have assumed that only 40% of the area is available for attenuation features and that a double height Polypipe Civils Permavoid Modular Cell 150 (300mm) can be installed beneath a permeable or gravelled paving type. On this basis a volume of 1,191m³ (Phase 1), increasing to 1,588m³ (Phase 2) of surface water attenuation can be provided in crates.
- 3.34 Based upon the above assessment, 484-1,212m³ (Phase 1), increasing to 680-1,557m³ (Phase 2) of surface water attenuation features may need to be incorporated within the remaining development area through the use of swales, basins, ponds, rain gardens and other features. It should be noted however, that the use of buried crates at ground level is at the bottom of the SuDS Hierarchy (Table 3-1) and the development masterplan should seek to maximise accommodating surface water attenuation using features further up the hierarchy wherever possible.

Town Wharf

3.35 A single option has been developed by LDA for the Town Wharf site as shown in Figure 3-43-4.

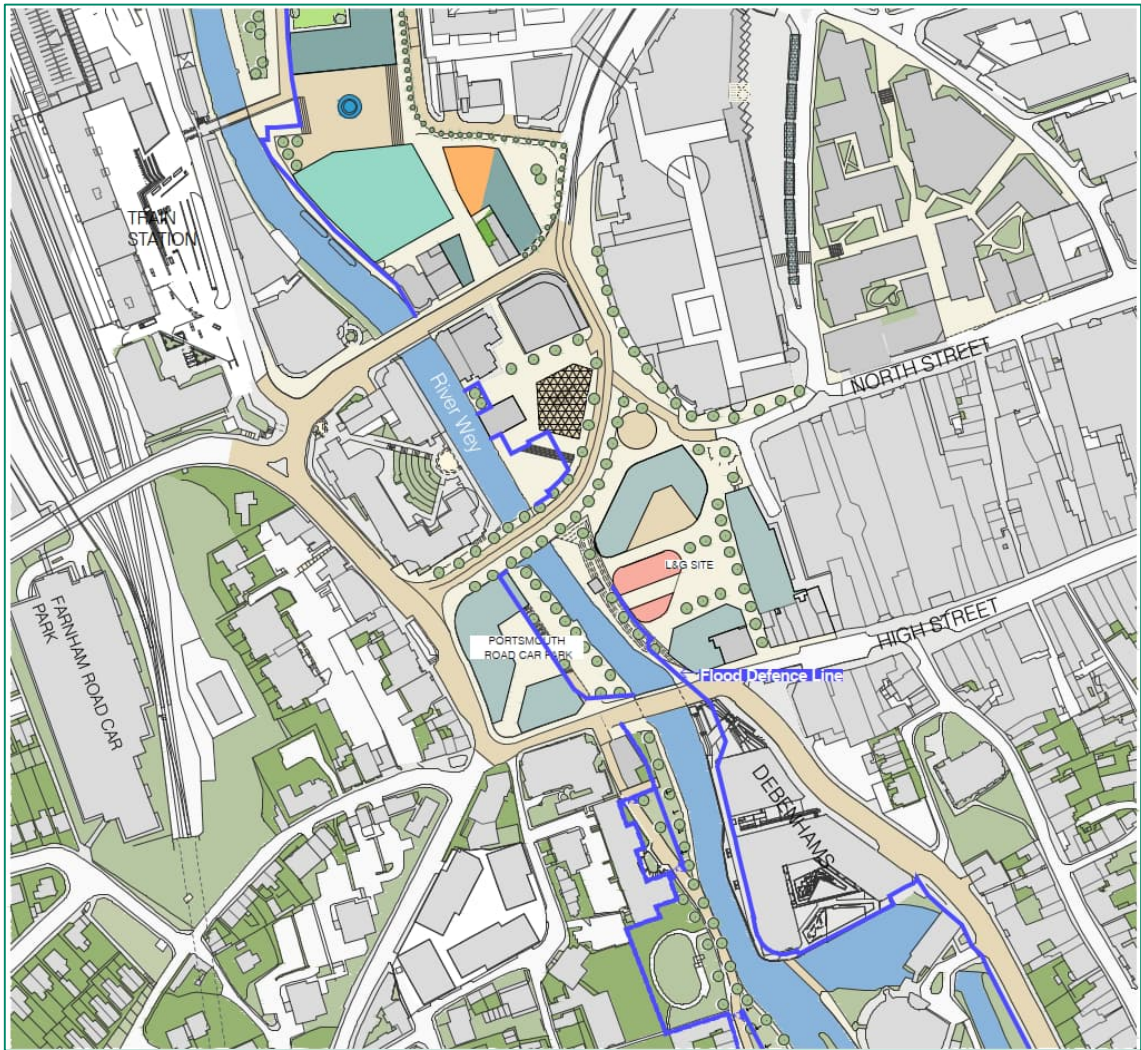


Figure 3-4: LDA Town Wharf Option

Surface Water Attenuation

- 3.36 We have estimated that the proposed development will need to restrict surface water discharge to a maximum greenfield runoff rate of 1.6 l/s based on a 1:100-year storm event. As the site is located on either side of the river, the drainage will need to be split into two networks. We have estimated that the Portsmouth Road Car Park (PRCP) side (west of the River Wey) will account for approximately 0.5 l/s based on the land area and the L&G side (east of the River Wey) taking the remaining 1.1 l/s.
- 3.37 The greenfield runoff rate on the PRCP side is very low and there is a risk that the pipe sizes associated with such a low flow discharge rate will be easily blocked. At this time, surface water drainage networks cannot practically accommodate a flow rate below 0.7 l/s. We therefore recommend that the allowable discharge rate for this site, and consequently the design of the on-site drainage network, is based upon the lowest practical discharge rate of 0.7 l/s.
- 3.38 Based on an initial assessment, Town Wharf will need to attenuate approximately 1,372m³ of surface water within the development footprint. Table 3-10 shows the attenuation volume, including the sensitivity test undertaken on how this volume might increase should the Climate Change factor rise in the future.

Table 3-10: Town Wharf Surface Water Attenuation Storage Volume

Attenuation Storage Volume including Climate Change Allowance at:				
Phase	40%	50%	60%	70%
Town Wharf	1,372m³	1,491m³	1,609m³	1,727m³

Attenuation Storage Volume including Climate Change Allowance at:

Phase	40%	50%	60%	70%
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3.39 There are a range of options available to developers to achieve surface water attenuation on the development. The following section provides options for SuDS on the proposed Town Wharf development.

Town Wharf Sustainable Drainage System Options

Green Roofs and Podium Deck Storage

- 3.40 Town Wharf provides 6,262m² of building roof area, which could be partially used to accommodate a sustainable roof system. An element of roof area will not be available for a sustainable roof system as other building elements (such as MEP equipment) will also need to be accommodated on the roof.
- 3.41 Table 3-11 summarises the extent of roof-based attenuation based on four scenarios of available roof area (80%, 70%, 60% and 50%). Details of the attenuation volume per building are shown in the tables in Appendix C.

Table 3-11: Town Wharf Options Roof Based Surface Water Attenuation Summary

Option	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
		80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
PRCP	1,862	1,490	212	1,303	186	1,117	159	931	133
L&G	4,400	3,520	502	3,080	439	2,640	376	2,200	314
Total:	6,262	5,010	714	4,383	625	3,757	535	3,131	446

3.42 The Town Wharf masterplan does not include any podium areas around the buildings where podium deck surface water attenuation could be provided.

Ground Level Storage

- 3.43 The remainder of the surface water attenuation will need to be accommodated at ground level. Table 3-12 and Table 3-13 provide the estimated Ground Level Based Surface Water Attenuation for Town Wharf on either side of the River Wey. This assessment assumes that the PRCP side accommodates ⅓ of the 1,372m³ attenuation requirement (457m³) and the L&G side the remaining ⅔ (915m³).

Table 3-12: Town Wharf (Portsmouth Road Car Park) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	457m³	457m³	457m³	457m³
Surface Water Attenuated at Roof Level	212m³	186m³	159m³	133m³
Surface Water Attenuated at Podium Level	0m³	0m³	0m³	0m³
Surface Water Attenuation Required at Ground Level	245m³	272m³	298m³	325m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

Table 3-13: Town Wharf (L&G) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	915m³	915m³	915m³	915m³
Surface Water Attenuated at Roof Level	502m³	439m³	376m³	314m³
Surface Water Attenuated at Podium Level	0m³	0m³	0m³	0m³
Surface Water Attenuation Required at Ground Level	413m³	476m³	538m³	601m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

- 3.44
- There is a large volume of surface water which will need to be attenuated at ground level. As shown in the SuDS Hierarchy (Table 3-1), there are a number of options for ground based sustainable drainage systems available which will need to be explored to strike a balance between buried and surface features.
- 3.45
- An initial assessment of the Town Wharf masterplan has identified that approximately 823m² (PRCP) and 4,214m² (L&G) of hard landscaping (outside the flood defence feature) may be available for crated attenuation features.
- 3.46
- The hard landscaped areas will require below ground space to be free of attenuation features to allow for utility and drainage networks to be routed. They also need to be relatively large usable areas, rather than narrow paths behind buildings. Therefore, we have assumed that 40% of the area is available for attenuation features and that a double height Polypipe Civils Permavoid Modular Cell 150 (300mm) can be installed beneath a permeable or gravelled paving type. On this basis a volume of 94m³ (PRCP) and 480m³ (L&G) of surface water attenuation can be provided in crates.
- 3.47
- Based upon the above assessment, on the PRCP side 151 to 231m³ of surface water attenuation features may need to be incorporated within the remaining development area through the use of swales, basins, ponds, rain gardens and other features.
- 3.48
- Based upon the above assessment, on the L&G side up to 121m³ of surface water attenuation features may need to be incorporated within the remaining development area through the use of swales, basins, ponds, rain gardens and other features.
- 3.49
- It should be noted however, that the use of buried crates at ground level is at the bottom of the SuDS Hierarchy (Table 3-1) and the development masterplan should seek to maximise accommodating surface water attenuation using features further up the hierarchy wherever possible. The SGF masterplan layout does not currently show areas of landscaping within the Town Wharf area on either side of the River Wey, with the exception of some trees.

Millbrook Car Park

- 3.50
- LDA have prepared several options for the Millbrook Car Park site as shown in Figure 3-53-8.

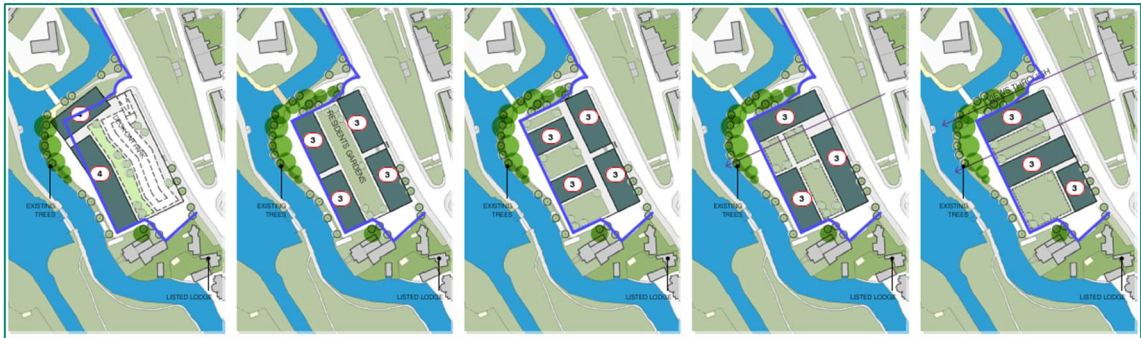


Figure 3-5: LDA Millbrook Car Park Options

- 3.51
- For our assessment we have only considered the Option B (second from left) as we have assumed this to be the most conservative from a surface water attenuation view.

Surface Water Attenuation

- 3.52
- We have estimated that the proposed development will need to restrict surface water discharge to a maximum greenfield runoff rate of 1.1 l/s based on a 1:100-year storm event.

- 3.53
- The greenfield runoff rate is very low and there is a risk that the pipe sizes associated with such a low flow discharge rate will be easily blocked. At this time, surface water drainage networks cannot practically accommodate a flow rate below 0.7 l/s. We therefore recommend that the allowable discharge rate for this site, and consequently the design of the on-site drainage network, is based upon the lowest practical discharge rate of 0.7 l/s.

- 3.54
- Based on an initial assessment, Millbrook Car Park (Option B) will need to accommodate approximately 956m³ of surface water attenuation within the development footprint. Table 3-14 shows the attenuation volume, including the sensitivity test undertaken on how this volume could increase should the Climate Change factor rise in the future.

Table 3-14: Millbrook Car Park (Option B) Surface Water Attenuation Storage Volume

Attenuation Storage Volume including Climate Change Allowance at:				
Phase	40%	50%	60%	70%
Millbrook Car Park	956m³	1,038m³	1,120m³	1,202m³

- 3.55
- There are a range of options available to developers to achieve surface water attenuation on the development. The following section provides options for SuDS on the proposed Millbrook Car Park (Option B) development.

Millbrook Car Park Sustainable Drainage System Options

Green Roofs and Podium Deck Storage

- 3.56
- Millbrook Car Park (Option B) provides 2,560m² of building roof area, which could be partially used to accommodate a sustainable roof system. An element of roof area will not be available for a sustainable roof system as other building elements (such as MEP equipment) will also need to be accommodated on the roof.
- 3.57
- Table 3-15 summarises the extent of roof-based attenuation based on four scenarios of available roof area (80%, 70%, 60% and 50%). Details of the attenuation volume per building are shown in the tables in Appendix C.

Table 3-15: Millbrook Car Park (Option B) Roof Based Surface Water Attenuation Summary

Option	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
		80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
Millbrook Car Park	2,560	2,048	292	1,792	255	1,536	219	1,280	182
Total:	2,560	2,048	929	1,792	255	1,536	219	1,280	182

- 3.58
- The Millbrook Car Park (Option B) masterplan does not include any podium areas around the buildings where surface water attenuation could be provided.

Ground Level Storage

- 3.59
- The remainder of the surface water attenuation will need to be accommodated at ground level. Table 3-16 provide the estimated Ground Level Based Surface Water Attenuation for Millbrook Car Park (Option B).

Table 3-16: Millbrook Car Park (Option B) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	956m³	956m³	956m³	956m³
Surface Water Attenuated at Roof Level	292m³	255m³	219m³	182m³
Surface Water Attenuated at Podium Level	0m³	0m³	0m³	0m³
Surface Water Attenuation Required at Ground Level	664m³	701m³	737m³	774m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

- 3.60
- There is a large volume of surface water which will need to be attenuated at ground level. As shown in the SuDS Hierarchy (Table 3 1), there are a number of options for ground based sustainable drainage systems available which will need to be explored to strike a balance between buried and surface features.

- 3.61 An initial assessment of the Millbrook Car Park masterplan options suggests that there is very little area within the site allocated for ground base hard landscaping (outside the flood defence feature) which may be available for crated attenuation features. Additionally, the space below the area identified for Residents Gardens is above a proposed car park and therefore the structural depth and construction will be a limiting factor in the ability to locate ground-based attenuation features, whether that is crated attenuation or the use of swales, basins, ponds, rain gardens and other features.
- 3.62 As the design of this site is progressed, the Architect will need to consider the ability to locate ground-based attenuation features within the Millbrook Car Park development area to control and store surface water, without putting undue pressure on the structural form of the buildings which is likely to significantly increase development costs due the weight of surface water attenuation when on a structure.
- 3.63 It should be noted however, that the use of buried crates at ground level is at the bottom of the SuDS Hierarchy (Table 3-1) and the development masterplan should seek to maximise accommodating surface water attenuation using features further up the hierarchy wherever possible.

Millmead

- 3.64 LDA have prepared several options for the Millmead site as shown in Figure 3-63-9.



Figure 3-6: LDA Millmead Options

- 3.65 For our assessment we have only considered the Low Rise Town-homes option (second from left) as we have assumed this to be the most conservative from a surface water attenuation view. In addition, we have not included the proposal for 10 town-homes adjacent to the Guildford Baptist Church, or the existing building which is proposed to remain in all options as it is unlikely that roof-based surface water attenuation would be able to be retro-fitted to this building.

Surface Water Attenuation

- 3.66 We have estimated that the proposed development will need to restrict surface water discharge to a maximum greenfield runoff rate of 1.1 l/s based on a 1:100-year storm event.
- 3.67 The greenfield runoff rate is very low and and there is a risk that the pipe sizes associated with such a low flow discharge rate will be easily blocked. At this time, surface water drainage networks cannot practically accommodate a flow rate below 0.7 l/s. We therefore recommend that the allowable discharge rate for this site, and consequently the design of the on-site drainage network, is based upon the lowest practical discharge rate of 0.7 l/s.
- 3.68 Based on an initial assessment, Millmead (Low Rise Town-homes option) will need to accommodate approximately 714m³ of surface water attenuation within the development footprint. Table 3-17 below shows the attenuation volume, including the sensitivity test undertaken on how this volume could increase should the Climate Change factor rise in the future.

Table 3-17: Millmead (Low Rise Town-homes option) Surface Water Attenuation Storage Volume

Attenuation Storage Volume including Climate Change Allowance at:				
Phase	40%	50%	60%	70%
Millmead	714m³	777m³	814m³	906m³

- 3.69 There are a range of options available to developers to achieve surface water attenuation on the development. The following section provides options for SuDS on the proposed Millmead (Low Rise Town-homes option) development.

Millmead Sustainable Drainage System Options

Green Roofs and Podium Deck Storage

- 3.70 Millmead (Low Rise Town-homes option) provides 2,264m² of building roof area, which could be partially used to accommodate a sustainable roof system. An element of roof area will not be available for a sustainable roof system as other building elements (such as MEP equipment) will also need to be accommodated on the roof.
- 3.71 Table 3-18 summarises the extent of roof-based attenuation based on four scenarios of available roof area (80%, 70%, 60% and 50%). Details of the attenuation volume per building are shown in the tables in Appendix C.

Table 3-18: Millmead (Low Rise Town-homes option) Roof Based Surface Water Attenuation Summary

Option	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
		80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
Millmead	2,264	1,811	258	1,585	226	1,358	194	1,132	161
Total:	2,264	1,811	258	1,585	226	1,358	194	1,132	161

- 3.72 The Millmead (Low Rise Town-homes option) masterplan does not include any podium areas around the buildings where surface water attenuation could be provided.

Ground Level Storage

- 3.73 The remainder of the surface water attenuation will need to be accommodated at ground level. Table 3-19 provide the estimated Ground Level Based Surface Water Attenuation for Millmead (Low Rise Town-homes option).

Table 3-19: Millmead (Low Rise Town-homes option) Ground Level Based Surface Water Attenuation

	80% Roof Area	70% Roof Area	60% Roof Area	50% Roof Area
Surface Water Attenuation Volume Required*	714m³	714m³	714m³	714m³
Surface Water Attenuated at Roof Level	258m³	226m³	194m³	161m³
Surface Water Attenuated at Podium Level	0m³	0m³	0m³	0m³
Surface Water Attenuation Required at Ground Level	456m³	488m³	520m³	553m³

* Based on a 1:100-year storm event, including a 40% allowance for Climate Change.

- 3.74 There is a large volume of surface water which will need to be attenuated at ground level. As shown in the SuDS Hierarchy (Table 3-1), there are a number of options for ground based sustainable drainage systems available which will need to be explored to strike a balance between buried and surface features.
- 3.75 An initial assessment of the Millmead (Low Rise Town-homes option) masterplan has identified that ground base hard landscaping is present around the buildings which may be available for an element of crated attenuation features. It is difficult to quantify based on the current status to the masterplan development however, based on use of a double height Polypipe Civils Permavoid Modular Cell 150 (300mm) installed beneath a permeable or gravelled paving type a volume of 29m³ of surface water attenuation can be accommodated per 100m².
- 3.76 As the design of this site is progressed, the Architect will need to consider the ability to locate ground-based attenuation features within the Millmead development area to control and store surface water.
- 3.77 It should be noted however, that the use of buried crates at ground level is at the bottom of the SuDS Hierarchy (Table 3-1) and the development masterplan should seek to maximise accommodating surface water attenuation using features further up the hierarchy wherever possible. The SGF masterplan layout does not currently show areas of landscaping within the Town Wharf area on either side of the River Wey, with the exception of some trees.

Surface Water Quality Control

- 3.78 The risk posed by surface water runoff to the receiving environment is a function of:
- The pollution hazard at a particular site (i.e., the pollutant source).

- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, (i.e., the pollutant pathway).
- The sensitivity of the receiving environment (i.e., the environment receptor).

Simple Index Approach

- 3.79 The CIRIA C753 SuDS Manual, Table 26.1 suggests a Simple Index Approach for low-risk developments, which follows a three-step process, namely:
- Allocate suitable pollution hazard indices for the proposed land use.
 - Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.
 - Where the discharge is protected surface waters or groundwater, consider the need for a more precautionary approach.
- 3.80 To successfully deliver adequate treatment, the chosen SuDS components should have a total pollution mitigation index that equals or exceeds the pollution hazard index.
- 3.81 Where the mitigation index of an individual components is insufficient, two components (or more) in series will be required, where: Total SuDS mitigation index = mitigation index1 + 0.5(mitigation index).
- 3.82 The Simple Index Approach states that if the land use varies across the “runoff area”, either:
- Use the land use type with the highest pollution hazard index.
 - Apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all.
- 3.83 Pollution hazard indices for the various land uses that will be included in the proposed Development are shown in Table 3-21: SuDS mitigation indices for discharge to surface water (Source, CIRIA C753).

Pollution Hazard Indices

Table 3-20: Pollution Hazard indices relevant to the proposed Development (Source- UK SuDS SIA tool)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Liquid Hydrocarbons (Free Floating Oils)
Commercial/Industrial roofing: Medium potential for metal leaching	Medium	0.3	0.6	0.05
Non-residential parking with infrequent change (e.g., schools, offices, < 300 traffic movements a day)	Low	0.5	0.4	0.4
Standard commercial yard or delivery area	Medium	0.7	0.6	0.7
Low traffic roads (e.g., residential roads and general access roads, < 300 traffic movements/day	Low	0.5	0.4	0.4
Roads (excluding low traffic roads, highly frequented lorry approaches to industrial estates, trunk roads/motorways)	Medium	0.7	0.6	0.7

Pollution Mitigation Indices

- 3.84 The surface water strategy for the SGF proposed development sites will need to include open SuDS and bioretention features to provide water quality uplift in accordance with the CIRIA C753 SuDS manual, and GBC and SCC policies and other statutory legislation (such as the Water Environment (Water Framework Directive) (England and Wales) Regulations) applicable at the time of commencing detailed design.
- 3.85 Predominantly these will consist of rain gardens, SuDS trees, swales and ponds to treat surface water runoff as it flows through the proposed development sites.

- 3.86 Table 3-21 (reproduced from Table 26.3 in CIRIA C753) gives details of the pollution mitigation provided by each type of SuDS feature.

Table 3-21: SuDS mitigation indices for discharge to surface water (Source, CIRIA C753)

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Liquid Hydrocarbons (Free Floating Oils)
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary Treatment Systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Notes

- SuDS components only deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters.
 - Filter drains can remove coarse sediments, but their use for this purpose will have significant implications with respect to maintenance requirements, and this should be considered during the design of the maintenance plan.
 - Ponds and wetlands can remove coarse sediments, but their use for this purpose will have significant implications with respect to the maintenance requirements and amenity value of the system. Sediment should normally be removed upstream, unless they are specifically designed to retain sediment in a separate part of the component, where it cannot easily migrate to the main body of water.
- 3.87 The surface water strategy for the SGF proposed development sites will need to integrate appropriate SuDS components to ensure sufficient treatment is provided based on the respective pollution hazard and mitigation indices. For pollution sources where it is identified that a single SuDS component would be insufficient to mitigate the pollutant, a range of SuDS features will need to be considered. Pollutants conveyed by the surface water runoff will be treated via the range of pollutant removal mechanisms offered by each SuDS component. Amenity and biodiversity value will be promoted wherever possible to maximise the benefits of the SuDS.
- 3.88 Guildford is situated on the North Downs, located in a natural depression caused by the River Wey. The towpath adjacent to the River Wey lies at a level of approximately 30.0m (±1m) AOD and is broadly the lowest area of the town. The SGF emerging masterplan sites are all situated in close proximity to the river and therefore typically at the low points of the wider topography.
- 3.89 Further details on the broad terrain and landscape for Guildford can be found in the 'Guildford Town Centre Masterplan, Chapter 3 – Looking back', which includes the following topography image:

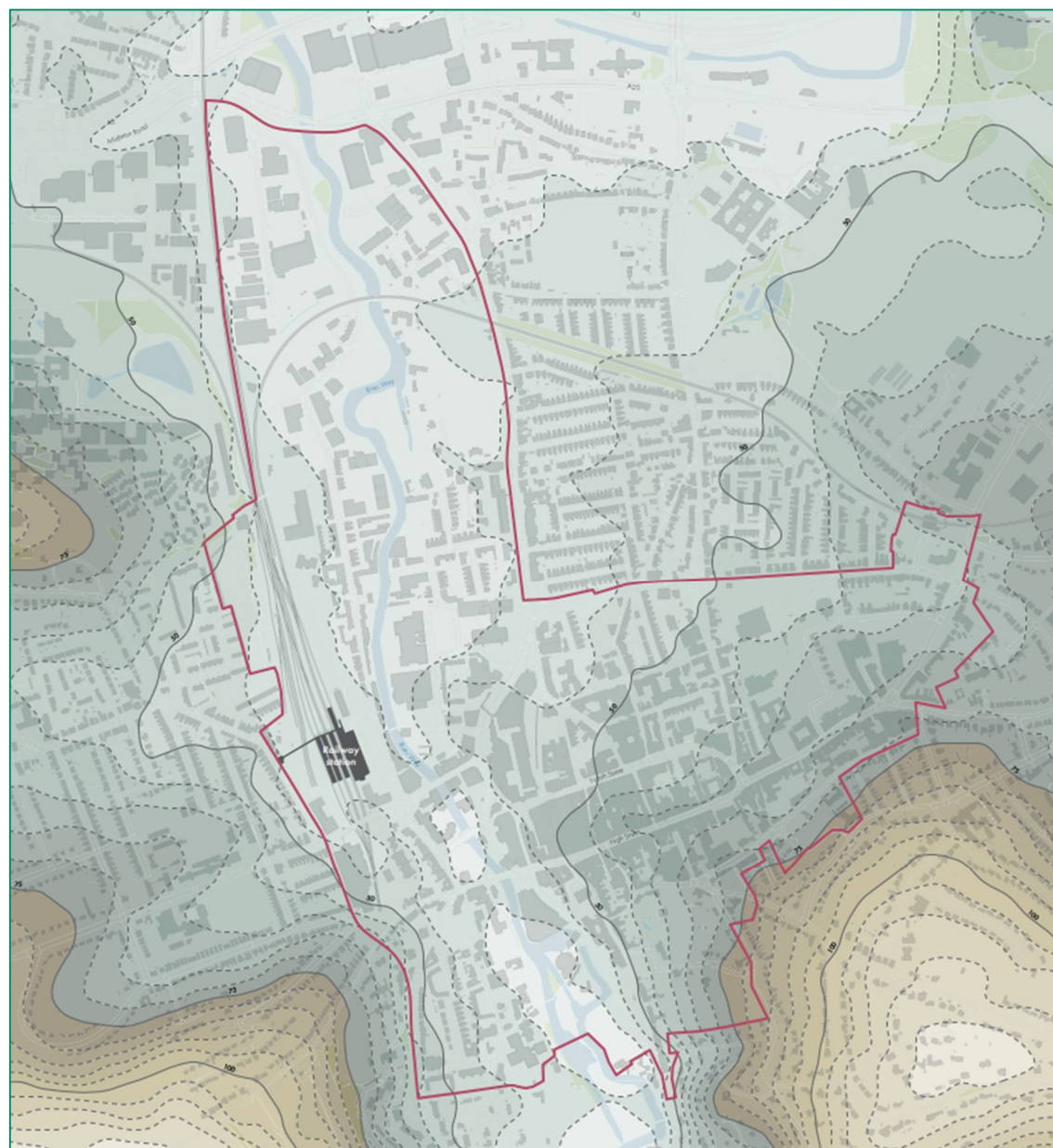


Figure 3-7: Illustration of Topography Around Guildford⁸

- 3.90 The emerging masterplan and site-wide designs will need to take account of the positioning of the sites in relation to the topography and the risk and / or management of existing surface water overland flood routes from the wider area.
- 3.91 A Guildford FAS Surface Water Flood Risk Opportunities report (document ref: ENVIMSE500192-JAC-ZZ-00-RP-C-0001, revision P02, dated 21 December 2021), has previously been undertaken by engineering consultant Jacobs to support the wider Guildford Flood Alleviation Scheme (FAS). This included a study of the overland flow routes through the Bedford Wharf and Town Wharf (east of the River Wey) sites.
- 3.92 Figure 3-83-11 is an extract of Figure 2.4 from the Jacobs report showing the overland flood route coming westbound down the A246 York Road and Leapale Lane, converging on the A322 Onslow Street. The flows then route west along both Laundry Road and Bedford Road, flowing into the River Wey past either side of the Odeon Cinema.

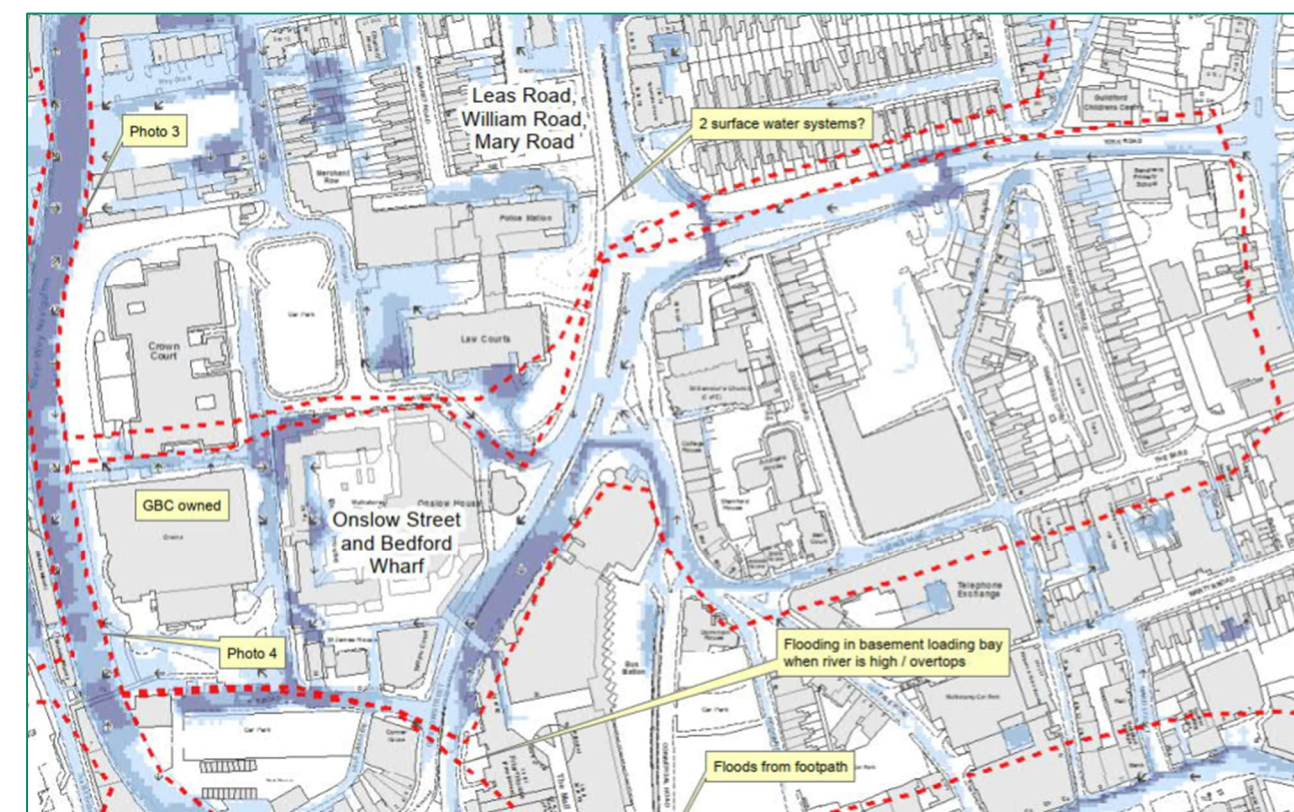


Figure 3-8: Extract of Figure 2.4 from Jacobs Report (ref: ENVIMSE500192-JAC-ZZ-00-RP-C-0001, P02)

- 3.93 Figure 3-93-12 is an extract of Figure 2.5 from the Jacobs report showing the overland flood route coming westbound down North Street and then flowing into the River Wey through the Town Wharf site.

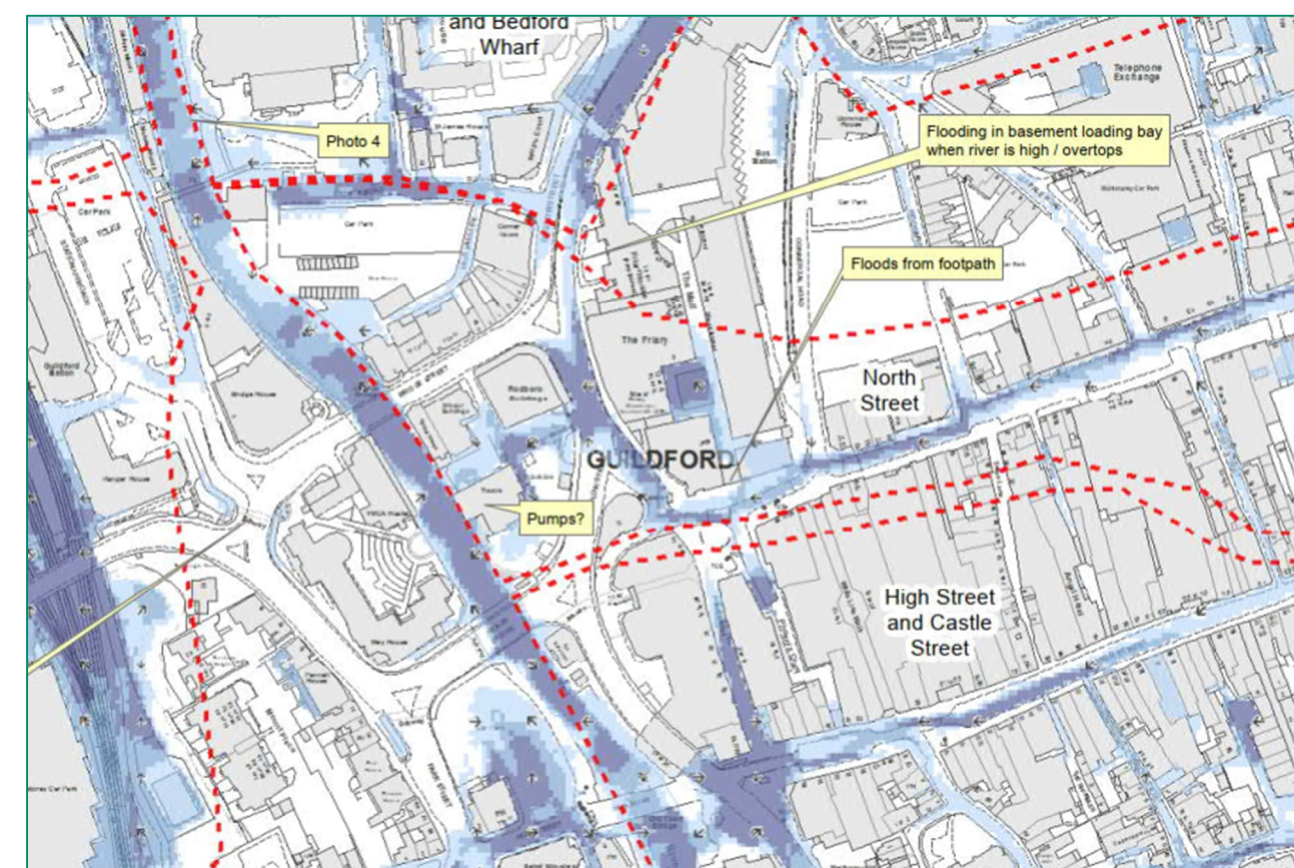


Figure 3-9: Extract of Figure 2.5 from Jacobs Report (ref: ENVIMSE500192-JAC-ZZ-00-RP-C-0001, P02)

⁸ <https://www.guildford.gov.uk/tcmp>

3.94 The proposed development sites should consider several elements with regard to overland flood flows routes:

- The emerging masterplan for the sites should not alter the existing flow route characteristics in a manner that could form a dam or bund that causes increased flood risk elsewhere.
- Consideration on how overland flood flows will bypass the proposed flood defences, such that water does not build-up behind the defence.
- Building finished floor levels should be set at an appropriate level to avoid inundation by overland flood flows. This may be above the river level. It could be considered that the ground floor of the development could include non-inhabited amenity areas and building receptions that are designed to flood without damage and evacuation routes / procedures established.
- If basement areas (or lower floors) are proposed, ensure they are not habitable and have suitable measures to prevent the ingress of water, or be designed such that they can be evacuated, pumped out and don't contain contents that are damaged by water. Ideally lower floors should be accessed from inside the building, rather than having any external steps or ramps down.
- Ensure the layout of the proposed buildings promotes overland flood flow routes to safely flow around buildings, at a lower ground level.
- The design of the proposed flood defence should include for non-return valves to be introduced to the existing surface water outfalls to the River Wey, to prevent water from the river surcharging behind the flood defence and becoming trapped.

3.95 A key challenge to the management of the overland flood flow route is the River Wey flood defence, as this will need to be set at a level to prevent river overtopping, which in-turn could block existing surface water flow paths resulting in surface water being trapped behind the new defences. Whilst this may improve fluvial flood risk to the development, it may as a result increase the risk of pluvial flooding from the existing arrangement.

3.96 The Jacobs study suggests several measures to mitigate this:

- Retrofitting SuDS upstream to reduce surface water flows.
- Capturing and storing surface water flows along the flow routes (this may not be feasible due to constraints of existing road widths, utilities, etc).
- Storage tied into the re-development of Bedford Wharf on the dry side of the flood defences or pumping over the river defence. As rightly noted by the Jacobs report, this depends on the constraints of the design of Bedford Wharf and buried utilities.

3.97 It is unlikely that the current masterplan allows for sufficient external space to attenuate both the surface water attenuation requirement of the development and additional storage for the overland flood flows whilst the river levels are surcharging the flood defences.

3.98 To understand this, a detailed pluvial modelling exercise would need to be commissioned to inform the required volume of overland flood storage and the masterplan would have to be developed further (potentially resulting in reduced building footprints) to accommodate this. This decision, whilst positive for strategic flood risk in the vicinity would come at additional cost and potentially reduction in units for the Bedford Wharf and Town Wharf developments.

3.99 A coordinated approach is required with GBC, the LLFA and the Environment Agency to decide how this risk and floodwater is to be managed. Assuming hypothetically, that the flood defence is provided and no interventions for storing overland flood flows are made, the Bedford Wharf and Town Wharf developments could have buildings set at an appropriate level to be above pluvial surface water trapped behind the defence. Pipework could be installed through the flood defence with non-return valves, to allow trapped flows to drain through the defence when the water level in the river is lower. However, adjacent properties may still be at a lower level and may be affected when the river level is surcharged. Therefore, there is a shared interest to work with other stakeholders to benefit not only the proposed development areas, but also the wider area.

4. Electricity

Introduction

- 4.1
- The proposed development sites identified to be delivered as part of SGF will require a reliable electrical supply from the District Network Operator (DNO). The DNO for Guildford is UK Power Networks⁹ (UKPN), with the development sites located within their Southeast England Network Area. They are responsible for the provision of new electrical connections, disconnections and alterations within their network area.
- 4.2
- The main incoming electrical supply to Guildford arrives at the UKPN owned primary substation located on Woodbridge Road as shown in Figure 4-14-1.



Figure 4-1: UKPN Primary Substation Location (Google Maps, © 2022 Google)

Assessment

- 4.3
- We have undertaken an assessment of the development sites identified within the LDA masterplan (March 2022) to gain an understanding of the anticipated electrical loads that would need to be supplied by UKPN either through existing capacity on their network, or through strategic reinforcement.
- 4.4
- With the exception of Town Wharf, the LDA masterplan has differing options for the remaining four sites. For ease within this assessment, we have prepared our anticipated electrical demand estimates for the largest option at each site. The LDA masterplan does not include sufficient information for Millmead to estimate electrical loading, so this site has been omitted from the assessment. Table 4-1 shows our assessment:

Table 4-1: Estimated Electrical Demand

Site	Residential	Commercial	Car Parking (residential)	Car Parking (public)	Total	
Bedford Wharf	3.34 MVA	2.47 MVA	1.08 MVA	N/A	6.88 MVA	21.47 MVA
Woodbridge Meadows	7.53 MVA	0.80 MVA	2.42 MVA	N/A	10.76 MVA	
Town Wharf	0.91 MVA	1.04 MVA	0.29 MVA	N/A	2.24 MVA	
Millbrook Car Park	0.32 MVA	N/A	0.15 MVA	1.13 MVA	1.60 MVA	T.B.A.
Millmead	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.	

Assessment Assumptions

- 4.5
- We have prepared the above estimates based on the following assumptions:
- Residential units are assigned an electrical supply of 3.5 kVA per unit. This allows for each residential unit to be gas free for both cooking and heating, with heat provided through a form of heat pump (air source / ground source).

Commercial units have been assigned an electrical supply on the basis of:

– 70 W/m² Office and Civil use

– 120 W/m² Retail and Food & Beverage use

– 65 W/m² Hotel

A diversity factor for the residential and commercial units has not been allowed for at this stage.

Electric car charging has been assigned an electrical supply of 7.5 kW per residential space. It is assumed that all residential spaces will have an EV charge point.

Electric car charging has been assigned an electrical supply of 7.5 kW per public space. It is assumed that all public spaces will have an EV charge point, though these might be delivered over several years as demand for these facilities increases with EV ownership.

A diversity factor of 0.5 has been applied to the EV charging for both residential and public parking spaces.

The assessment does not consider the electrical capacity which would become available from existing buildings on the development sites as they are decommissioned and demolished.

Engagement with UKPN

- 4.6
- We have provided our estimated electrical loading assessment to UKPN and asked that they undertake an assessment and advise on the following points:
- The emerging masterplan and the estimated electrical demand loads.

The available electrical capacity within the Guildford Primary that the SGF developments might be able to utilise.

UKPNs route / timeframe to provision of increased capacity as a result of future developments.

Will additional land be required for either an extension of the Guildford Primary or a secondary primary within the town centre.

Funding options for increasing capacity at the Guildford Primary or another site should one be required.

Whether UKPN can provide advice on the electrical capacity which might become available from demolition of existing buildings at the identified development sites, which could offset the estimated demand loads for the new developments.

Whether UKPN have future plans for increasing capacity within Guildford and if so, the timeframes for these.
- 4.7
- A copy of the Memo supplied to UKPN has been included in Appendix E for reference.
- 4.8
- We met with UKPN on 17 June 2022 to discuss the SGF emerging masterplan and the items identified above. A key item to note is that as the UK continues to target sustainable developments to support a transition to a net zero economy and resilience to the future impacts of climate change the pressure on all the UK electricity networks is at unprecedented levels.
- 4.9
- The following is a summary of our discussion:
- The existing Guildford Primary substation has very little capacity available to supply future developments within the Guildford area. The existing Guildford Grid at 33kV at the Primary Substation has approximately 5MVA of electrical capacity available for future developments. UKPN are currently undertaking upgrades to the Guildford Primary substation to replace existing equipment.

The existing Guildford Primary substation is supplied electricity from the UKPN West Weybridge Grid Supply Point (GSP). This GSP currently has 30-35MVA of electrical capacity available however, portions of this capacity is being requested by other developments and therefore the available capacity will continue to reduce.

⁹ <https://www.ukpowernetworks.co.uk/>

- Should additional capacity need to be supplied to Guildford then it is likely that a new 132/33kV transformer would be required in Guildford.
 - If space is available then this could be located at the existing Guildford Primary substation however, if space is not available, then a new Primary substation will need to be located at a location to be identified.
 - UKPN would need to undertake an analysis of whether the existing Primary substation could accommodate the additional transformer.
 - A spatial requirement of 40m x 40m would need to be allowed for to accommodate a new Primary substation at another location. Land identification and purchase would not be undertaken by UKPN.
 - This Primary substation would be supplied via a new 132kV network from the UKPN West Weybridge GSP.
 - Should capacity at West Weybridge be insufficient for future developments, then a new Super Grid Transformer will be required. This could take 4-5 years to deliver and is a customer funded item of infrastructure with costs estimated at £15-22M.
 - The delivery of electrical infrastructure can be undertaken by both UKPN as the DNO or by an Independent District Network Operators (IDNO) or Independent Connection Provider (ICP).
 - UKPN as the DNO, must undertake all works on their sites. In this instance this is the West Weybridge GSP and the Guildford Primary substation. These are known as the Non-Contestable Works.
 - An IDNO or ICP can be appointed to undertake works outside the UKPN sites, such as construction of a new Primary substation, or delivery of a new 132kV network between the UKPN West Weybridge GSP and a new Primary substation. These are known as the Contestable Works.
- 4.10 UKPN may be able to advise on the extent of electrical capacity which might become available following demolition of existing buildings at the SGF masterplan sites.

Distribution Substation Provision

- 4.11 Each of the development sites will require distribution substations to allow HV incoming electrical supply to be distributed at either HV or LV to individual buildings.
- 4.12 UKPN's preferred substation type is a freestanding brick-built enclosure located at ground level and this type should be considered first when planning for substations on a new development. UKPN prefer these to be truly freestanding however, they can be positioned adjacent to non-residential buildings, such as bin stores, garages, etc. UKPN do allow for other substation enclosures to be considered:
- GRP Substation**, however due to a lack of fire resistance, these must be located a minimum of 4m away from the nearest building unless a 4-hour fire barrier is provided.
 - Integral Substation**, these should be positioned on the ground floor with at least one external wall, though two external walls (i.e. building corner) is preferred to allow for cooling of the enclosure through the use of cross flow ventilation. Due to noise and vibration transmittal, these should also not be positioned immediately adjacent or below domestic dwellings.
 - Basement Substation**, this may be considered in certain circumstances with the agreement of UKPN however, we do not consider these will be necessary or appropriate for developments identified within the current SGF LDA masterplan.
- 4.13 All substation enclosures must be provided solely for the use of UKPN with no access for other users (e.g. landlords) and no interconnecting doors to other parts of buildings.
- 4.14 The locations of new substations will require agreement with UKPN and there are a number of key requirements which need to be considered when choosing locations.
- They need to be located at or near the electrical load centre of the network to be supplied.
 - They need to be located at ground level.
 - They need to be provided with safe and adequate 24-hour access from the public highway for operational personnel and vehicles, including plant delivery vehicles with a lorry mounted crane. Access from road junctions and major roads shall be avoided. Where necessary, unrestricted access via a dual locking arrangement is acceptable; access via recourse to a 3rd party (e.g. Security) is not acceptable.

- They need to be located positioned such that obstruction is not caused with the doors open (e.g. over the public footpath).
- They need to be located in a visible location to deter vandals.
- They need to be located where ventilation is to free air and not adjacent to escape routes. Venting into loading bays, undercrofts or underground car parks is not acceptable.
- They need to be located a minimum of ten metres from residential properties, where possible, to mitigate potential noise nuisance.
- They need to be located a minimum of four metres away from the nearest building to mitigate the fire risk; if the substation is less than four metres away from the nearest building the introduction of fire mitigation measures will be required.

4.15 UKPN provide plot size guidelines for substation enclosures which are shown in Figure 4-24-2 to Figure 4-64-6 below.

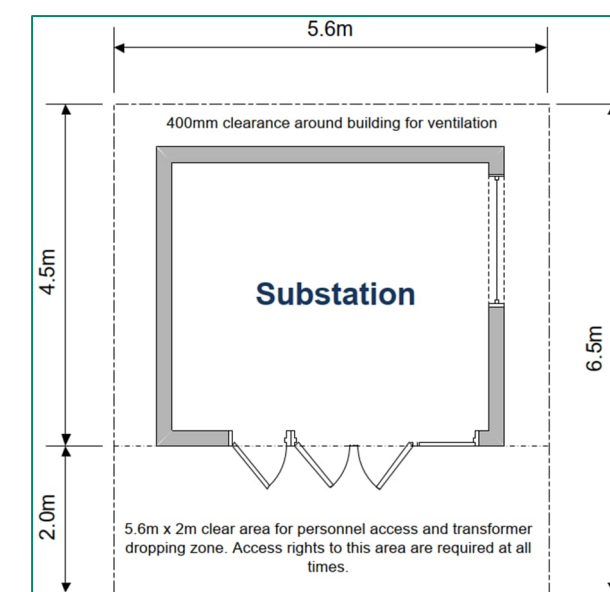


Figure 4-2: Freestanding Brick-built Single Transformer Substation Enclosure

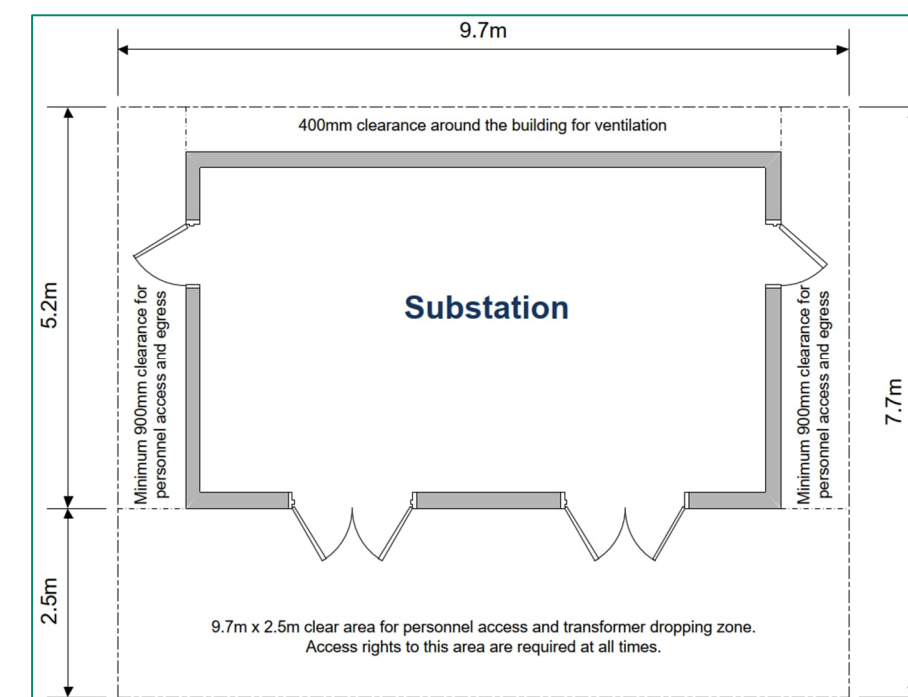


Figure 4-3: Freestanding Brick-built Two Transformer Substation Enclosure

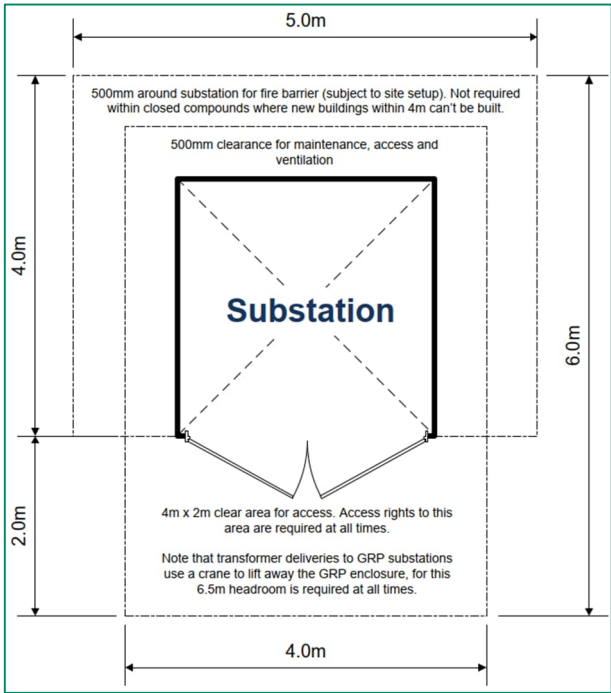


Figure 4-4: Freestanding GRP Single Transformer Substation Enclosure

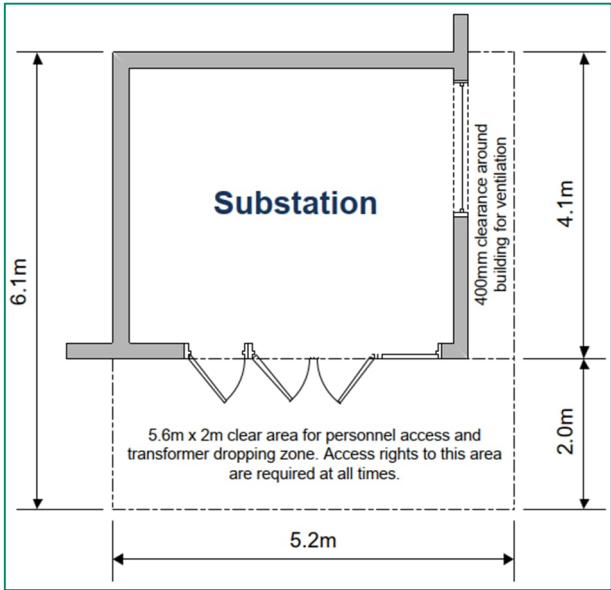


Figure 4-5: Integral Single Transformer Substation Enclosure

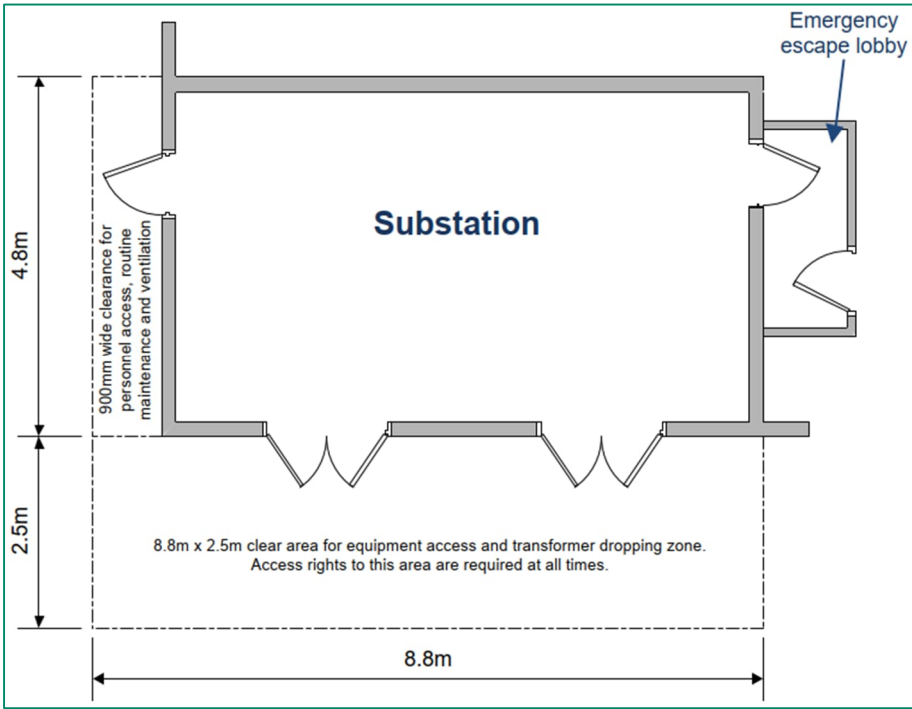


Figure 4-6: Integral Two Transformer Substation Enclosure

- 4.16 Appendix F includes copies of the latest UKPN standard details for Brick, GRP and Integral enclosures.
- 4.17 UKPN allow for transformers up to 1,500 kVA loading to be installed within a single transformer substation enclosure. For the two transformer substation enclosures, two 1,000 kVA transformers may be installed. Transformers typically come in 315, 500, 800 and 1000 kVA, with 1,500 kVA transformers potentially available, though for this assessment we have assumed that each transformer will only be up to a 1,000 kVA loading.
- 4.18 Based on the estimated electrical loading assessment for the SGF development sites, we have shown in Table 4-2 to Table 4-5 the anticipated number of substation enclosures which should be allowed for at each site. The LDA masterplan does not include sufficient information for Millmead to estimate electrical loading so this site has been omitted from the assessment. As the design of these sites is further developed and in-turn the electrical loading estimates, we would expect the number of substation enclosures and transformer sizes to be refined.

Table 4-2: Bedford Road Electrical Loading Estimate and Transformer / Enclosure Sizes

Building	Estimated Electrical Loading	Transformer	Enclosure
One Estate, Block 1	1.36 MVA	1x 500 kVA + 1x 1000 kVA	1x Two Transformer or 2x Single Transformer
One Estate, Block 2	0.65 MVA	1x 800 kVA	1x Single Transformer
One Estate, Block 3a & 3b	1.09 MVA	1x 315 kVA + 1x 800 kVA	1x Two Transformer or 2x Single Transformer
One Estate, Block 4	0.71 MVA	1x 800 kVA	1x Single Transformer *
One Estate, Block 5	0.42 MVA	1x 500 kVA	1x Single Transformer *
Odeon, Block 6	1.52 MVA	2x 800 kVA	1x Two Transformer or 2x Single Transformer
Bedford Road Car Park, Block 1	0.88 MVA	1x 1000 kVA	1x Single Transformer *
Bedford Road Car Park, Block 2a & 2b	0.26 MVA	1x 315 kVA	1x Single Transformer *
6.88 MVA			

* It might be feasible for One Estate Blocks 4 and 5 to share a two-transformer enclosure. This may also be feasible for Bedford Road Car Park Blocks 1, 2a and 2b.

Table 4-3: Woodbridge Meadows Electrical Loading Estimate and Transformer / Enclosure Sizes

Building	Estimated Electrical Loading	Transformer	Enclosure
Woodbridge Meadows, Block 1	0.96 MVA	1x 1000 kVA	1x Single Transformer
Woodbridge Meadows, Block 2	1.26 MVA	1x 1000 kVA + 1x 315 kVA	1x Two Transformer
Woodbridge Meadows, Block 3	0.93 MVA	1x 1000 kVA	1x Single Transformer
Woodbridge Meadows, Block 4	0.70 MVA	1x 800 kVA	1x Single Transformer
Woodbridge Meadows, Block 5	1.85 MVA	2x 1000 kVA	1x Two Transformer or 2x Single Transformer
Woodbridge Meadows, Block 6	1.62 MVA	1x 1000 kVA + 1x 800 kVA	1x Two Transformer or 2x Single Transformer
Woodbridge Meadows, Block 7	1.42 MVA	1x 1000 kVA + 1x 500 kVA	1x Two Transformer or 2x Single Transformer
Woodbridge Meadows, Block 8	1.17 MVA	1x 1000 kVA + 1 x 315 kVA	1x Two Transformer or 2x Single Transformer
Woodbridge Meadows, Block 9	0.86 MVA	1x 1000 kVA	1x Single Transformer
10.77 MVA			

Table 4-4: Town Wharf Electrical Loading Estimate and Transformer / Enclosure Sizes

Building	Estimated Electrical Loading	Transformer	Enclosure
Portsmouth Road Car Park, Block 1 + Portsmouth Road Car Park, Block 2	0.66 MVA	1x 800 kVA	1x Single Transformer
Legal & General, North	0.74 MVA	1x 800 kVA	1x Single Transformer
Legal & General, South	0.28 MVA	1x 500 kVA	1x Single Transformer
Legal & General, Block 1	0.03 MVA		
Legal & General, Block 2	0.05 MVA		
Friary Street	0.48 MVA	1x 500 kVA	1x Single Transformer
2.24 MVA			

Table 4-5: Millbrook Car Park Electrical Loading Estimate and Transformer / Enclosure Sizes

Building	Estimated Electrical Loading	Transformer	Enclosure
Option B	1.60 MVA	1x 1000 kVA + 1x 800 kVA	1x Two Transformer or 2x Single Transformer
1.60 MVA			

Challenges and Risks Associated with Electrical Supply

UKPN Identified Challenges

- 4.19
- In our initial contact with UKPN in early 2021, they raised concerns over the ability of the Guildford primary substation to supply sufficient electricity to support significant development in Guildford. At the time they advised that they had recently accepted a connection and capacity application from a new Datacentre to be delivered. The details regarding this Datacentre (such as location, delivery timing, etc) could not be divulged by UKPN due to confidentially reasons however, we were advised that this development has requested a supply of 180MVA and that it will affect the UKPN network ‘up-stream’ of the Guildford primary substation.

- 4.20
- During our informal discussion in early 2021, they outlined the works to provide increased capacity at the Guildford primary substation were likely to be significant, which they anticipated involving:

- Reinforcement works at the West Weybridge GSP, including a new building, new 132kV circuit breaker, new switchgear and other works.
- A new 132kV circuit to be run between the West Weybridge GSP and the Guildford primary substation.
- A new 132kv-33kV transformer, rated at 90-120MVA to be installed at the Guildford primary substation and reconfiguration of the Guildford primary substation site to accommodate.
- Other supporting works at the Guildford Primary to accommodate, including replacement of switchboards.

- 4.21
- The re-engagement with UKPN has shown that the situation regarding a lack of electrical capacity within Guildford has not changed.

Broader Risks

- 4.22
- As the UK continues to target sustainable developments to support a transition to a net zero economy and resilience to the future impacts of climate change the pressure on the UK electricity networks increase. Gas to power heat sources in homes and businesses is being phased out, replaced by electrically powered heat pumps (ground, air and water sourced). Gas for cooking is also being phased out, with reliance on electrical hobs and ovens.

- 4.23
- The UK Government has also set out a strategy to decarbonise road transport by announcing that sales of all new petrol and diesel cars and vans is to end in 2030, with motor manufactures only being allowed to sell fully electric vehicles (EV) across their range. EV charging is therefore a necessity for future developments and allowance for these from both a local and national level increases pressure on the electricity networks.

- 4.24
- The ability to source electrical capacity on the UK networks is becoming ever more challenging with high costs and long lead-in times. AECOM have recently applied for a 20MVA electrical connection (a similar electrical load to the estimate for the SGF masterplan) with SSEN for a development in Buckinghamshire. The Connection Offers that have been received have quoted a delivery time for this supply in excess of 8 years.

- 4.25
- While this lead-in time may be excessive and driven in part by the slightly remote location of this particular scheme, it does reinforce the need to continue engagement with UKPN for the SGF project and seek to develop a masterplan from which robust electrical demand estimates can be determined so that an electrical supply can be secured within the programme for development.

5. Potable Water

Introduction

5.1 The proposed development sites identified to be delivered as part of SGF will require a reliable potable water supply from Thames Water¹⁰ who are the statutory water authority, supplying potable (clean) water to an area of approximately 13,000 square km, extending from Cirencester in the west to Dartford in the east, and from Banbury in the north to Guildford in the south. Thames Water supply approximately 2.6 billion litres of water to around 10 million people and 215,000 businesses every day. They are responsible for the provision of new potable water connections, disconnections and alterations within their network area.

Assessment

5.2 We have undertaken an assessment of the development sites identified within the LDA masterplan (March 2022) to gain an understanding of the anticipated potable water demand that would need to be supplied by Thames Water either through existing capacity on their network, or through strategic reinforcement.

5.3 With the exception of Town Wharf, the LDA masterplan has differing options for the remaining four sites. For ease within this assessment, we have prepared our anticipated potable water demand estimates for the largest option at each site. The LDA masterplan does not include sufficient information for Millmead to estimate potable water loading so this site has been omitted from the assessment. Table 5-1 shows our assessment:

Table 5-1: Estimated Potable Water Demand

Site	Residential	Peak Flow Rate	Commer- cial	Peak Flow Rate	Hotel	Peak Flow Rate	Total Peak Flow Rate
Bedford Wharf	954 flats	8.42 l/s	26,763m²	14.04 l/s	120 rooms	1.25 l/s	23.71 l/s
Woodbridge Meadows	2,151 flats	17.93 l/s	8,464m²	19.70 l/s	N/A	N/A	37.63 l/s
Town Wharf	259 flats	2.16 l/s	10,954m²	2.54 l/s	N/A	N/A	4.70 l/s
Millbrook Car Park	92 flats	0.75 l/s	N/A	N/A	N/A	N/A	0.75 l/s
Millmead	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.

Assessment Assumptions

5.4 We have prepared the above estimates based on the following assumptions:

- Residential units are assigned a potable water demand of 210 l/bedroom for 1-bedroom units and 130 l/bedroom for 2-bedroom units.
- Commercial units have been assigned potable water demands based on previous experience and assumptions. For instance, we may have assumed a worst-case for potable water for a proportion of the commercial, so as to start this exercise.
- The assessment does not consider the potable water capacity which would become available from existing buildings on the development sites as they are decommissioned and demolished.

Engagement with Thames Water

5.5 We have provided our estimated electrical loading assessment to Thames Water and asked that they undertake an assessment and advise on the following points:

- The emerging masterplan and potable water demand loads.
- The available potable water capacity within the Guildford area that these developments might be able to utilise.
- Thames Waters route / timeframe to provision of increased capacity as a result of future developments.

- Thames Waters timeframe for undertaking water modelling for each of the identified sites and confirmation that Thames Water have an up-to-date Flow Monitoring Zone model for Guildford and other internal information required to inform the development modelling.
- Whether Thames Water can provide advice on the potable water capacity which might become available from demolition of existing buildings at the identified development sites, which could offset the estimated demand loads for the new developments.
- Whether Thames Water have future plans for increasing potable water capacity within Guildford and if so, the timeframes for these.

5.6 A copy of the Memo supplied to Thames Water has been included in Appendix G for reference.

Thames Water Capacity Response

5.7 Thames Water has undertaken an initial capacity check on their network based on the information we supplied. They have confirmed that they are unable to confirm the capacity for the full development and will need to carry out modelling to confirm whether reinforcement of their network is necessary to deliver the capacity required.

5.8 They have confirmed that they are able to supply the first 50 residential properties or commercial equivalent across all development areas (Bedford Wharf, Woodbridge Meadows, Town Wharf (east of the River Wey), Millbrook Car Park and Millmead). These sites need to be considered collectively as they are all with a single District Metered Area and Flow Monitoring Zone.

5.9 Thames Water currently has a model available for this District Metered Area and Flow Monitoring Zone which they would need to use as a basis for their modelling assessment for the developments.

5.10 Thames Water has also confirmed that they are able to supply the first 50 residential properties or commercial equivalent in development area Town Wharf (west of the River Wey). This site is considered separately to the other sites as it lies within in a separate District Metered Area and Flow Monitoring Zone.

5.11 Thames Water does not currently have a model available for this District Metered Area and Flow Monitoring Zone and therefore this would need to be prepared and calibrated. They have asked that it is noted that this model would also need to take into account a separate development enquiry for Guildford Car Park (25 houses and 219 flats) which is in the same District Metered Area.

5.12 Thames Water has stated that the peak water flows for residential that we have provided are broadly in line with what they would calculate. They consider our commercial estimates may be on the higher side, though given the high-level nature of the SGF masterplan at the time we do not consider this an issue and the estimates will be refined when further development of the masterplan is available.

5.13 Thames Water has further advised that existing properties in the development sites would appear to be mostly industrial / commercial type buildings so their demolition would make available peak flows for similar types of use. However, residential use has a different peak demand profile and given the scale of this type of development, it is anticipated to be the dominant demand in terms of network capacity.

5.14 At this time, where Thames Water has received enquiries for other development sites in the Guildford area and have carried out modelling studies, they have not resulted in a requirement to reinforce their network.

5.15 A copy of the Thames Water Capacity Report is included in Appendix H for reference.

Thames Water Network Modelling

5.16 The modelling that Thames Water need to undertake can be secured through two financial routes.

6. If a development has secured outline or full planning permission and the applicant can prove landownership, then Thames Water will undertake the modelling at their cost.

7. If however, either or both of these conditions cannot be met, then Thames Water require the applicant to share the risk of the scheme not progressing by underwriting the costs of the modelling.

¹⁰ <https://www.thameswater.co.uk/about-us>

For each development that modelling is requested, they will require the applicant to cover a cost of £11,000 (plus vat)¹¹ through an Underwriting Agreement. These costs are not payable upfront and are only payable should first occupancy for the site not happening within five years of the date of the Underwriting Agreement.

In modelling each site individually, they would need to consider the cumulative demands for any local or strategic network reinforcement.

- 5.17 The outcome of the modelling will inform whether potable water capacity for a particular development site is available in their existing network or whether reinforcement will be required. Thames Water estimate that they will require 6-months to undertake the modelling.
- 5.18 Should the modelling confirm that reinforcement is required then Thames Water will design and build the necessary improvements. The design phase is estimated to take 6-months, with a further 6-months to build, though this is subject to the extent of the reinforcement works the modelling may identify.
- 5.19 A copy of the Thames Water Underwriting Agreement is included in Appendix H for reference.

Challenges and Risks Associated with Potable Water Supply

- 5.20 As noted above, Thames Water does not currently have a District Metered Area and Flow Monitoring Zone model for the Town Wharf (west of the River Wey) site. This model is required to inform network modelling for the site to confirm capacity within the network. No details on when this model may be required, or whether it is currently within their plans to build one have been given, however on a separate project we are currently supporting Thames Water need to build this model and it has delayed the start of the network modelling by approximately 8-months.
- 5.21 We understand that District Metered Area and Flow Monitoring Zone models are only valid for a set amount of time and then they have to be re-built. There is a risk that the existing model for the Bedford Wharf, Woodbridge Meadows, etc, will expire in validity before the proposed SGF development sites are ready to request Thames Water modelling and therefore there could be delays while a new District Metered Area and Flow Monitoring Zone model is prepared.
- 5.22 In early 2021 we submitted a Pre-Planning Enquiry to Thames Water based on the previous Guildford Economic Regeneration Project masterplan. The Thames Water response to the enquiry was that they would need to undertake a capacity check on their networks and could only confirm a partially supply to the development plots as detailed below:
- The first 50 residential properties or commercial equivalent across the Woodbridge Meadows, Walnut Tree Close, Bedford Wharf, North Street, Town Wharf, Millmead car park, Millmead GBC and Plaza sites;
 - The first 50 residential properties at Woodbridge Road site;
 - The first 50 residential properties across the Debenhams and Guildford Park Road sites;
 - The first 50 residential properties at Bright Hill site.
- 5.23 The re-engagement with Thames Water has shown that this situation has not changed.
- 5.24 Thames Water previously acknowledged that their existing potable water pipes may require diverting within or adjacent to the development opportunity sites to facilitate the masterplan proposals. Charges will be levied for this work in line with their charging arrangements, current at the time of application.

¹¹ This is the current underwriting cost and Thames Water could change this cost in the future.

6. Telecommunications

6.1 We previously reported that the default provision for new developments is a full fibre solution. This statement was based on a mixture of technical and political factors, summarised in the following key findings:

- Broadband technologies are continually evolving to meet the ever-increasing user demands for performance. Traditional copper and hybrid fibre / copper solutions are no longer fit for purpose to meet these needs, as such Full Fibre solutions are the only viable means to achieve this.
- Government realises the importance of good digital connectivity to meet their ambition of having in place a world class digital infrastructure that would support current and future transport, business and lifestyle needs. To facilitate this ambition, Government initiatives and investment are available to assist in the rollout and delivery of full fibre networks.

Openreach

6.2 Openreach¹² operates and maintains the UK's digital network which allows over 650 communication providers to sell phone and broadband services to households and businesses. Their network includes ducts, chambers and cabinet infrastructure, together with telephone exchanges, and other items of key telecommunication infrastructure.

6.3 For residential developments exceeding 20 properties or commercial only sites exceeding 20 units, Openreach will currently install full Fibre to the Premises (FTTP) free of charge, including any reinforcement of their network that this will require.

6.4 For mixed use developments, such as SGF, where there are developments with residential units exceeding 20 properties, but possibly less than 20 commercial units, Openreach will likely still install FTTP for free, but discussions would be required to confirm once the design has reached a more developed stage.

6.5 This technology currently supports speeds up to 1Gbps. Openreach will likely require wayleave agreements to allow them to access and maintain their equipment on private land, such as blocks of flats where the tenant is not the landowner.

6.6 Some commercial sites may require a more resilient fibre connection to maintain connection in the event of a failure in the Openreach network¹³. Openreach offer two resilient options for commercial customers depending on their individual requirements. These options will be discussed and priced with individual developers once the design has reached a more developed stage.

Enterprise M3 Digital Fibre Project

6.7 Enterprise M3 Local Enterprise Partnership (EM3)¹⁴ are continuing to develop a project to “*deliver gigabit-capable broadband for business and communities across Surrey and Hampshire*”. Private sector firms have are currently being invited to express their interest in bidding for the work to deliver this project.

6.8 The proposal is for new “*infrastructure, which will initially run from Basingstoke to Guildford taking in Hook, Camberley, Aldershot, Farnborough, and Farnham, involves laying new cables to provide a step change in the speed and reliability of digital communications matching levels available in major urban areas*”.

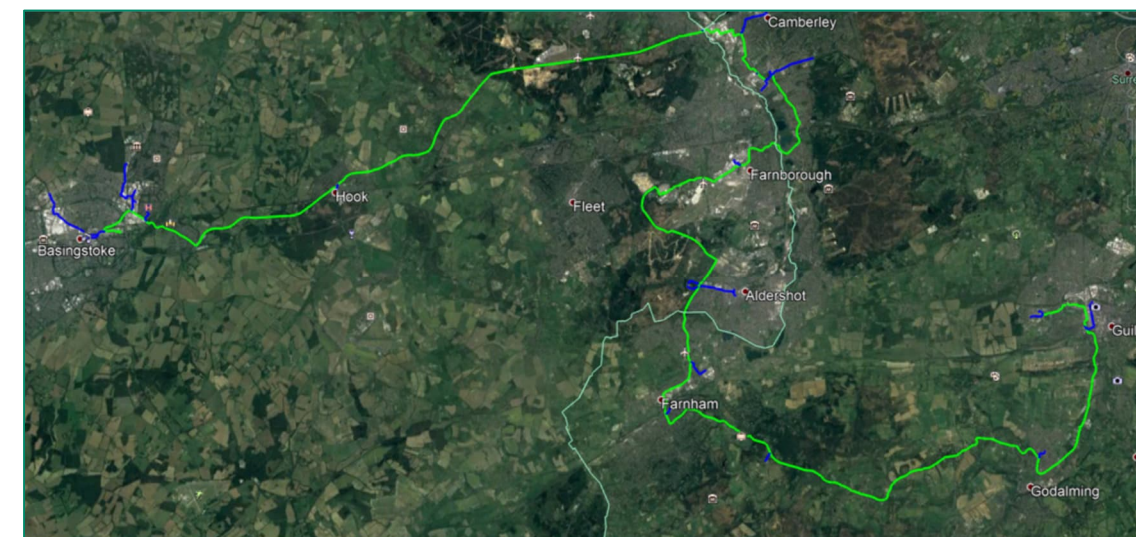


Figure 6-1: EM3 Digital Fibre Project, the Proposed Route

6.9 It is understood that this scheme is to provide gigabit-capable broadband to towns and villages between Basingstoke and Guildford, and therefore it is unclear whether this scheme will bring any significant benefit to the sites within the SGF masterplan who should be able to receive speeds up to 1Gbps from an Openreach FTTP service.

¹² <https://www.openreach.com/>

¹³ <https://www.openreach.co.uk/cpportal/products/ethernet/resilience>

¹⁴ <https://inbound.enterprisem3growthhub.co.uk/fibre>

7. Town Wharf Existing Utilities

- 7.1 The SGF masterplan layout at Town Wharf also considers a diversion of the existing A281 Millbrook Road to cross the River Wey south of the Town Wharf.
- 7.2 The stopped-up section of road includes a number of utilities. From a Statutory Undertakers asset search undertaken in December 2020, it is understood the following Statutory Undertakers have existing utilities in either the stopped-up section of A281 Millbrook Road or Friary Street:
- Openreach telecommunication infrastructure (cables, ducts, pits and cabinets). Both in the A281 Millbrook Road and Friary Street.
 - Southern Gas Networks. Both in the A281 Millbrook Road and Friary Street.
 - SSE Telecoms in Friary Street.
 - Thames Water:
 - A 225mmØ surface water sewer in the A281 Millbrook Road.
 - A 825mmØ foul water sewer in the A281 Millbrook Road.
 - 2No. potable water trunk mains in the A281 Millbrook Road and distribution mains in Friary Street.
 - UKPN high and low voltage electricity cables in Friary Street. Some low voltage in A281 Millbrook Road.
 - Virgin Media telecommunication infrastructure in Friary Street.
 - Vodafone telecommunication infrastructure in A281 Millbrook Road and Friary Street.
- 7.3 While the majority of utilities can be diverted to allow for new developments, the Thames Water 825mmØ foul water sewer in the A281 Millbrook Road is a strategic asset conveying a large catchment of foul water from the east and southeast area of Guildford. This is not an asset which is easily diverted or built over. Bespoke discussions would be required with Thames Water on the feasibility of a diversion, or a build-over agreement and we would anticipate that the costs and / or agreement obligations would be a significant challenge to the SGF masterplan. There is no guarantee that Thames Water would even agree to either approach. Figure 7-1 shows the Town Wharf masterplan with the existing foul sewer approximate alignment shown.



Figure 7-1: LDA Town Wharf Option with Existing Foul Sewer Alignment

- 7.4 It should be noted that the existing Friary Court building currently spans across the existing Thames Water 825mmØ foul water sewer in the A281 Millbrook Road.
- 7.5 Should the masterplan be revised so proposed buildings avoid the sewer, we would anticipate that Thames Water would expect an easement from the centreline of the pipe to any new buildings. These easements can range from 3m to 10m, though 5m is a reasonable starting point. At this time, a topographical survey or buried utility survey has not been undertaken and therefore we cannot plot the exact line of the sewer.
- 7.6 We have discussed this issue with LDA who have proposed amending the Town Wharf layout to cut the ground floor footprint outside any easement to the existing sewer and spanning the upper floors over the sewer easement extents (see Figure 7-2).

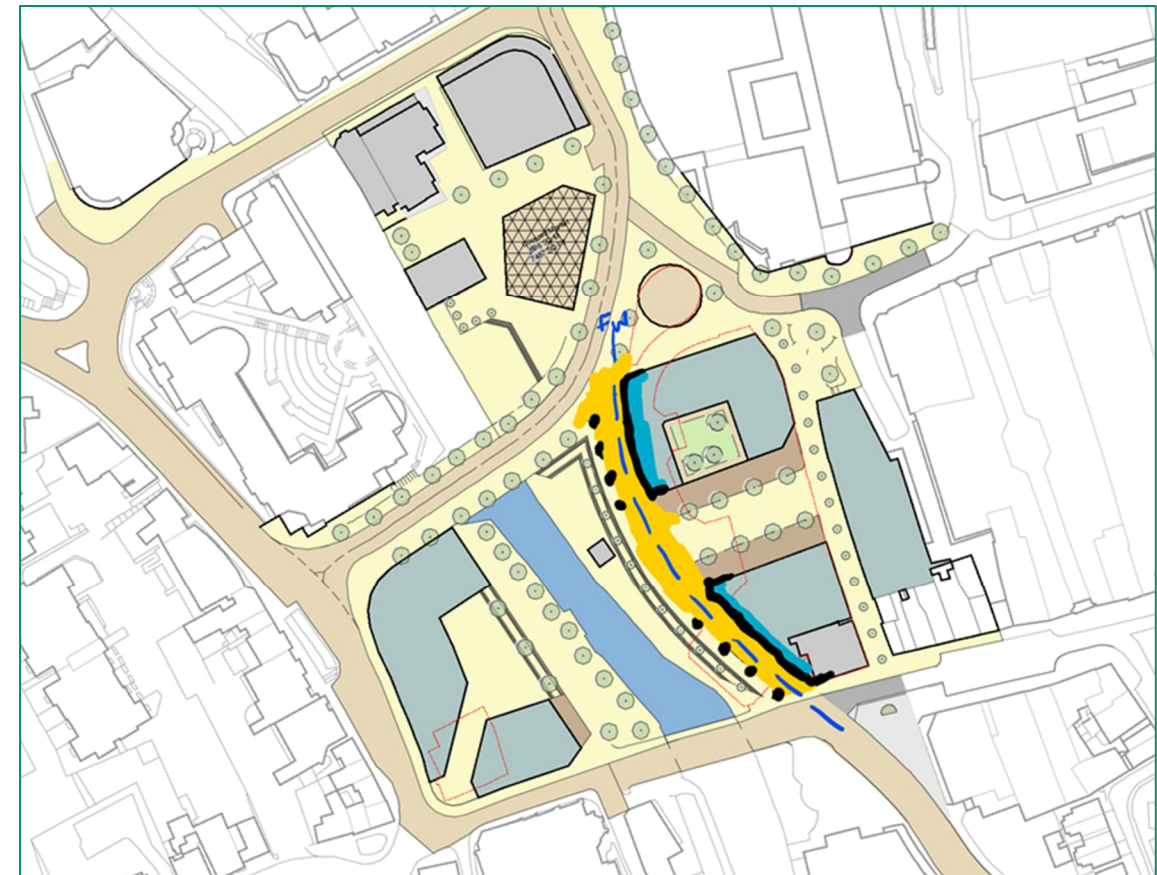


Figure 7-2: LDA Potential Revised Town Wharf Layout

- 7.7 Based on the existing Friary Court arrangement, this is a feasible option, though subject to Thames Water agreement as they would be new buildings. Thames Water will likely expect a building over agreement to be entered into which will give them rights to access and maintain their asset, including the right to remove any obstruction should it be necessary, which can be as extreme as demolition of the above building.
- 7.8 As modern trenchless techniques have developed, excavation to maintain a sewer is more a last resort these days, but the risk will always remain. Our initial assumption would be for the new building masterplan to include headroom over the sewer which at least matches the existing headroom of the Friary Court building as a starting point (see Figure 7-3), with a risk that Thames Water could require an enhanced solution (such as further headroom) once any detailed discussion commences.

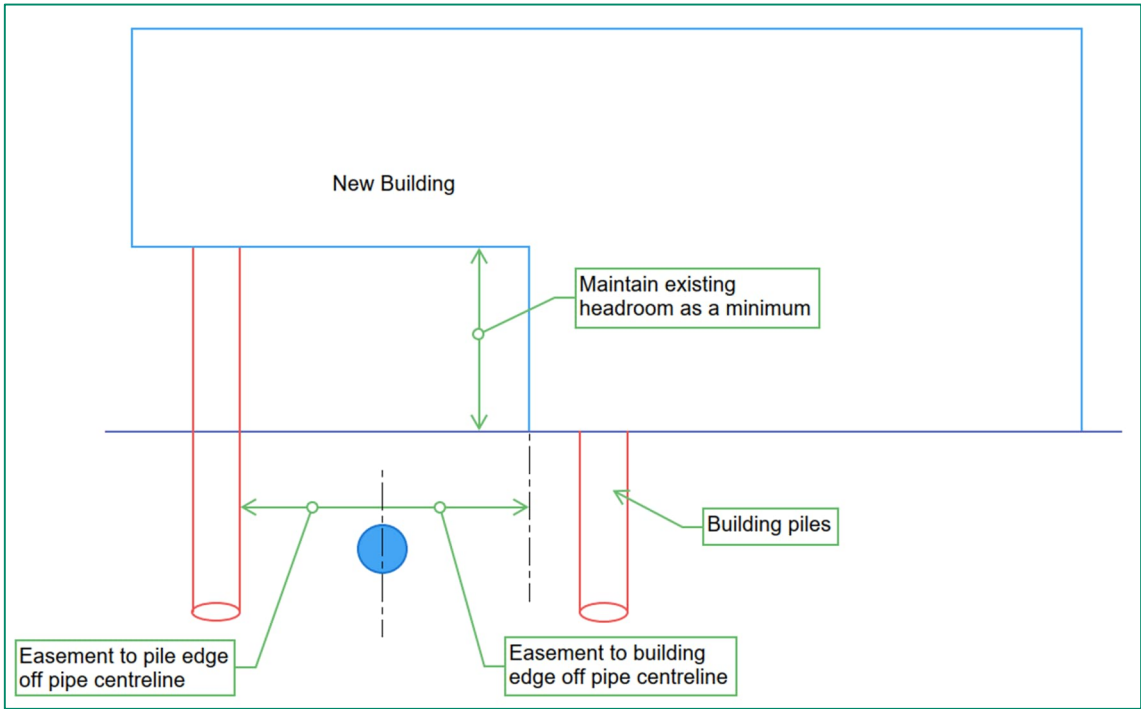


Figure 7-3: Building Cross Section

8. Conclusion and Next Steps

- 8.1 This report provides an analysis relating to the following areas of infrastructure, which will influence further development of the emerging masterplan:
- Sustainable Drainage Systems, including Surface Water Pollution Control and Surface Water Overland Flood Routes.
 - Electricity.
 - Potable Water.
 - Telecommunications.
- 8.2 In relation to the first two items, this analysis provides advice regarding the spatial areas which may need to be allowed for, or safeguarded, within the emerging masterplan development sites to ensure the inclusion of critical infrastructure elements, such as surface water attenuation features and electrical transformer rooms / equipment.

Sustainable Drainage Systems

- 8.3 This report has undertaken an analysis of the SGF proposed development sites regarding the anticipated surface water attenuation volume which each site will need to accommodate. The analysis has undertaken sensitivity testing, both in terms of the Climate Change factor used and the available roof space for roof-based attenuation features to be included.
- 8.4 The results of this analysis have been presented in this report for the SGF Architect to reference when developing the proposals further to ensure that sufficient space is allowed for at each site to integrate a range of SuDS features to manage surface water runoff by controlling the surface water discharge rate, volume and water quality. These features will also help control pluvial flood risk from the proposed developments, promote habitat, amenity and biodiversity within the sites, and provide pollution mitigation.
- 8.5 The management and control of surface water pollution will need to be considered as the SGF proposed development sites are considered further, with the use of a range of SuDS features to actively ensure the quality of water being discharged from the sites.
- 8.6 Consideration of overland flood routes will also need to be considered given the topography of Guildford. A detailed pluvial modelling exercise would need to be commissioned to inform the required volume of overland flood storage and the masterplan would have to be developed to either accommodate and control the predicted overland flood volumes, or new mitigation measures considered in the wider Guildford area to manage these events outside the development sites.

Next Steps

- 8.7 We advise the following next steps are considered in relation to surface water management.
- The SGF emerging masterplan development sites should continue to be developed, taking consideration of the anticipated surface water attenuation volume requirements estimated in this report and seek to identify the likely roof areas available for roof-based attenuation and safeguard areas within the development plots for ground-based SuDS features.
 - Once the next revision of the SGF masterplan is ready for review, we can re-run our surface water attenuation volume calculations for each of the proposed development sites to start refining the volume of attenuation and types of SuDS features to be proposed.
 - Within the above assessment, the management and control of surface water pollution will also start to be developed as the extent and range of SuDS features is determined.
 - Consideration of overland flood routes should also be considered in greater detail to better understand the potential impact these may have on the development sites and mitigation measures available.
 - Continue to engage with the LLFA regarding the surface water strategy for SGF.

Electricity

- 8.8 This report has undertaken an analysis of the SGF proposed development sites regarding the anticipated electrical loads that would need to be supplied by UKPN either through existing capacity on their network, or through strategic reinforcement.

- 8.9 This report has shown that the four development sites with sufficient information to estimate loadings (Bedford Wharf, Woodbridge Meadows, Town Wharf and Millbrook Car Park) are anticipated to require approximately 21.47MVA.
- 8.10 This electrical demand exceeds the available capacity on the UKPN Guildford Grid, which we have been informed by UKPN is currently approximately 5MVA, with capacity back at their West Weybridge Grid Supply Point currently at 30-35MVA however, portions of this capacity is being requested by other developments and therefore the available capacity will continue to reduce.
- 8.11 The discussions with UKPN has identified that it is a possibility that a new Primary substation may be required within Guildford. Land identification and purchase for this substation would not be undertaken by UKPN.
- 8.12 This report has undertaken an analysis of the anticipated number of substation enclosures which should be allowed for at each development site and the options and sizes of these facilities. Consideration of these will need to be included within the next iteration of the emerging masterplan by the SGF Architect.

Next Steps

- 8.13 We advise the following next steps are considered in relation to electrical demand.
- The SGF emerging masterplan development sites should continue to be developed, providing more clarity on the usage of each development building.
 - Once the next revision of the SGF masterplan is ready for review, we can re-run our electrical demand calculations for each of the proposed development sites to start refining the anticipated electrical demand required.
 - Continue to engage with UKPN regarding electrical capacity availability. Connection applications can be made to UKPN on a site-by-site basis to receive formal Connection Offers from UKPN. A Connection Offer will provide clarity from UKPN on the costs and timescales with supply of electricity to each development plot however, these offers typically have a 90-day validity period and should a Connection Offer be accepted, then construction would likely need to commence within 12-months. The current SGF programme is likely to far in the future for a Connection Offer to be particularly valid.

Potable Water

- 8.14 This report has undertaken an analysis of the SGF proposed development sites regarding the anticipated potable water demand that would need to be supplied by Thames Water either through existing capacity on their network, or through strategic reinforcement.
- 8.15 This report has shown that the four development sites with sufficient information to estimate loadings (Bedford Wharf, Woodbridge Meadows, Town Wharf and Millbrook Car Park) are anticipated to require approximately 23.7 l/s, 37.6 l/s, 4.7 l/s and 0.7 l/s respectively.
- 8.16 Following submission of a Pre-Planning Enquiry to Thames Water, they have undertaken an initial capacity check on their network based on the information we supplied. They have confirmed that they are unable to confirm the capacity for the full development and will need to carry out modelling to confirm whether reinforcement of their network is necessary to deliver the capacity required.
- 8.17 The modelling that Thames Water need to undertake can be secured through two financial routes.
1. If a development has secured outline or full planning permission and the applicant can prove landownership, then Thames Water will undertake the modelling at their cost.
 2. If however, either or both of these conditions cannot be met, then Thames Water require the applicant to share the risk of the scheme not progressing by underwriting the costs of the modelling.

For each development that modelling is requested, they will require the applicant to cover a cost of £11,000 (plus vat)¹⁵ through an Underwriting Agreement. These costs are not payable upfront and are only payable should first occupancy for the site not happening within five years of the date of the Underwriting Agreement.

- 8.18 The outcome of the modelling will inform whether potable water capacity for a particular development site is available in their existing network or whether reinforcement will be required. Thames Water estimate that they will require 6-months to undertake the modelling.
- 8.19 Should the modelling confirm that reinforcement is required then Thames Water will design and build the necessary improvements. The design phase is estimated to take 6-months, with a further 6-months to build, though this is subject to the extent of the reinforcement works the modelling may identify.

Next Steps

- 8.20 We advise the following next steps are considered in relation to potable water demand.
- The SGF emerging masterplan development sites should continue to be developed, providing more clarity on the usage of each development building.
 - Once the next revision of the SGF masterplan is ready for review, we can re-run our potable water demand calculations for each of the proposed development sites to start refining the anticipated potable water demand required.
 - Thames Water have stated that any development exceeding 50 units will require modelling to confirm capacity. As the SGF development sites do not currently have planning permission and the land is predominately not in Guildford ownership, Thames Water will require the costs of the modelling to be underwritten. In addition, should first occupation not be achieved within 5-years, the underwriting costs are likely to be payable. Therefore, we advise that the modelling works are not commissioned until such time that greater clarity on the deliverability of the proposed development sites is known.

Telecommunications

- 8.21 Openreach will currently install full Fibre to the Premises (FTTP) free of charge for residential developments exceeding 20 properties, or commercial only sites exceeding 20 units, including any reinforcement of their network that this will require.
- 8.22 This technology currently supports speeds up to 1Gbps. Openreach will likely require wayleave agreements to allow them to access and maintain their equipment on private land, such as blocks of flats where the tenant is not the landowner.
- 8.23 Some commercial sites may require a more resilient fibre connection to maintain connection in the event of a failure in the Openreach network. Openreach offer two resilient options for commercial customers depending on their individual requirements. These options will be discussed and priced with individual developers once the design has reached a more developed stage.

Next Steps

- 8.24 We advise the following next steps are considered in relation to telecommunications.
- There are multiple options for developers in relation to high-speed broadband connections. At this stage there is little benefit in progressing with telecommunications, this can be re-considered once greater certainty on the proposed development sites is known.

¹⁵ This is the current underwriting cost and Thames Water could change this cost in the future.

Appendix A

A.1 Leonard Design Architects, Guildford Masterplan Areas Summary

Guildford Masterplan

Areas Summary

Millbrook & Millmead

Millbrook Car Park - Capacities

OPTION A - SINGLE DECK
244 Public parking spaces
30 Residents parking spaces
88 Apartments

149 Units/Hectare
6,750 m² GEA

OPTION B - 2 DECKS
300 Public parking spaces
40 Residents parking spaces
92 Apartments

156 Units/Hectare
7,680 m² GEA

OPTION C - 2 DECKS
300 Public parking spaces
40 Residents parking spaces
87 Apartments

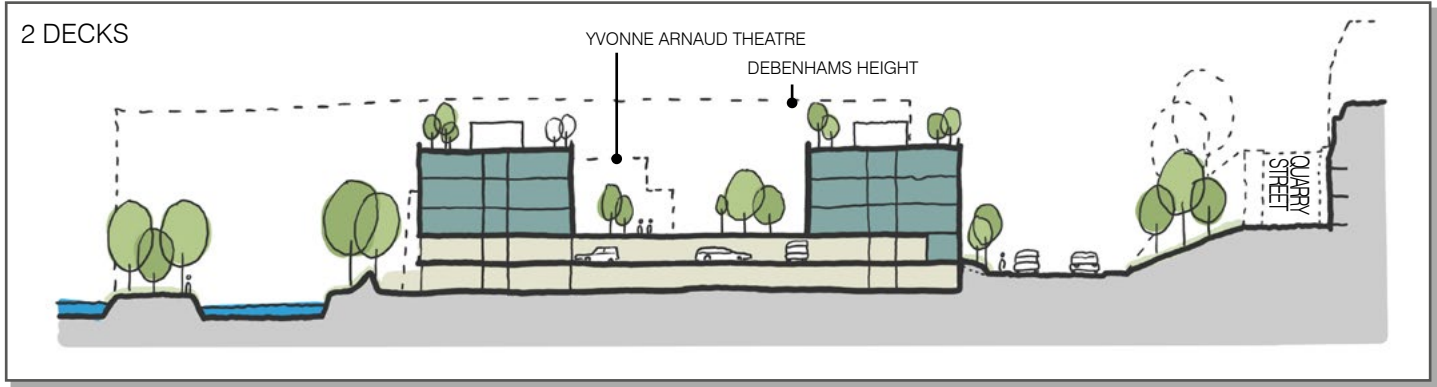
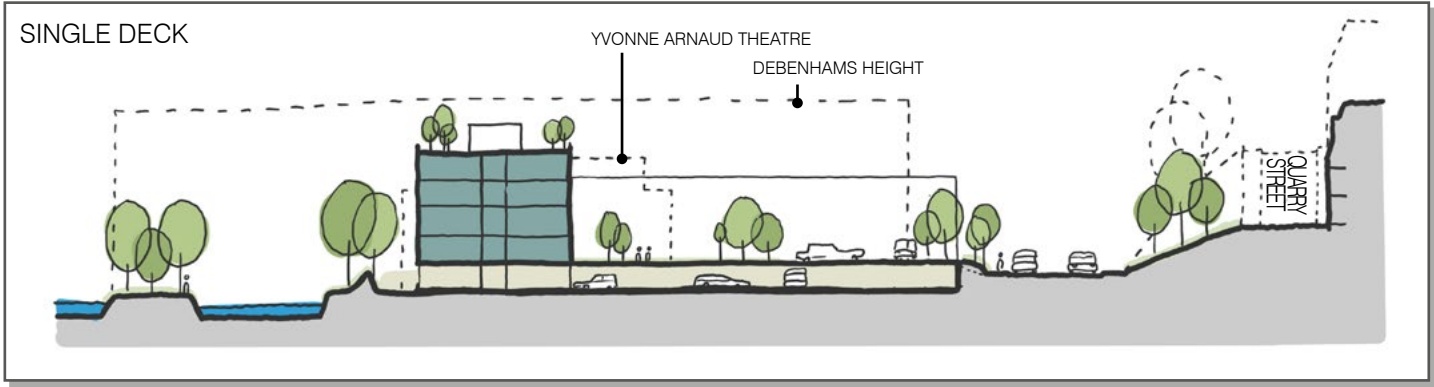
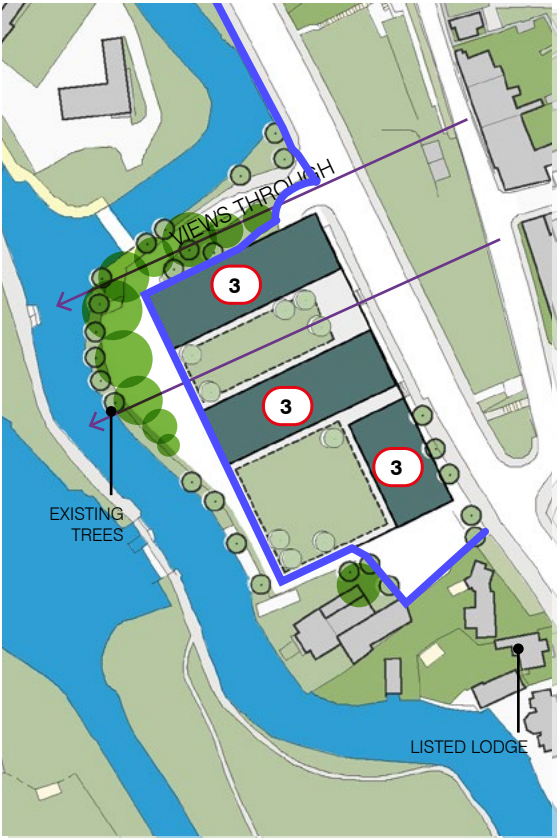
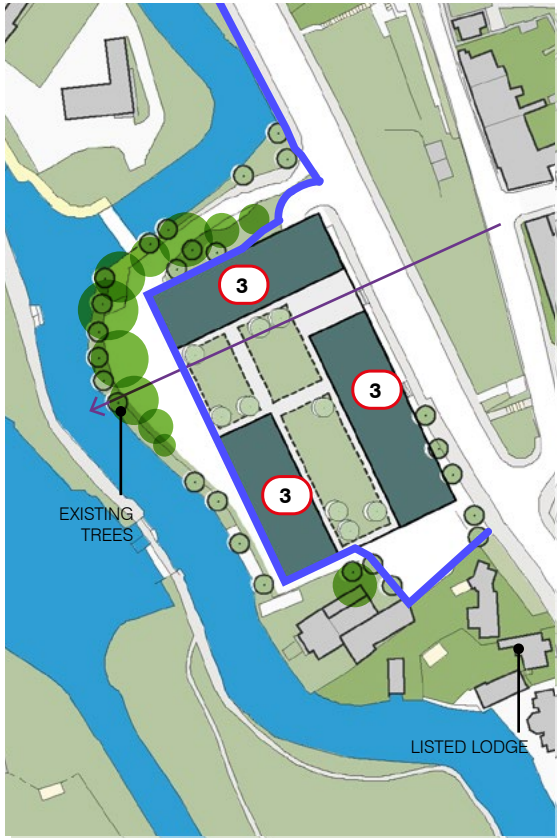
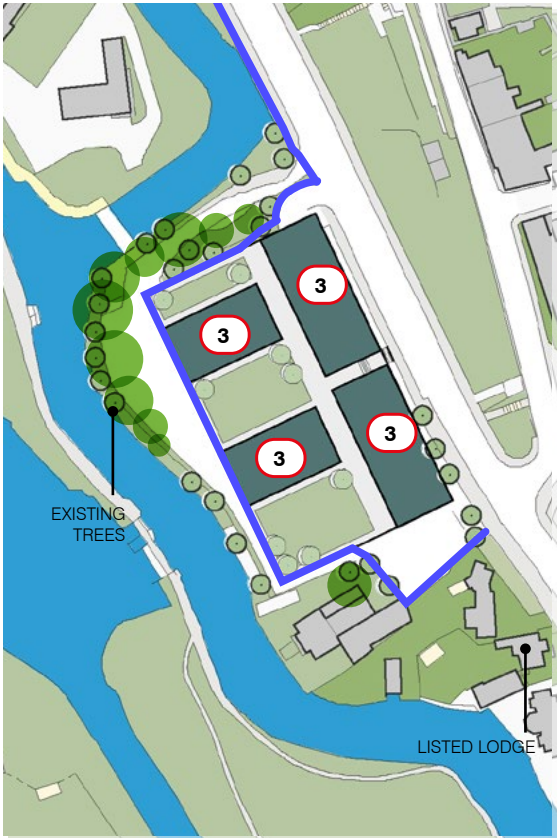
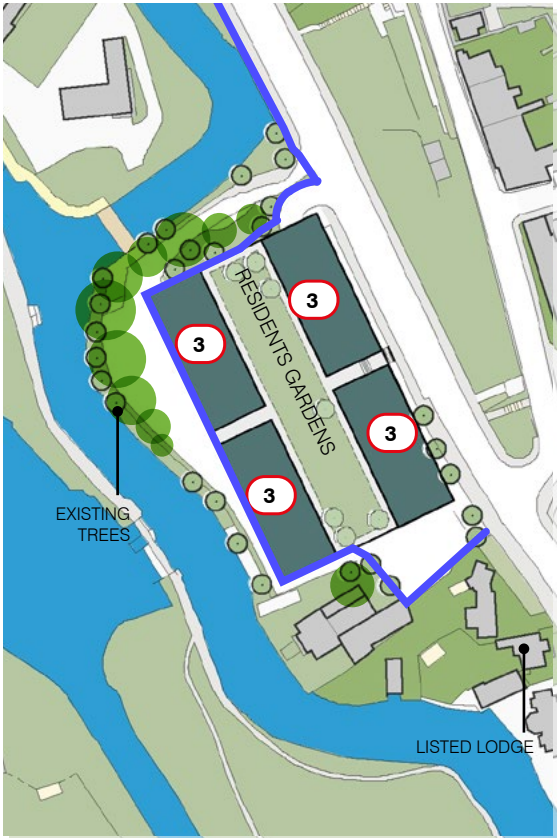
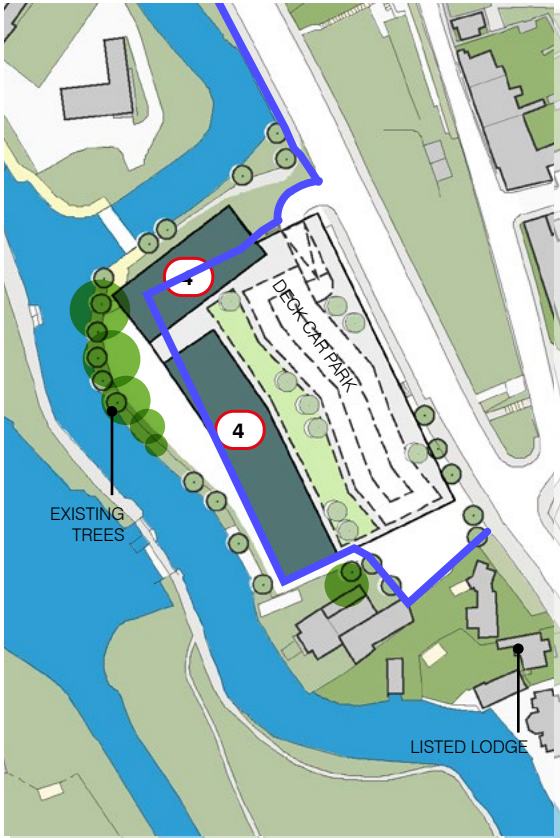
147 Units/Hectare
6,500 m² GEA

OPTION D - 2 DECKS
300 Public parking spaces
40 Residents parking spaces
91 Apartments

154 Units/Hectare
7,000 m² GEA

OPTION E - 2 DECKS
300 Public parking spaces
40 Residents parking spaces
78 Apartments

132 Units/Hectare
6,250 m² GEA



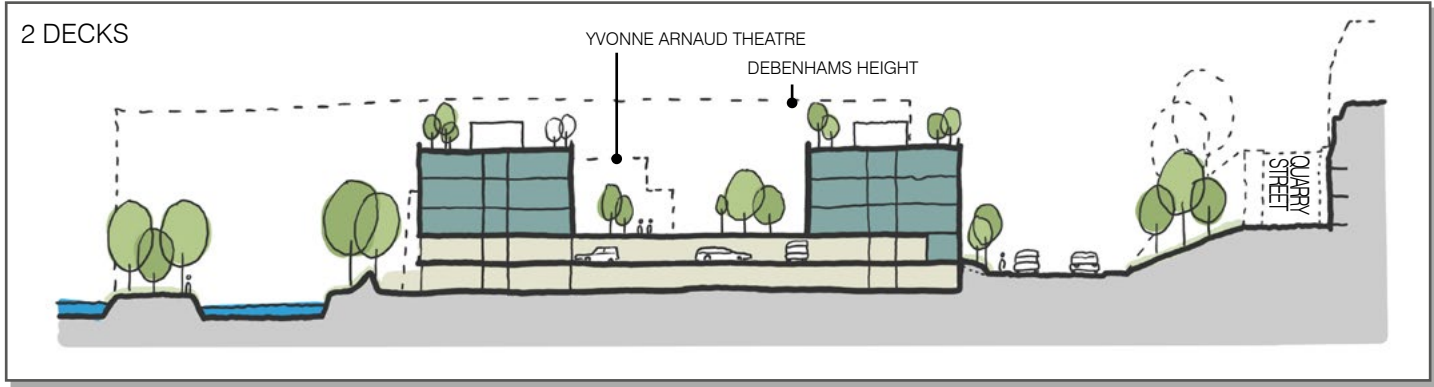
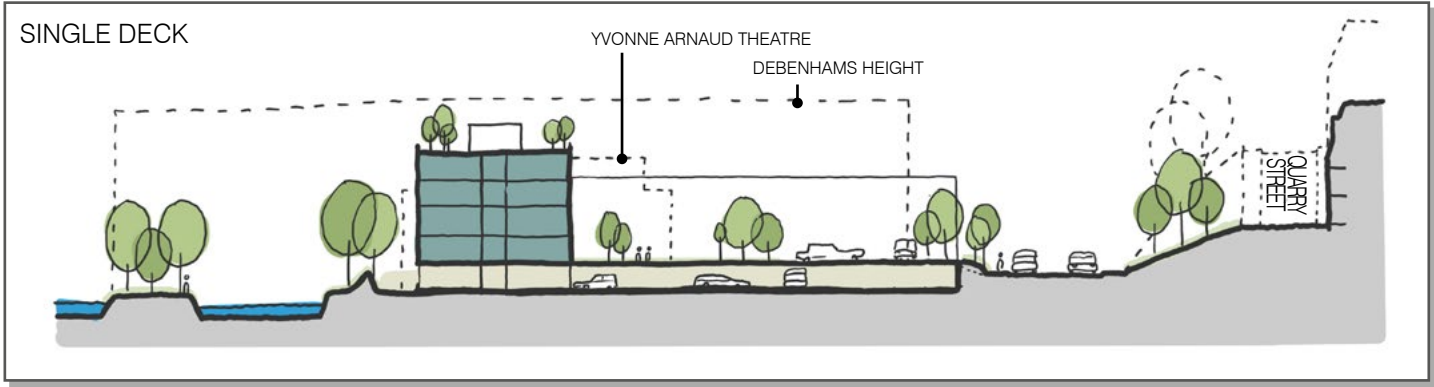
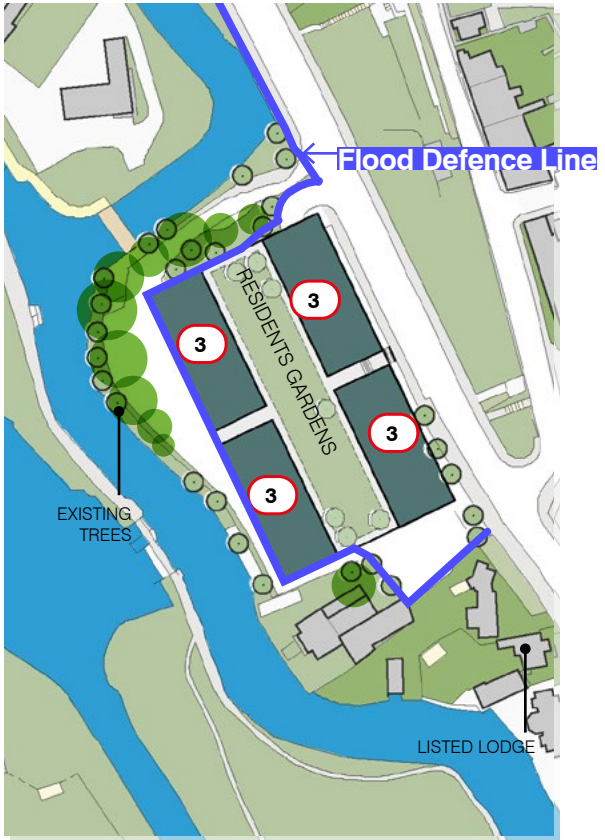
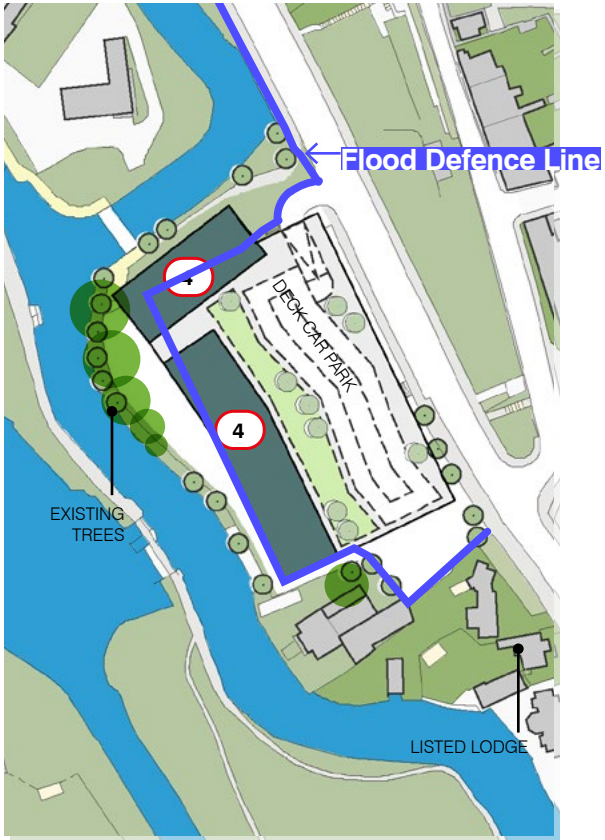
*Approximate unit numbers and areas, subject to planning.

x Number of storeys
Residential

Millbrook Car Park - Areas

OPTION A - SINGLE DECK
4,655m² Deck
1,700m² Resi building footprint
(x4 storeys)
600m² Deck garden

OPTION B - 2 DECKS
4,200m² Per Deck (x2)
2,560m² Resi building footprint
(x3 storeys)
1,120m² Deck garden



**Approximate unit numbers and areas, subject to planning.*

(x) Number of storeys
Residential

Millmead - Areas

REUSE THE EXISTING BUILDING

Refurbish existing building
2,700m² footprint area

LOW RISE TOWNHOMES

3,000m² Building footprint area
2,350m² Soft landscaping
2,150m² Hard Landscaping

OPTION B - UNDERCROFT PARKING

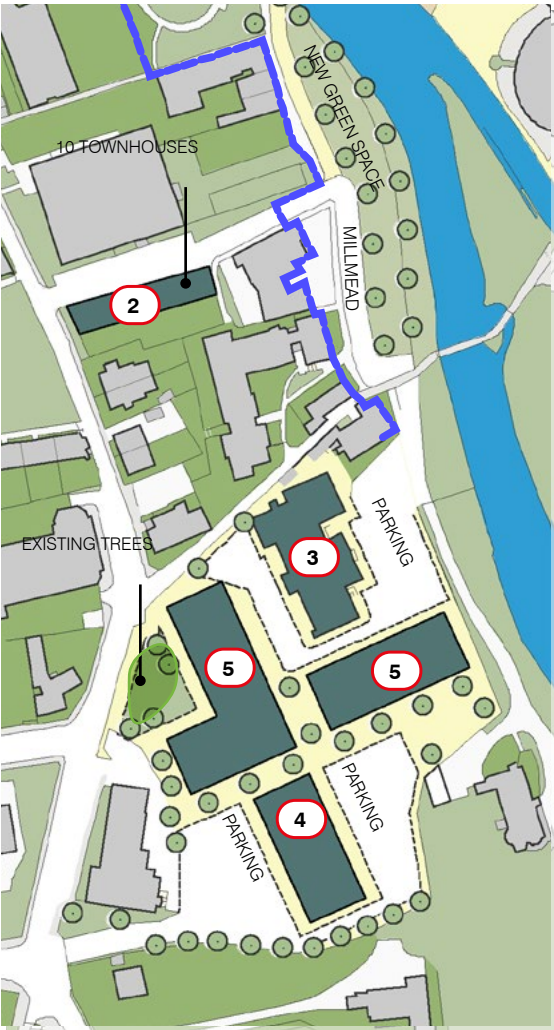
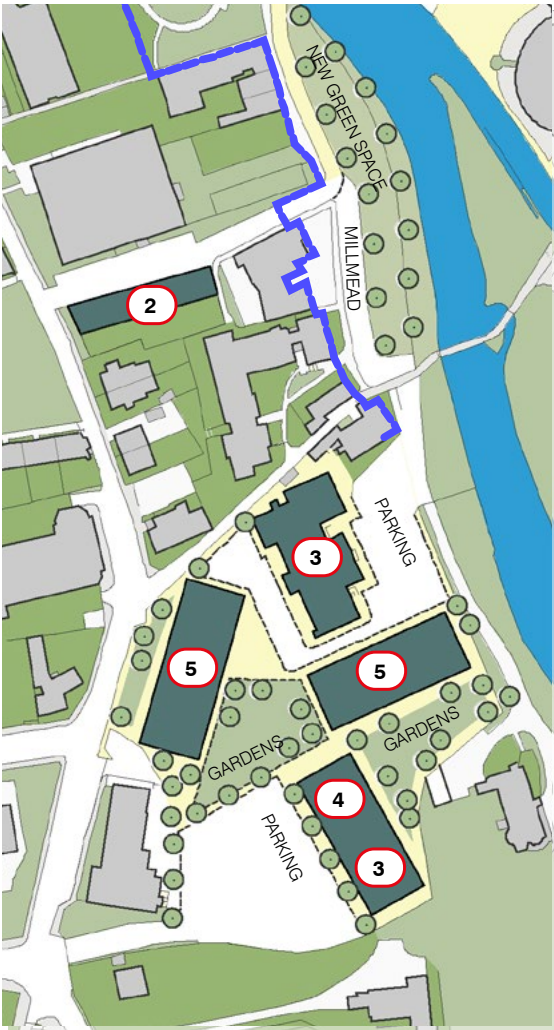
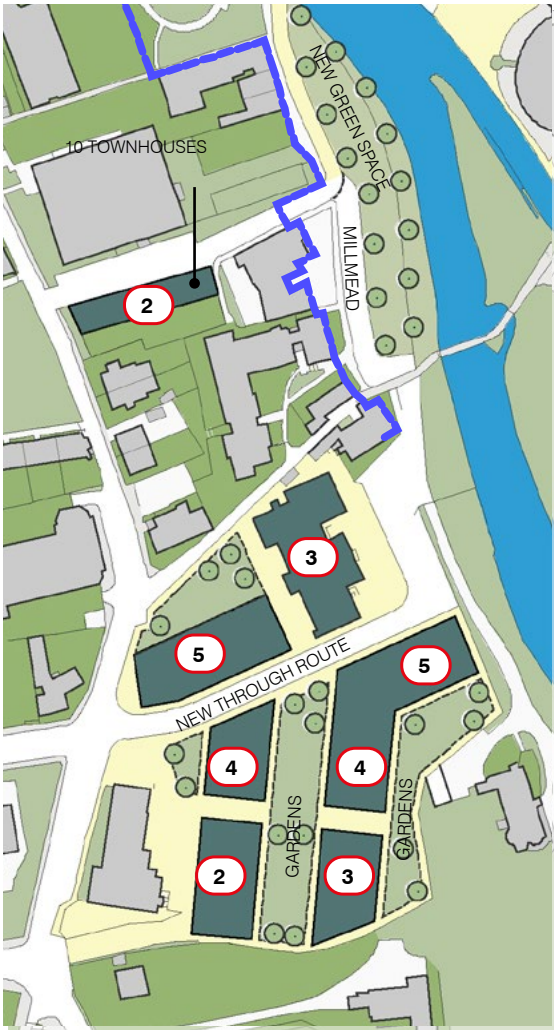
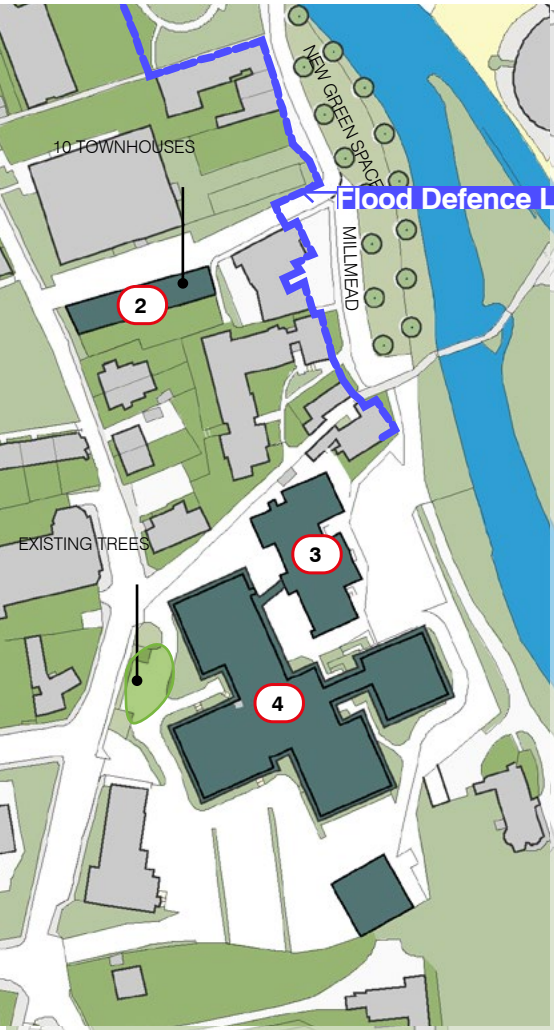
3,550m² Building footprint area
1,800m² Soft landscaping
2,150m² Hard Landscaping

OPTION C

2,650m² Building footprint area
1,400m² Soft landscaping
2,350m² Hard Landscaping

OPTION D

2,650m² Building footprint area
1,400m² Soft landscaping
2,350m² Hard Landscaping



**Approximate unit numbers and areas, subject to planning.*

(x) Number of storeys
Residential

Town Wharf

Little 'C' - without a new Town Bridge

Portsmouth Road Car Park, L&G site totals:

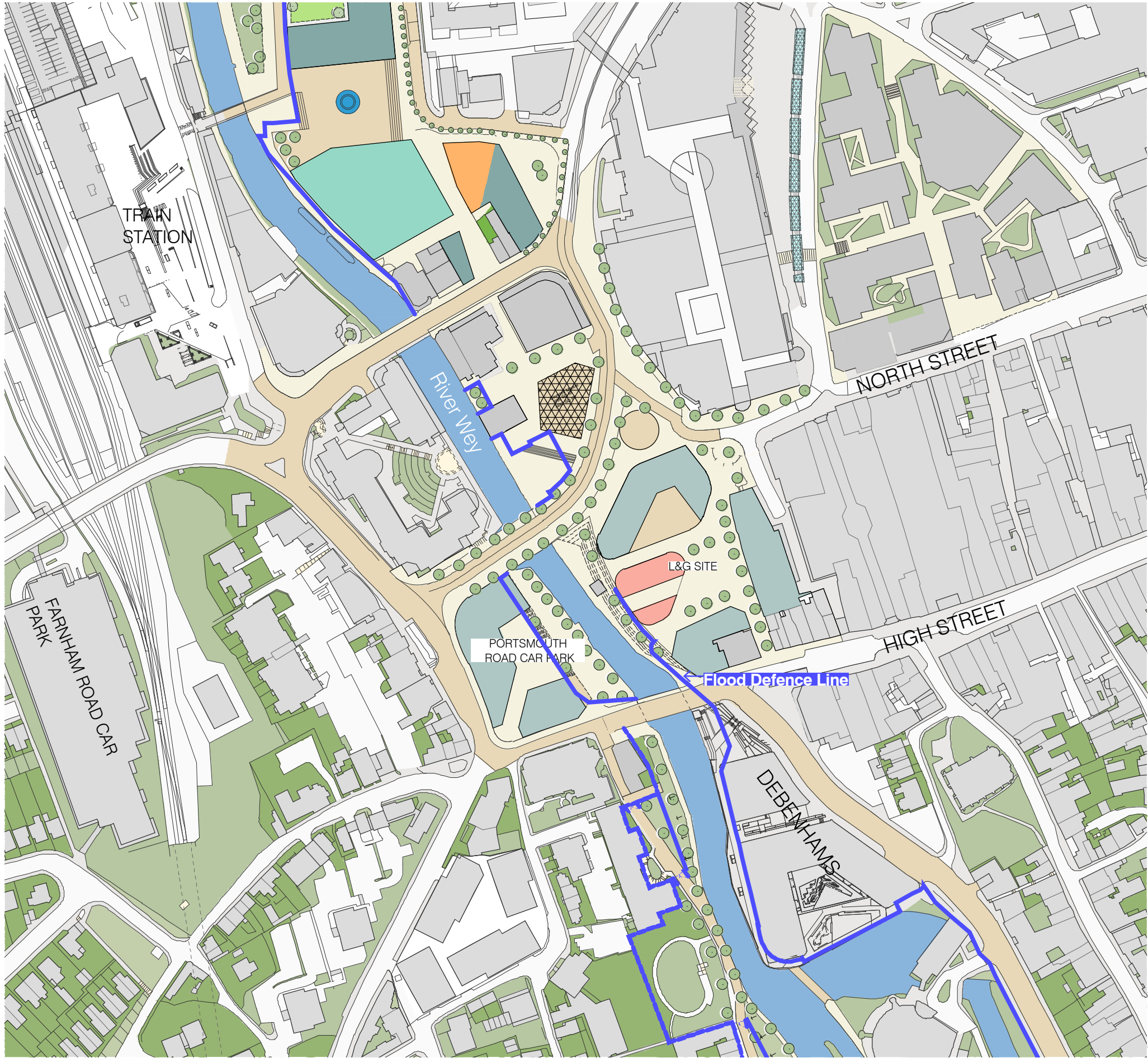
1,500m² Building Footprint
900m² Decked hard landscaping
1,400m² Hard landscaping

L&G (6 & 4 storeys)

4,000m² Building footprint (4-6 storeys)
1,600m² Building refurbishment & extension (4 storeys)
2,000m² Hard civic landscaping

Existing L&G (Demolition)

4,000m² Building footprint (approx.)



Bedford Wharf

Alignment Options

EA Alignment (Left)

16,000m² Building footprint area
(117,050m² Total building floor area)
12,500m² Podium deck area

9,000m² Soft landscaping
16,000m² Hard landscaping
1,650m² Roads

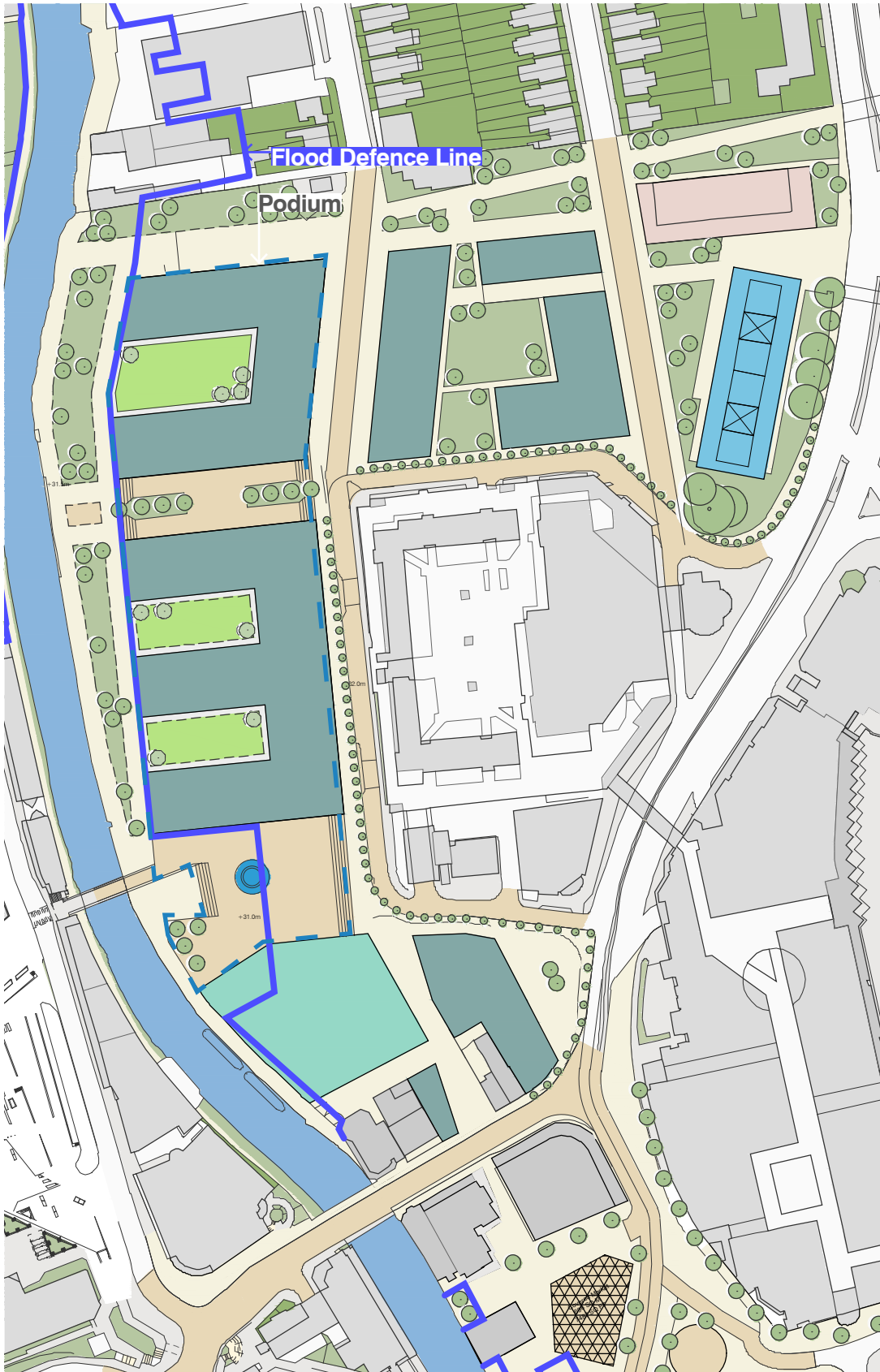
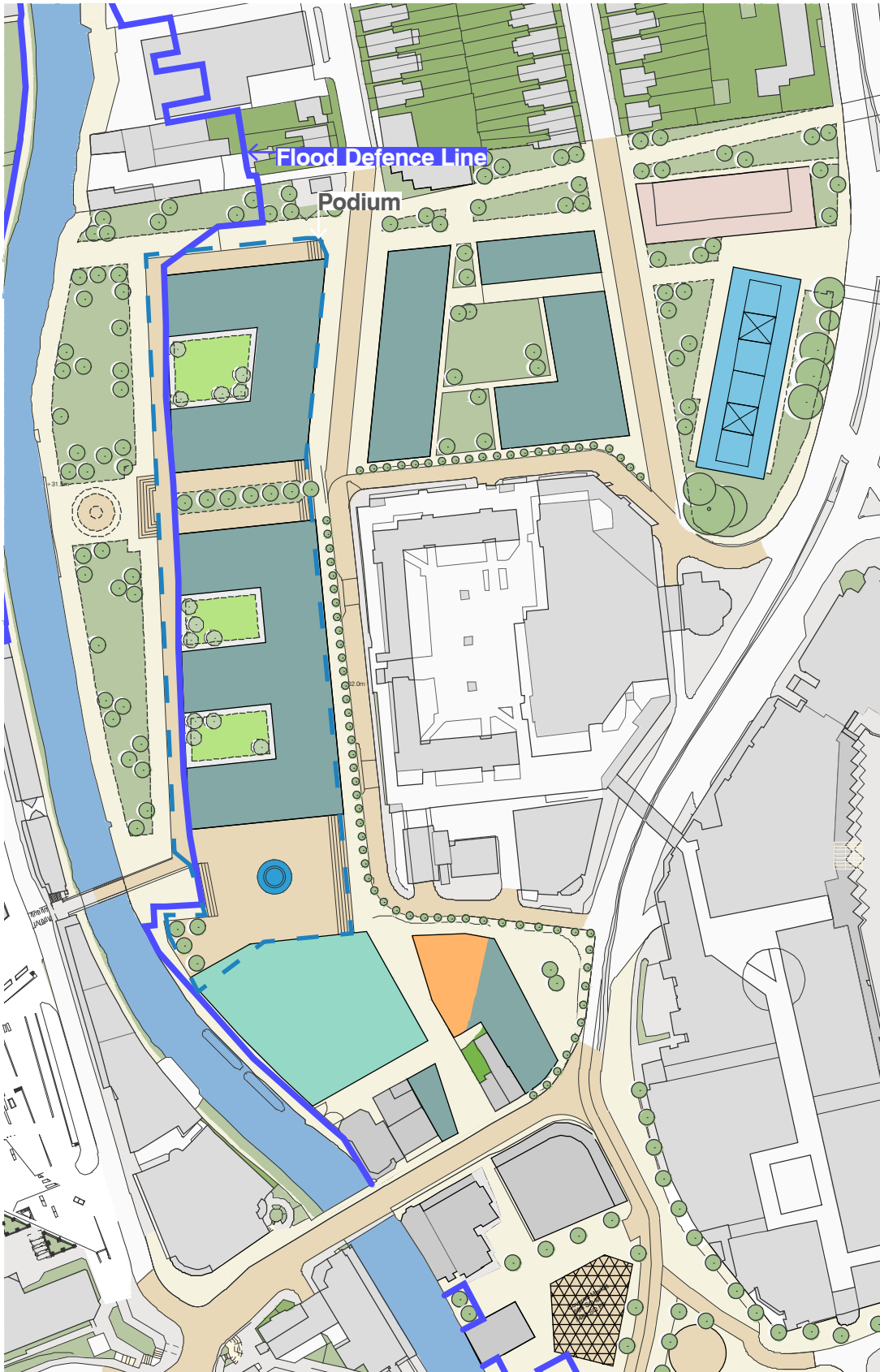
45,000m² Total area

Pushed Alignment (Right)

18,500m² Building footprint area
(125,000m² Total building floor area)
14,000m² Podium deck area

7,400m² Soft landscaping
12,000m² Hard landscaping
1,650m² Roads

45,000m² Total area



Woodbridge Meadows

Phased Development

Phase 1
20,000m² Building footprint area
(152,500m² Total floor area)
18,000m² Soft landscaping
15,000m² Hard landscaping
2,500m² Road to shared surface

Phase 2
25,000m² Building footprint area
(183,000m² Total floor area)
18,500m² Soft landscaping
16,000m² Hard landscaping
2,500m² Road to shared surface



Phase 1 - Porsche, Big Yellow Storage & Travelodge remain

Phase 2

Appendix

Town Wharf

1120 Guildford | Outline unit calculation

leonard design architects

	Block	Commercial			Residential								Total Floors	Parking		Existing L&G	
		Active Ground sqm	Creative Trade sqm	Floors	GEA sqm	NIA 80%	Floors	1 Bed		2 Bed		Total		spaces		Retail / F&B sqm	Office sqm
								1b1p	1b2p	2b2p	2b3p			30%	32		
Council Riverside	PRCP 1	2,594		1	1,319	1,055	4	15	15	22	22	74	5	27	855	6150	1904
	PRCP 2				543	434	2	3	3	5	5	15	2				
	Total				2,594	1,862	1,490	35	54	89							
	L&G West	L&G N		5,217	3	1,257	1,006	3	10	11	16	16	53	6	16	507	6150
L&G S		669		1	669	535	5	9	9	14	14	47	6	14	449		
L&G P1		267		1			0					1					
L&G P2		541		1			0					1					
Total		1,477	5,217		1,926	1,541		40		60		100					
L&G East	Friary St	1,666		1	1,666	1,333	3	14	14	21	21	70	4	21	671	3,884	
	Total	1,666			1,666	1,333		28		42		70					
Total L&G		3,143	5,217		3,592	2,874		67		102		170					
Site Total		5,737 sqm	5,217 sqm	8 Floors	5,454 sqm	4,363 sqm	17 Floors	103 Units	52	78	78	259 Units	25 Floors	78 sqm	2,482 spaces	10,034 sqm	1,904 sqm
		61,752 sqft	56,155 sqft		58,706 sqft	46,965 sqft										108,005 sqft	20,494 sqft
		16,408 Total sqm												Prop. L&G 8,360 Total sqm		Existing L&G 11,938 Total sqm	
		120,459 Total sqft												89,986 Total sqft		-3,578 -38,513	
																128,499 Total sqft	

Bedford Wharf EA Line

1120 Guildford | EA Option

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Block	GEA		No. Floors		NIA		No. Residential Units				Office	Civic	Retail/Community/ F&B	Hotel		Basement				
	Ground Floor sqm	Above Ground sqm	(Ground)	(above Ground)	One Floor 80%	Above Ground sqm	1 Bed		2 Bed		Total	NIA 100%	NIA 100%	NIA 100%	NIA 80%	Keys 40	Car Parking		Cinema	Civic
							1b1p	1b2p	2b2p	2b3p							Number 50%	Area 32		
							39	50	61	70										
							13.5	17.5	32.0	37.0										
One Estate																	107	3,424		
Block 1	3,283	2,444	1	4	1,955	9,462	38	38	57	57	190			1,642			57	1,827		
	*inc. Ground Floor Resi						20%	20%	30%	30%										
Block 2	1,379	1,379	1	6	1,103	6,619	28	28	42	42	140						42	1,348		
	*inc. Ground Floor Resi						20%	20%	30%	30%										
Block 3	1,931	2,167	1	7	1,734	12,135	47	47	71	71	236						71	2,277		
	*inc. Ground Floor Resi						20%	20%	30%	30%										
Block 4	1,124	1,124	1	8								10,116								
Block 5	1,500	1,500	1	4									7,500							
		Total (sqm):		10341	57203															
				67544																
Odeon																				
Block 6	4,625	3,610	1	4	2,888	13,865	48	49	73	73	243			2,313			73	2,336		
		Total (sqm):		4,625	14,440															
				19,065																
Bedford Road Surface Car Park																	68	2,176		
Block 1	2,613	2,246	1	4								5,000		1,797	4,800	120	0	0		
Block 2	985	985	1	4	788	3,152	11	11	17	17	55						17	531		
		Total (sqm):		3,598	12924															
				16,522			161	162	243	245										
Total			18,564 sqm	84,567 sqm	8,468 sqm	45,233 sqm	323 Units		489 Units		864 Units	15,116 sqm	7,500 sqm	5,751 sqm	4,800 sqm	120 keys	435 Spaces	13,919 sqm	0 sqm	0 sqm
			199,821 sqft	910,271 sqft	91,149 sqft	486,886 sqft						162,707 sqft	80,729 sqft	61,903 sqft	51,667 sqft			149,825 sqft	0 sqft	0 sqft
Site Total:			117,050 sqm 1,259,916 sqft														Basement Total:			
																	13,919 sqm 149,825 sqft			

Bedford Wharf LDA Line

1120 Guildford | LDA Option

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Block	GEA		No. Floors		NIA		No. Residential Units				Office	Civic	Retail/Community/ F&B	Hotel		Basement				
	Ground Floor sqm	Above Ground sqm	(Ground)	(above Ground)	One Floor 80%	Above Ground sqm	1 Bed		2 Bed		Total	NIA 100%	NIA 100%	NIA 100%	NIA 80%	Keys 40	Car Parking		Cinema	Civic
							1b1p	1b2p	2b2p	2b3p							Number 50%	Area 32		
							39	50	61	70										
							13.5	17.5	32.0	37.0										
One Estate																	107	3,424		
Block 1	3,482	3,482	1	4	2,786	12,883	49	50	75	75	249			1,741			75	2,403		
	*inc. Ground Floor Resi						20%	20%	30%	30%										
Block 2	1,379	1,379	1	6	1,103	6,619	28	28	42	42	140						42	1,348		
	*inc. Ground Floor Resi						20%	20%	30%	30%										
Block 3	1,931	2,167	1	7	1,734	12,135	47	47	71	71	236						71	2,277		
							20%	20%	30%	30%		10,116								
Block 4	1,124	1,124	1	8																
Block 5	1,500	1,500	1	4									6,000							
		Total (sqm):		10540	61355															
				71895																
Odeon																				
Block 6	4,218	4,218	1	4	3,374	15,607	54	55	82	82	273			2,109			82	2,630		
		Total (sqm):		4,218	16,872															
				21,090																
Bedford Road Surface Car Park																	68	2,176		
Block 1	2,613	2,246	1	4								5,000		1,797	4,800	120	0	0		
Block 2	985	985	1	4	788	3,152	11	11	17	17	55						17	531		
		Total (sqm):		3,598	12924															
				16,522			178	180	270	272										
Total			18,356 sqm	91,151 sqm	9,785 sqm	50,396 sqm	359 Units		543 Units		954 Units	15,116 sqm	6,000 sqm	5,647 sqm	4,800 sqm	120 keys	462 Spaces	14,789 sqm	0 sqm	0 sqm
			197,582 sqft	981,140 sqft	105,323 sqft	542,462 sqft						162,707 sqft	64,583 sqft	60,784 sqft	51,667 sqft		159,189 sqft		0 sqft	0 sqft
	Site Total:		124,296 sqm 1,337,912 sqft													Basement Total:		14,789 sqm 159,189 sqft		

Woodbridge Meadows Phase 1

1120 Guildford | Outline unit calculation

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Block	GEA		No. Floors		Resi						Employment	Car Parking		
	Ground Floor sqm	Above Ground sqm			NIA		Units							
			One Floor 80%	Above Ground sqm	1 Bed		2 Bed		Total					
					1b1p	1b2p	2b2p	2b3p						
							39 13.5	50 17.5	61 32.0	70 37.0				
Porsche														
Block 2	3,941	2,837		6	2,270	13,618	47	48	71	72	238	1,654	71	2,287
							20%	20%	30%	30%				
Block 3	3,211	2,004		6	1,603	9,619	33	34	50	51	168	1,596	50	1,615
							20%	20%	30%	30%				
Block 4	2,493	1,512		6	1,210	7,258	25	25	38	38	127	1,274	38	1,219
							20%	20%	30%	30%				
Block 5	4,400	3,060		9	2,448	22,032	76	77	116	116	385	700	116	3,700
							20%	20%	30%	30%				
Block 6	3,747	2,690		9	2,152	19,368	67	68	102	102	339	494	102	3,253
							20%	20%	30%	30%				
Block 7	3,241	2,378		9	1,902	17,122	59	60	90	90	300	366	90	2,875
							20%	20%	30%	30%				
Block 8	2,811	1,922		9	1,538	13,838	48	48	73	73	242	487	73	2,324
							20%	20%	30%	30%				
Big Yellow Storage														
Total							357	361	542	546		6,571 sqm	540 Spaces	17,273 sqm
	23,844 sqm	16,403 sqm	128,568 sqm	13,122 sqm	102,854 sqm	719 Units	1,087 Units	1,799 Units						
	256,654 sqft	176,560 sqft		1,383,893 sqft	141,248 sqft	1,107,114 sqft						70,732 sqft		185,922 sqft
Site Total	152,412 sqm													
	1,640,548 sqft													

Woodbridge Meadows Phase 2

1120 Guildford | Outline unit calculation

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Block	GEA		No. Floors		Resi							Employment	Car Parking	
	Ground Floor sqm	Above Ground sqm			NIA		Units						NIA 100%	Number 30%
			One Floor 80%	Above Ground sqm	1 Bed		2 Bed		Total					
					1b1p	1b2p	2b2p	2b3p						
							39 13.5	50 17.5	61 32.0	70 37.0				
Block 1	3,282	2,076	6	1,661	9,965	34	35	52	53	174	1,609	52	1,673	
						20%	20%	30%	30%					
Block 2	3,941	2,837	6	2,270	13,618	47	48	71	72	238	1,654	71	2,287	
						20%	20%	30%	30%					
Block 3	3,211	2,004	6	1,603	9,619	33	34	50	51	168	1,596	50	1,615	
						20%	20%	30%	30%					
Block 4	2,493	1,512	6	1,210	7,258	25	25	38	38	127	1,274	38	1,219	
						20%	20%	30%	30%					
Block 5	4,400	3,060	9	2,448	22,032	76	77	116	116	385	700	116	3,700	
						20%	20%	30%	30%					
Block 6	3,747	2,690	9	2,152	19,368	67	68	102	102	339	494	102	3,253	
						20%	20%	30%	30%					
Block 7	3,241	2,378	9	1,902	17,122	59	60	90	90	300	366	90	2,875	
						20%	20%	30%	30%					
Block 8	2,811	1,922	9	1,538	13,838	48	48	73	73	242	487	73	2,324	
						20%	20%	30%	30%					
Block 9	2,008	1,426	9	1,141	10,267	36	36	54	54	180	284	54	1,724	
						20%	20%	30%	30%					
Total						428	433	648	653		8,464 sqm	646 Spaces	20,670 sqm	
	29,134 sqm	19,905 sqm	153,858 sqm	15,924 sqm	123,086 sqm	860 Units	1,302 Units	2,153 Units						
	313,595 sqft	214,255 sqft	1,656,112 sqft	171,404 sqft	1,324,890 sqft						91,101 sqft		222,494 sqft	
Site Total	182,992 sqm													
	1,969,708 sqft													

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Appendix B

B.1 Bedford Wharf – EA Alignment

Table B-1: Bedford Wharf (EA Alignment) Site Breakdown

Location	Building No.	Roof Area (m²)	Residential					Office (NIA m²)	Civic (NIA m²)	Retail (NIA m²)	Hotel		No. Car Parking
			1b1p	1b2p	2b2p	2b3p	Total				(NIA m²)	Keys	
One Estate	#1	2,451	38	38	57	57	190	N/A	N/A	1,642	N/A	N/A	57
	#2	1,379	28	28	42	42	140	N/A	N/A	N/A	N/A	N/A	42
	#3a	545	47	47	71	71	236	N/A	N/A	N/A	N/A	N/A	71
	#3b	1,386											
	#4	1,124	N/A	N/A	N/A	N/A	0	10,116	N/A	N/A	N/A	N/A	N/A
	#5	1,485	N/A	N/A	N/A	N/A	0	N/A	7,500	N/A	N/A	N/A	N/A
Odeon	#6	3,610	48	49	73	73	243	N/A	N/A	2,313	N/A	N/A	73
Bedford Road Surface Car Park	#1	2,614	N/A	N/A	N/A	N/A	0	5,000		1,797	4,800	120	N/A
	#2a	1,179	11	11	17	17	56	N/A	N/A	N/A	N/A	N/A	17
	#2b	193											
TOTAL:		15,966	172	173	260	260	865	15,116	7,500	5,752	4,800	120	260

B.2 Bedford Wharf – LDA Alignment

Table B-2: Bedford Wharf (EA Alignment) Site Breakdown

Location	Building No.	Roof Area (m²)	Residential					Office (NIA m²)	Civic (NIA m²)	Retail (NIA m²)	Hotel		No. Car Parking
			1b1p	1b2p	2b2p	2b3p	Total				(NIA m²)	Keys	
One Estate	#1	3,080	49	50	75	75	249	N/A	N/A	1,741	N/A	N/A	75
	#2	1,379	28	28	42	42	140	N/A	N/A	N/A	N/A	N/A	42
	#3a	545	47	47	71	71	236	N/A	N/A	N/A	N/A	N/A	71
	#3b	1,386											
	#4	1,124	N/A	N/A	N/A	N/A	0	10,116	N/A	N/A	N/A	N/A	
	#5	1,485	N/A	N/A	N/A	N/A	0	N/A	6,000	N/A	N/A	N/A	
Odeon	#6	4,596	54	55	82	82	273	N/A	N/A	2,109	N/A	N/A	82
Bedford Road Surface Car Park	#1	2,463	N/A	N/A	N/A	N/A	0	5,000	N/A	1,797	4,800	120	
	#2a	1,179	11	11	17	17	56	N/A	N/A	N/A	N/A	N/A	17
	#2b	193											
TOTAL:		17,430	189	191	287	287	954	15,116	6,000	5,647	4,800	120	287

B.3 Woodbridge Meadows – Phase 1

Table B-3: Bedford Wharf (EA Alignment) Site Breakdown

Location	Building No.	Roof Area (m²)	Residential					Employment (NIA m²)	No. Car Parking
			1b1p	1b2p	2b2p	2b3p	Total		
Woodbridge Meadows	#2	2,838	47	48	71	72	238	1,654	71
	#3	2,004	33	34	50	51	168	1,596	50
	#4	2,114	25	25	38	38	126	1,274	38
	#5	3,070	76	77	116	116	385	700	116
	#6	2,690	67	68	102	102	339	494	102
	#7	2,378	59	60	90	90	299	366	90
	#8	1,922	48	48	73	73	242	487	73
	TOTAL:	17,016	355	360	540	542	1,797	6,571	540

B.4 Woodbridge Meadows – Phase 1 & 2

Table B-4: Bedford Wharf (EA Alignment) Site Breakdown

Location	Building No.	Roof Area (m²)	Residential					Employment (NIA m²)	No. Car Parking
			1b1p	1b2p	2b2p	2b3p	Total		
Woodbridge Meadows	#1	2,078	34	35	52	53	174	1,609	52
	#2	2,838	47	48	71	72	238	1,654	71
	#3	2,004	33	34	50	51	168	1,596	50
	#4	2,114	25	25	38	38	126	1,274	38
	#5	3,070	76	77	116	116	385	700	116
	#6	2,690	67	68	102	102	339	494	102
	#7	2,378	59	60	90	90	299	366	90
	#8	1,922	48	48	73	73	242	487	73
	#9	1,428	36	36	54	54	180	284	54
TOTAL:		20,522	425	431	646	649	2,151	8,464	646

B.5 Town Wharf – Little ‘C’ (without a new Town Bridge)

Table B-5: Bedford Wharf (EA Alignment) Site Breakdown

Location	Building No.	Roof Area (m²)	Residential					Commercial (NIA m²)	No. Car Parking
			1b1p	1b2p	2b2p	2b3p	Total		
Town Wharf	PRCP 1	1,319	15	15	22	22	74	2,594	27
	PRCP 2	543	3	3	5	5	16		
	L&G N	1,257	10	11	16	16	53	5,217	16
	L&G S	669	9	9	14	14	46	669	14
	L&G P1	267	0	0	0	0	0	267	0
	L&G P2	541	0	0	0	0	0	541	0
	Friary St.	1,666	14	14	21	21	70	1,666	21
TOTAL:		6,262	51	52	78	78	259	10,954	78

B.6 Millbrook Car Park

Table B-6: Bedford Wharf (EA Alignment) Site Breakdown

Location	Option	Roof Area (m²)	Residential Apartments	Commercial (NIA m²)	No. Car Parking (private)	No. Car Parking (public)
Millbrook Car Park	Option A	619	88	N/A	30	244
		1,076				
	TOTAL:	1,695	88	0	30	244
	Option B	640	92	N/A	40	300
		640				
		640				
		640				
	TOTAL:	2,560	92	0	40	300
	Option C	448	87	N/A	40	300
		448				
		640				
		640				
	TOTAL:	2,176	87	0	40	300
	Option D	800	91	N/A	40	300
		672				
		891				
	TOTAL:	2,363	91	0	40	300
	Option E	800	78	N/A	40	300
		800				
		480				
TOTAL:	2,080	78	0	40	300	

B.7 Millmead

Table B-7: Bedford Wharf (EA Alignment) Site Breakdown

Location	Option	Roof Area (m²)	Residential Apartments	Commercial (NIA m²)	No. Car Parking (private)	No. Car Parking (public)
Millmead	Reuse the Existing Building	0	Unknown	Unknown	Unknown	Unknown
	TOTAL:	0	0	0	0	0
	Low Rise Town-homes	516	Unknown	Unknown	Unknown	Unknown
		604				
		604				
		300				
		240				
		TOTAL:				
	Option B - Undercroft Parking	638	Unknown	Unknown	Unknown	Unknown
		358				
		493				
		431				
		973				
		TOTAL:				
	Option C	720	Unknown	Unknown	Unknown	Unknown
		640				
		640				
	TOTAL:	2,000	0	0	0	0
	Option D	997	Unknown	Unknown	Unknown	Unknown
		576				
		640				
TOTAL:	2,213	0	0	0	0	

For Millmead, we have not included the proposal for 10 town-homes adjacent to the Guildford Baptist Church, or the existing building which is proposed to remain in all options.

Appendix C

C.1 Bedford Road

Table C-1: Bedford Wharf (EA Alignment) Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
One Estate	#1	2,451	1,961	279	1,716	244	1,471	210	1,226	175
	#2	1,379	1,103	157	965	138	827	118	690	98
	#3a	545	436	62	382	54	327	47	273	39
	#3b	1,386	1,109	158	970	138	832	119	693	99
	#4	1,124	899	128	787	112	674	96	562	80
	#5	1,485	1,188	169	1,040	148	891	127	743	106
Odeon	#6	3,610	2,888	412	2,527	360	2,166	309	1,805	257
Bedford Road Surface Car Park	#2a	1,179	943	134	825	118	707	101	590	84
	#2b	193	154	22	135	19	116	17	97	14
13,352			10,682	1,522	9,346	1,332	8,011	1,142	6,676	951

Table C-2: Bedford Wharf (LDA Alignment) Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
One Estate	#1	3,080	1,961	351	1,716	307	1,471	263	1,226	219
	#2	1,379	1,103	157	965	138	827	118	690	98
	#3a	545	436	62	382	54	327	47	273	39
	#3b	1,386	1,109	158	970	138	832	119	693	99
	#4	1,124	899	128	787	112	674	96	562	80
	#5	1,485	1,188	169	1,040	148	891	127	743	106
Odeon	#6	4,596	2,888	524	2,527	458	2,166	393	1,805	327
Bedford Road Surface Car Park	#2a	1,179	943	134	825	118	707	101	590	84
	#2b	193	154	22	135	19	116	17	97	14
14,967			10,682	1,706	9,346	1,493	8,011	1,280	6,676	1,066

C.2 Woodbridge Meadows

Table C-3Woodbridge Meadows (Phase 1 and 2) Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
One Estate	#1	2,078	1,662	237	1,455	207	1,247	178	1,039	148
	#2	2,838	2,270	324	1,987	283	1,703	243	1,419	202
	#3	2,004	1,603	228	1,403	200	1,202	171	1,002	143
	#4a	2,114	1,691	241	1,480	211	1,268	181	1,057	151
	#5	3,070	2,456	350	2,149	306	1,842	262	1,535	219
	#6	2,690	2,152	307	1,883	268	1,614	230	1,345	192
	#7	2,378	1,902	271	1,665	237	1,427	203	1,189	169
	#8	1,922	1,538	219	1,345	192	1,153	164	961	137
	#9	1,428	1,142	163	1,000	142	857	122	714	102
20,522			16,418	2,340	14,365	2,047	12,313	1,755	10,261	1,462

C.3 Town Wharf

Table C-4: Town Wharf Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
Town Wharf	PRCP 1	1,319	1,055	150	923	132	791	113	660	94
	PRCP 2	543	434	62	380	54	326	46	272	39
	L&G N	1,257	1,006	143	880	125	754	107	629	90
	L&G S	669	535	76	468	67	401	57	335	48
	L&G P1	267	214	30	187	27	160	23	134	19
	L&G P2	541	433	62	379	54	325	46	271	39
	Friary St.	1,666	1,333	190	1,166	166	1,000	142	833	119
		6,262	5,010	714	4,383	625	3,757	535	3,131	446

C.4 Millbrook Car Park (Option B)

Table C-5: Millbrook Car Park (Option B) Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
Millbrook Car Park (Option B)	#1	640	512	73	448	64	384	55	320	46
	#2	640	512	73	448	64	384	55	320	46
	#3	640	512	73	448	64	384	55	320	46
	#4	640	512	73	448	64	384	55	320	46
		2,560	2,048	292	1,792	255	1,536	219	1,280	182

C.5 Millmead (Low Rise Town-homes option)

Table C-6: Millbrook Car Park (Option B) Roof Based Surface Water Attenuation

Location	Building No.	Roof Area (m²)	Roof Area Available (%) and Volume of Attenuation (m³)							
			80% (m²)	Volume (m³)	70% (m²)	Volume (m³)	60% (m²)	Volume (m³)	50% (m²)	Volume (m³)
Millmead (Low Rise Town-homes option)	Resi 1	516	413	59	631	51	310	44	258	37
	Resi 2	240	192	27	168	24	144	21	120	17
	Resi 3	300	240	34	210	30	180	26	150	21
	Resi 4	604	493	69	423	60	362	52	302	43
	Resi 5	604	493	69	423	60	362	52	302	43
		2,914	2,331	332	2,040	291	1,748	249	1,457	208

Appendix D

D.1 Polypipe Permavoid 150 Datasheet

Product code: PVPP150

Permavoid is a geocellular interlocking system designed for shallow ground water storage or infiltration, to be used in place of traditional aggregate sub-base, or to provide source control above ground at both roof and podium level, removing the need for heavier and less efficient systems. The system has an exceptionally high compressive and tensile strength and bending resistance with a proprietary jointing system to create a horizontal structural ‘raft’ within the pavement that is ideal for the shallow attenuation of surface water. The system can also be combined in layers using interlocking shear connectors to increase depth in 85mm and 150mm increments. This is particularly useful in designing infiltration systems, allowing flexibility in balancing the soil permeability/ infiltration area of the Permavoid storage units and residual temporary attenuation.



Applications

The Permavoid units are suitable for use as a stormwater attenuation and/or infiltration. The system comprises of single, interconnected cells which can be installed in the ground as part of sub-base formation, or above ground as part of roof or podium attenuation systems for source control. Permavoid is suitable for use in a range of applications including residential, industrial estates, car parks, sports pitches, roofs, basements, pedestrian areas and rainwater harvesting.

Key Benefits

- High strength, high capacity, shallow, sub-base replacement system
- Stormwater attenuation and/or infiltration system
- Used as part of a sustainable drainage system (SuDS) scheme to offer stormwater storage at shallow construction depths
- 100% recyclable
- Units are manufactured from 100% recycled polypropylene (PP)

Performance

The structural load bearing capacity of the Permavoid units have been tested in accordance with the following European Standard: BS 7533-13:2009. The system’s structural design life expectancy, based upon creep test data (tested in accordance with CIRIA guidelines) is as follows; for lightly loaded areas such as car parks a design life of 50 years is achievable. For areas with prolonged HGV loading a typical design life may only be 25 years, depending on the design of the pavement surfacing and structural layers over the tank.

Installation

All calculations for Permavoid units are based upon site-specific load cases, pavement construction types and thicknesses, soil cover and ground conditions and the suitability must therefore be approved for each project.

Technical Support

Detailed guidance and assistance is available. For further information, please contact our Technical Team on +44 (0) 1509 615 100 or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

Permavoid Modular Cell 150 can be utilised in these SuDS techniques

TECHNIQUES													
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
	✓		✓	✓	✓	✓	✓	✓	✓	✓			

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ELEMENT	VALUE
PHYSICAL PROPERTIES	
Weight per unit	3kg
Weight per square metre	12kg
Length	708mm
Width	354mm
Depth	150mm
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	715kN/m ²
Lateral	156kN/m ²
SHORT TERM DEFLECTION	
Vertical	1mm per 126kN/m ²
Lateral	1mm per 15kN/m ²
TENSILE STRENGTH	
Of a single joint	42.4kN/m ²
Of a single joint at (1% secant modulus)	18.8kN/m ²
Bending resistance of unit	0.71kN/m
Bending resistance of single joint	0.16kN/m
OTHER PROPERTIES	
Volumetric void ratio	95%
Average effective perforated surface area	52%
Intrinsic permeability (k)	Minimum 1.0 x 10 ⁻⁵
Ancillary	Permavoid Permatie Permavoid Shear Connector
Material	Polypropylene (PP)

HYDRAULIC PERFORMANCE							
3 units wide, 1 unit deep (1.06m x 0.15m)							
FREE DISCHARGE							
Gradient (%)	0	1	2	3	4	5	
Flow Rate (l/m/s)	8	13	15	17	19	21	

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Appendix E

E.1 Memo Provided to UKPN



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Midpoint, Alencon Link
Basingstoke
Hampshire RG21 7PP
United Kingdom

T: +44(0)1256 824500
aecom.com

Project name:
Shaping Guildford's Future

Project ref:
60647579

From:
Neil Tims

Date:
27 May 2022

Document Ref:
GERP-ACM-XX-XX-MO-UT-000002 P01

To:
Brian Golding, UKPN

CC:

Memo

Subject: Shaping Guildford's Future, Anticipated Electrical Demand

Introduction

This Memo has been prepared to outline the anticipated electrical demand loads for five development sites which for part of the Guildford Borough Council ‘Shaping Guildford’s Future’ study.

Shaping Guildford's Future (SGF) is seeking to regenerate a number of locations within Guildford town centre in the coming years. At this time, an initial masterplan is being developed and from this we are seeking to understand the challenges, opportunities and risks, which can then be reported back to Guildford Borough Council.

The emerging masterplan is considering five key sites (the locations are shown in Figure 1), which have a mixture of residential and commercial uses. They also have car parking which we anticipate will require EV Charge points. The following table provides summary information regarding the five sites:

Site	Residential	Commercial	Car Parking (residential)	Car Parking (public)	Estimated Delivery
Bedford Wharf	954 units	26,763m²	287	N/A	Spring 2029 to end 2033
Woodbridge Meadows	2,151 units	8,464m²	646	N/A	Phase 1 from the start of 2031
Town Wharf	259 units	10,954m²	78	N/A	End of 2031
Millbrook Car Park	92 units	N/A	40	300	Summer 2027
Millmead	T.B.A.	T.B.A.	T.B.A.	T.B.A.	Spring 2027

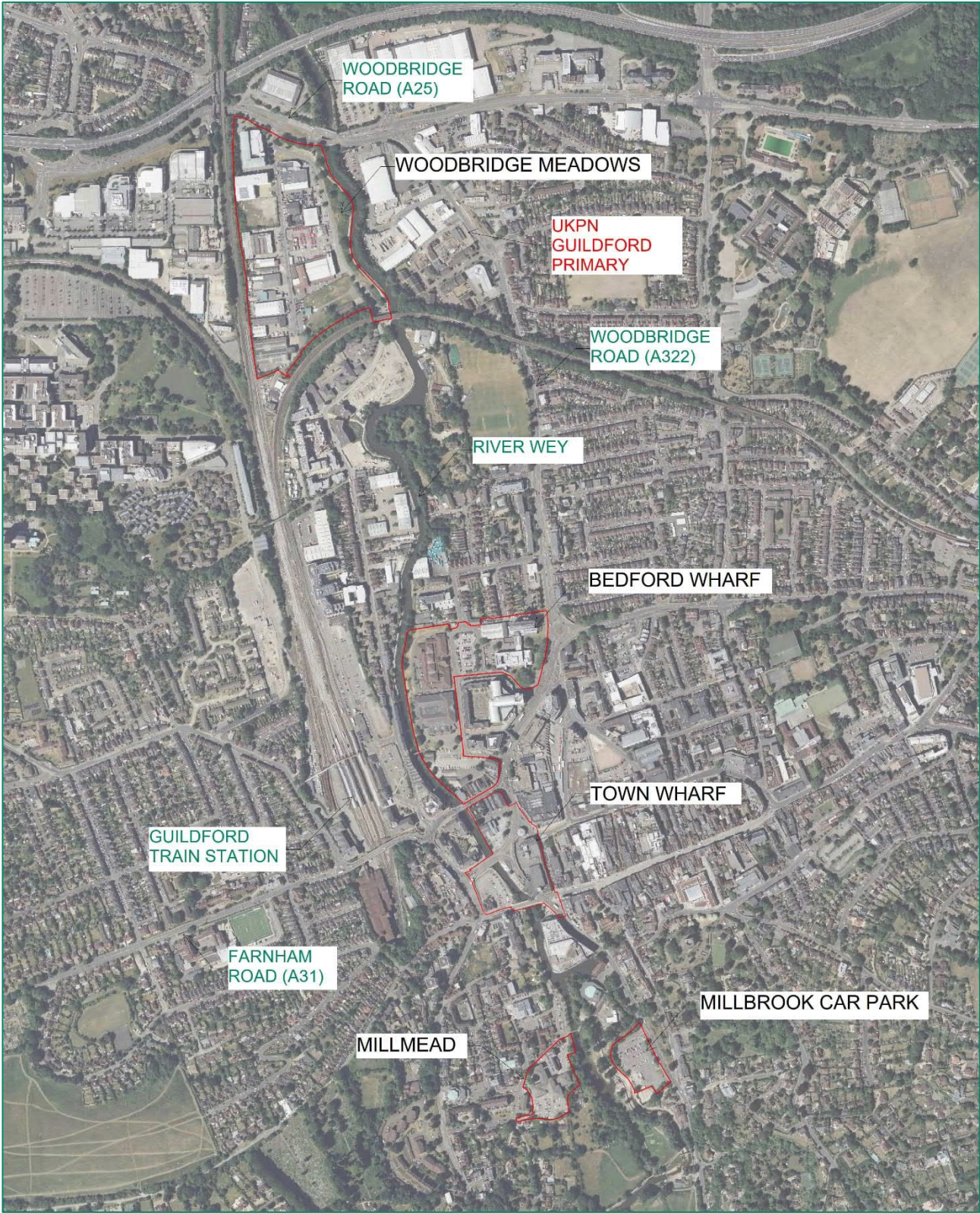


Figure 1: SGF Development Opportunity Locations

Electrical Demand

With the exception of Town Wharf, the masterplan has differing options for the remaining four sites. For ease within this initial engagement, we have provided our anticipated electrical demand estimate for the worst case of the site. At this time, we do not have sufficient information for Millmead, so we will provide this when received from the Masterplanner.

We have undertaken an initial assessment of the four sites to anticipate an electrical demand estimate for each development. The following table shows our assessment:

Site	Residential	Commercial	Car Parking (residential)	Car Parking (public)	Total
Bedford Wharf	3.34 MVA	2.47 MVA	1.08 MVA	N/A	6.88 MVA
Woodbridge Meadows	7.53 MVA	0.80 MVA	2.42 MVA	N/A	10.76 MVA
Town Wharf	0.91 MVA	1.04 MVA	0.29 MVA	N/A	2.24 MVA
Millbrook Car Park	0.32 MVA	N/A	0.15 MVA	1.13 MVA	1.60 MVA
Millmead	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.

21.47 MVA

Electrical Demand Assumptions

We have prepared the above estimates based on the following assumptions:

- Residential units are assigned an electrical supply of 3.5 kVA per unit. This allows for each residential unit to be gas free for both cooking and heating, with heat provided through a form of heat pump (air source / ground source).
- Commercial units have been assigned an electrical supply on the basis of:
 - 70 W/m² Office and Civil use
 - 120 W/m² Retail and Food & Beverage use
 - 65 W/m² Hotel
- A diversity factor for the residential and commercial units has not been allowed for at this stage.
- Electric car charging has been assigned an electrical supply of 7.5 kW per residential space. It is assumed that all residential spaces will have an EV charge point.
- Electric car charging has been assigned an electrical supply of 7.5 kW per public space. It is assumed that all public spaces will have an EV charge point, though these might be delivered over several years as demand for these facilities increases with EV ownership.
- A diversity factor of 0.5 has been applied to the EV charging for both residential and public parking spaces.
- The assessment does not consider the electrical capacity which would become available from existing buildings on the development sites as they are decommissioned and demolished.

UKPN Assessment / Advice

We would be grateful for UKPNs assessment/advice on:

- The emerging masterplan and electrical demand loads as summarised in this Memo;
- The available electrical capacity within the Guildford Primary that these developments might be able to utilise;
- UKPNs route / timeframe to provision of increased capacity as a result of future developments; and
- Will additional land be required for either an extension of the Guildford Primary or a secondary primary within the town centre.

- Funding options for increasing capacity at the Guildford Primary or another site should one be required.
- Are UKPN able to provide advice on the electrical capacity which might become available from demolition of existing buildings at the identified development sites, which could offset the estimated demand loads for the new developments?

It would also be helpful to understand whether UKPN have any future plans for increasing capacity within Guildford and if so, the timeframes for these.

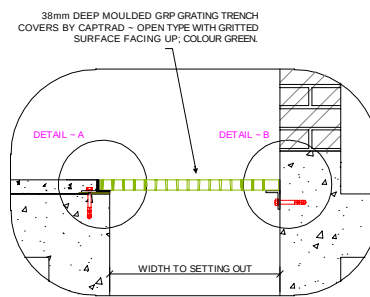
Wider Guildford Area

We are trying to secure further details of committed / planned developments for the wider Guildford area from GBC to enable a strategic review of the current and future electrical challenges / opportunities / risks that Guildford face. We will provide this information once received from GBC.

Appendix F

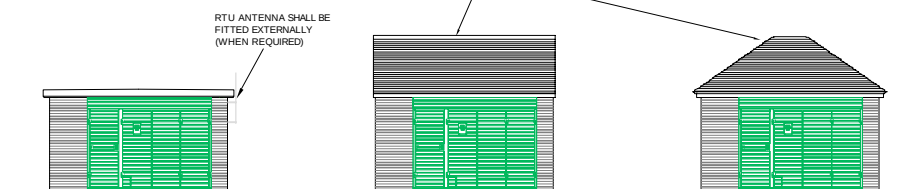
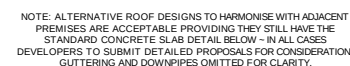
F.1 UKPN Standard Details

Document No.	Document Title	Revision	Date
EDS 07-3102.15	Freestanding Brick-Built Substation for a Transformer up to 1,500kVA - Earth Ring Civil Layout Sheet 1 of 3	C	26.10.2018
	Freestanding Brick-Built Substation for a Transformer up to 1,500kVA - Earth Ring Earthing Layout Sheet 2 of 3	A	26.10.2018
	Freestanding Brick-Built Substation for a Transformer up to 1,500kVA - Earth Ring Small Power & Lighting Sheet 3 of 3	A	26.10.2018
EDS 07-3102.01	Unit or Padmount Substation in a GRP Enclosure Civil Layout Sheet 1 of 3	C	26.10.2018
	Unit or Padmount Substation in a GRP Enclosure Earthing Layout Sheet 2 of 3	A	26.10.2018
	Unit or Padmount Substation in a GRP Enclosure Small Power & Lighting Sheet 3 of 3	A	26.10.2018
EDS 07-3102.20	Integral Substation for a Single Transformer up to 1,500kVA Civil Layout Sheet 1 of 3	C	26.10.2018
	Integral Substation for a Single Transformer up to 1,500kVA Earthing Layout Sheet 2 of 3	A	26.10.2018
	Integral Substation for a Single Transformer up to 1,500kVA Small Power & Lighting Sheet 3 of 3	A	26.10.2018
EDS 07-3102.22	Integral Substation for Two Transformers up to 1,000kVA Each Civil Layout Sheet 1 of 3	C	26.10.2018
	Integral Substation for Two Transformers up to 1,000kVA Each Earthing Layout Sheet 2 of 3	A	26.10.2018
	Integral Substation for Two Transformers up to 1,000kVA Each Small Power & Lighting Sheet 3 of 3	A	26.10.2018



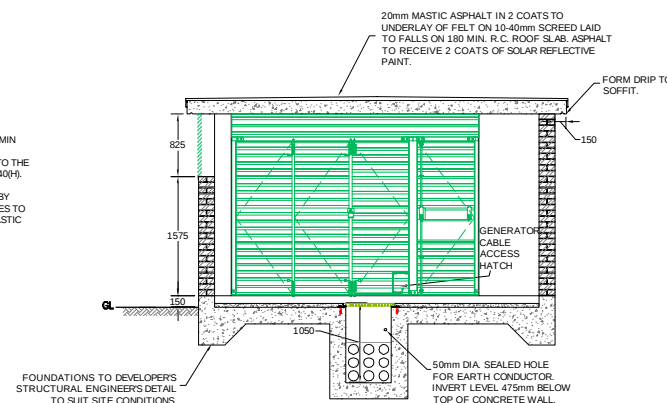
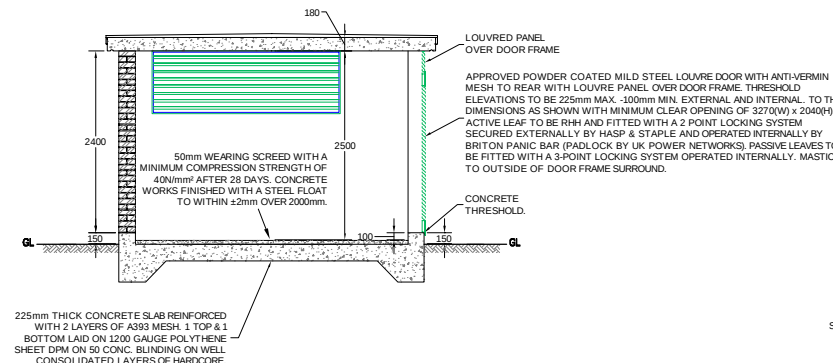
PROPOSED SUBSTATION
LOCATION TO BE ADVISED
BY DEVELOPER AND
AGREED WITH UK POWER
NETWORKS PRIOR TO
CONSTRUCTION

SUBSTATION ~ GENERAL ARRANGEMENT PLAN



STANDARD AND ALTERNATIVE ROOF DESIGNS

SETTING OUT DIMENSIONS



SECTION A~A

SECTION B~B

SECTION C~C

REFERENCES	
SHEET 2	EARTHING LAYOUT
SHEET 3	SMALL POWER AND LIGHTING LAYOUT
EAS 07-0000	APPROVED EQUIPMENT LIST - CIVIL
EAS 02-0000	APPROVED EQUIPMENT LIST - CABLES & DUCTS
EDS 07-1119	SUBSTATION ELECTRICAL SERVICES
EDS 07-3101	PRE-DESIGN REQUIREMENTS FOR SECONDARY SUBSTATIONS
EDS 07-3102	SECONDARY SUBSTATION CIVIL DESIGN STANDARD

EQUIPMENT WHICH MAY BE USED WITH THIS DESIGN:

- UNIT SUBSTATION WITH A 1500KVA TRANSFORMER OR BELOW
- MICRO SUBSTATION.
- COMPACT SUBSTATION

C	26-10-18	New 3+1 leaf door arrangement. Drawing notes & title revised.	UA	R
			UA	UK
B	05-01-18	Earth mesh replaced by earth ring arrangement. Notes revised.	UA	R
			UA	UK
A	09-08-17	ORIGINAL	UA	R
			UA	UK
Version	Date	Description	Checked Approved	Des Dis



TITLE **FREESTANDING BRICK-BUILT
SUBSTATION FOR A TRANSFORMER
UP TO 1500kVA - EARTH RING
CIVIL LAYOUT**

SCALE	NTS	@A1	APPROVED	Version C
DRAWING NO. EDS 07-3102.15 Sheet 1 of 3				
SITE		SECONDARY SITES		

GENERAL NOTES

- THIS DRAWING SHALL NOT BE SCALED AND NO VARIATION TO THE STATED DIMENSIONS OR MATERIALS SPECIFIED SHALL BE PERMITTED WITHOUT PRIOR WRITTEN CONSENT FROM UK POWER NETWORKS.
- ALL DIMENSIONS ARE IN MILLIMETRES.
- THE EARTHING SYSTEM SHALL BE PROVIDED BY THE DEVELOPER/CONTRACTOR UNLESS STATED OTHERWISE BY UK POWER NETWORKS.
- WHEREVER POSSIBLE THE EARTHING SYSTEM SHOULD BE INSTALLED IN ASSOCIATION WITH THE GROUND WORKS TO ENSURE THAT EARTH ELECTRODES ARE CORRECTLY POSITIONED PRIOR TO PLACEMENT OF CONCRETE.

REBAR/MESH REINFORCEMENT

- THE CONNECTION TO THE REINFORCEMENT WITHIN THE PLINTH SHALL USE EXOTHERMIC WELDING OR SUITABLE CLAMPS.
- ALL CONNECTIONS TO THE REINFORCEMENT SHALL USE A MINIMUM OF 70mm² STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.

EARTH CONDUCTOR, ELECTRODE & RODS

- THE EARTH RODS SHALL BE COPPER CLAD WITH APPROPRIATE FITTINGS, DRIVEN TO A MINIMUM DEPTH OF 3.0m.
- ALL EARTH ELECTRODE CONDUCTOR AND ELECTRODE SHALL BE AS FOLLOWS:
- FOR EARTH FAULT LEVELS UP TO 8kA USE 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 12.5kA USE 120mm² OR 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 4mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 15kA USE 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 6mm COPPER TAPE.

EARTH RESISTANCE

- THE MAXIMUM RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE SPECIFIED BY THE UK POWER NETWORKS DESIGNER.
- WHERE THE EARTHING SYSTEM IS INSTALLED BY A DEVELOPER OR CONTRACTOR CERTIFICATION CONFIRMING THE RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE PROVIDED TO UK POWER NETWORKS PRIOR TO EQUIPMENT INSTALLATION.

BONDING

- NOT ALL EQUIPMENT BONDING IS SHOWN ON THE DRAWING. ALL EQUIPMENT SHALL BE BONDED IN ACCORDANCE WITH EDS 08-0023.

OTHER

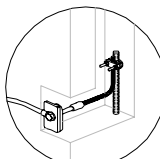
- A 6-WAY EARTH BAR SHALL BE PROVIDED IN THE POSITION SHOWN ATTACHED TO THE PLINTH AROUND 100mm BELOW FFL.
- THE EARTHING SYSTEM IS INSTALLED FOR UK POWER NETWORKS' SOLE USE AND SHALL NOT BE INTERCONNECTED WITH ANOTHER EARTHING SYSTEM OR USED FOR ANY OTHER PURPOSE WITHOUT PERMISSION FROM UK POWER NETWORKS.

FURTHER INFORMATION

- FOR FURTHER DETAILS ON THE CONSTRUCTION OF THIS EARTHING SYSTEM INCLUDING MATERIALS, CONNECTIONS, LABELLING ETC. REFER TO EDS 08-0023.
- FOR INFORMATION ON SECONDARY SUBSTATION EARTHING DESIGN REFER TO EDS 08-0014

NOTE: THIS DRAWING ONLY SHOWS THE EARTHING ASSOCIATED WITH THE GROUND WORKS. ADDITIONAL EARTHING MAY BE REQUIRED TO ACHIEVE THE EARTH RESISTANCE VALUE AND TO ENSURE THE SUBSTATION IS SAFE. REFER TO THE RELEVANT EARTHING STANDARD FOR THE COMPLETE EARTHING AND BONDING REQUIREMENTS.

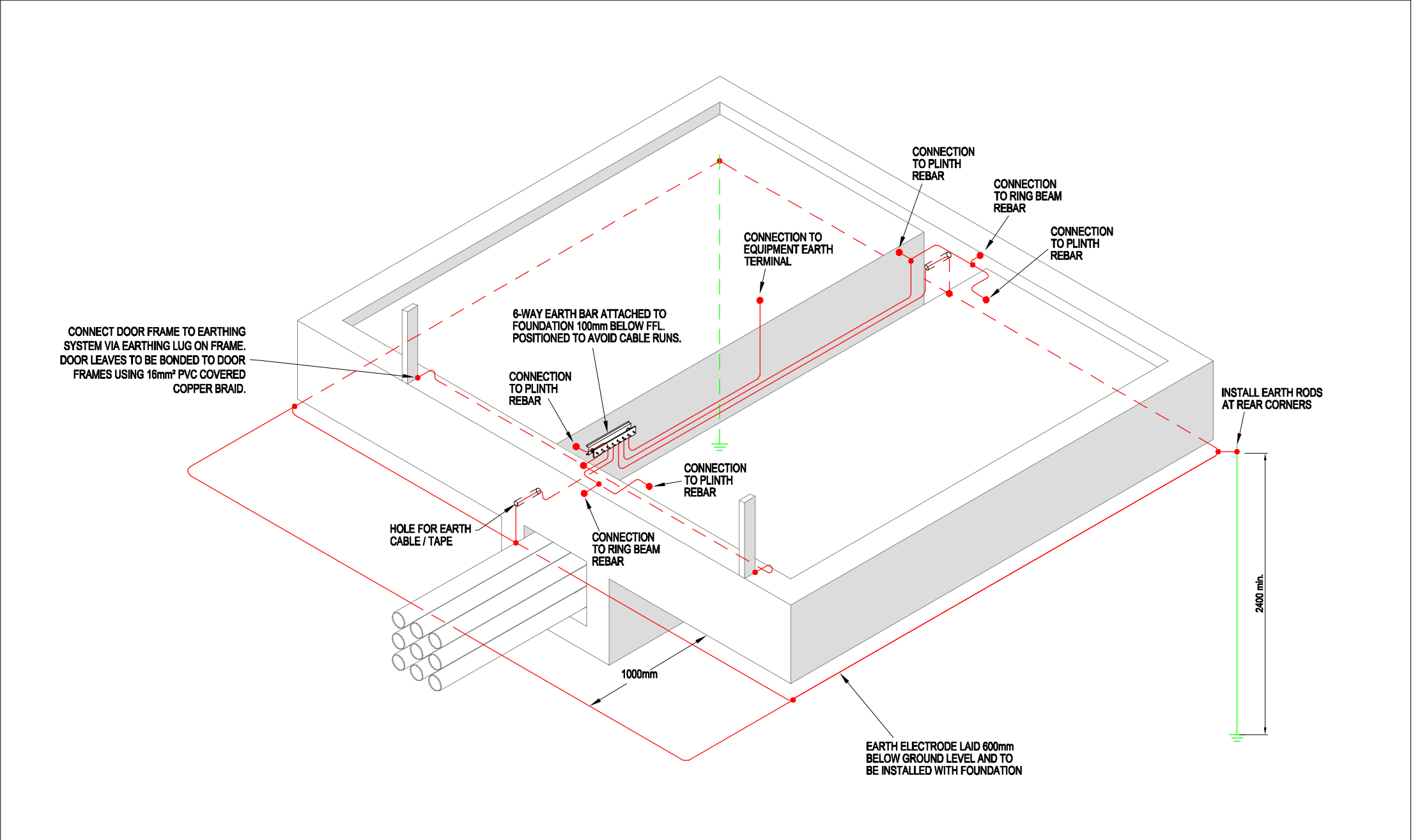
**REBAR/EARTH CONNECTION METHOD
DETAIL**

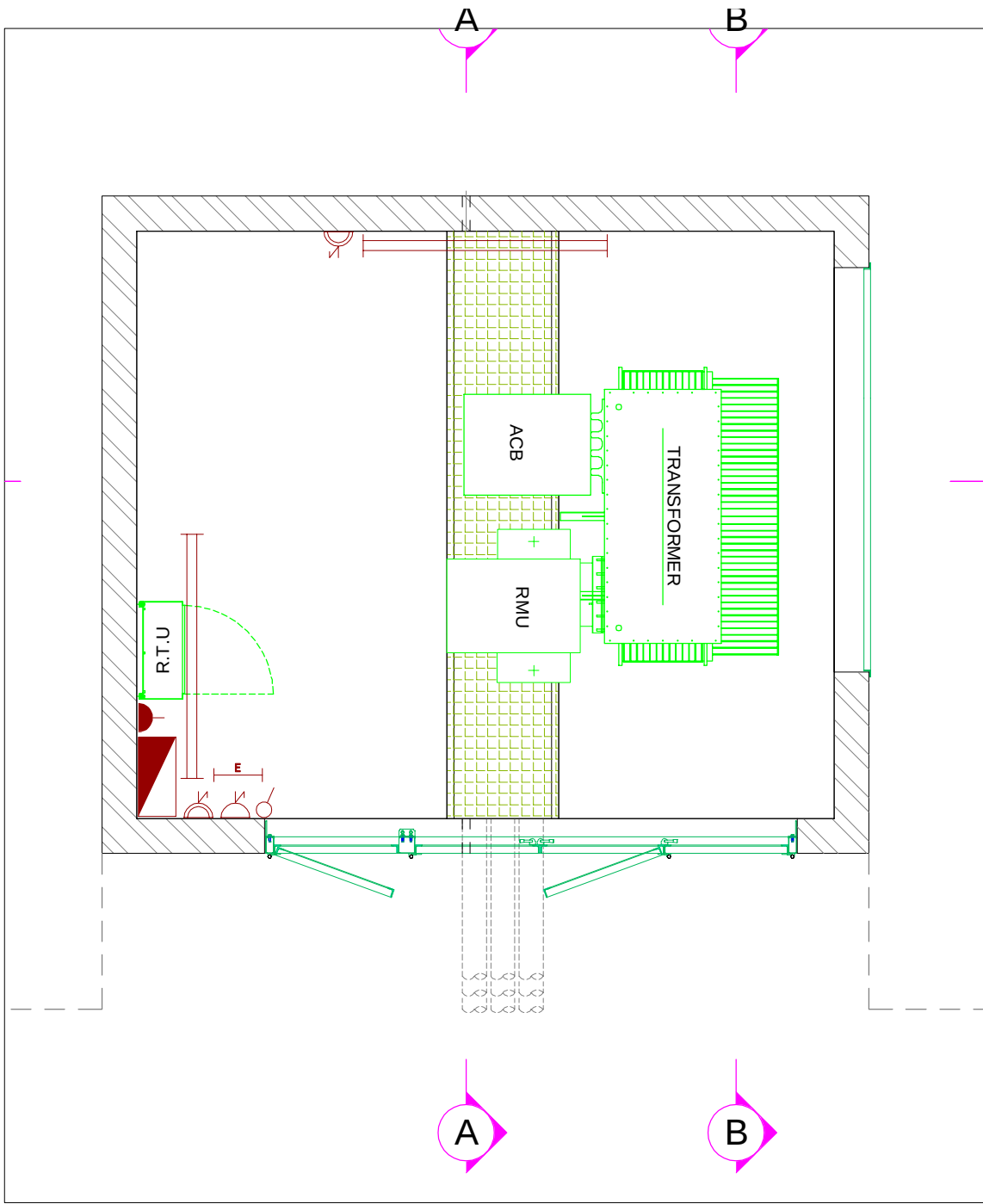


EARTH POINT CONNECTED TO REBAR OR REINFORCEMENT MESH WITH CLAMPS OR EXOTHERMIC WELDING.

EARTHING KEY	
	EARTH ROD
	EARTH ELECTRODE
	CONNECTION

A	26-10-18	ORIGINAL	UA	RC
			UA	UKI
Version	Date	Description	Checked Approved	Dr Desig
TITLE FREESTANDING BRICK-BUILT SUBSTATION FOR A TRANSFORMER UP TO 1500kVA - EARTH RING EARTHING LAYOUT				
SCALE NTS		@A1	APPROVED	Version
DRAWING NO.		EDS 07-3102.15	Sheet 2 of 3	A
SITE		SECONDARY SITES		



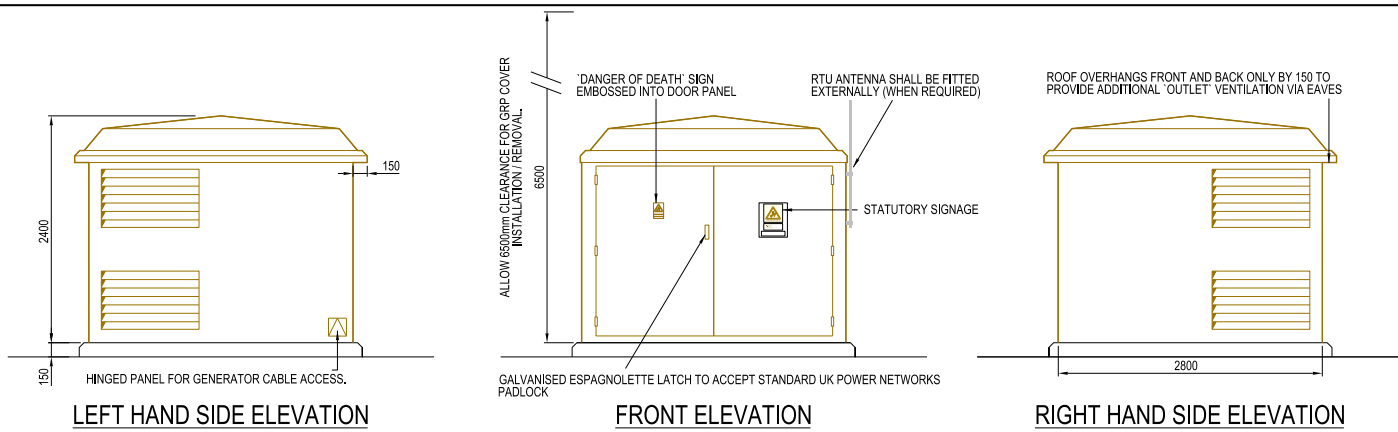


KEY:
(SEE NOTES FOR EQUIPMENT DETAILS)

- TWIN FLUORESCENT LUMINAIRE
- EMERGENCY SELF CONTAINED LUMINAIRE
- 13A UNSWITCHED FUSED SPUR FOR RTU
- 13A SWITCHED SINGLE SOCKET LABELLED FOR TEST EQUIPMENT
- 13A SWITCHED DOUBLE SOCKET
- LIGHT SWITCH
- CONSUMER UNIT

- GENERAL NOTES
- THE LIGHTING AND POWER REQUIREMENTS ARE SUMMARISED BELOW. REFER TO EDS 07-1119 FOR FURTHER DETAILS.
 - ALL WORK AND TESTING SHALL BE CARRIED OUT BY SUITABLY COMPETENT OPERATIVES IN ACCORDANCE WITH BS 7671.
 - ALL ACCESSORIES AND ACCESSORY MOUNTING BOXES OR ENCLOSURES SHALL BE IP66 SURFACE MOUNTED FROM THE MK MASTERSEAL RANGE OR EQUIVALENT.
- POWER SUPPLY OPTIONS
- MINIMUM 4mm² SWA FROM THE LV CABINET/BOARD 32A AUXILIARY SUPPLY TERMINALS OR 35mm² SERVICE FROM LV PILLAR OR LV DISTRIBUTION NETWORK. ALL SUPPLIES SHALL BE TERMINATED IN A 100A CUT-OUT FUSED AT 30A.
- DISTRIBUTION BOARD
- THE DISTRIBUTION BOARD SHALL BE AN IP66 SINGLE-PHASE AND NEUTRAL TYPE WITH A MINIMUM OF 5 WAYS AND INCLUDE:
 - A 100A/125A DOUBLE-POLE (PHASE AND NEUTRAL) DISCONNECTOR WITH 15KA BREAKING CAPACITY (TO BS EN 60947).
 - RCBOS (TO BS EN 61009-1) AND MCBs (TO BS EN 60898-2) WITH 15KA BREAKING CAPACITY.
 - 18/20A RCB0 FOR THE 13A SOCKET OUTLET CIRCUIT.
 - 16A MCB FOR THE TEST EQUIPMENT 13A SOCKET OUTLET.
 - 6/10A MCB FOR THE LIGHTING CIRCUIT.
 - 6A MCB FOR EACH RTU OR PLTU (IF INSTALLED).
 - A SPARE WAY COMPLETE WITH BLANKING PLATE FOR FUTURE USE.
 - THE DISTRIBUTION BOARD SHALL BE MOUNTED AT A HEIGHT OF 1350mm TO 1450mm ABOVE FINISHED FLOOR LEVEL.
- INTERNAL LIGHTING
- THE SUBSTATION SHALL HAVE A MINIMUM LUMINANCE OF 300 LUX IN ACCORDANCE WITH HSE H5G38 PROVIDED BY A MINIMUM OF TWO LIGHT FITTINGS ON OPPOSITE SIDES OF THE SUBSTATION.
 - THE LIGHT FITTINGS SHALL BE POSITIONED TO AVOID SHADOWS WHEN EQUIPMENT DOORS ARE OPEN.
 - ALL LIGHT FITTINGS SHALL BE MOUNTED AT A MAXIMUM HEIGHT OF 2200mm ABOVE FINISHED FLOOR LEVEL AND BE POSITIONED TO AID FUTURE MAINTENANCE. LIGHT FITTINGS SHALL NOT BE INSTALLED ABOVE AN LV BOARD.
 - GENERAL PURPOSE LIGHT FITTINGS SHALL BE OF THE FLUORESCENT IMPACT AND CORROSION RESISTANT TYPE, CORROSION RESISTANT WITH A POLYCARBONATE PRISMATIC DIFFUSER (TO BS EN 60598-1) AND SHALL HAVE A MINIMUM DEGREE OF PROTECTION OF IP56. THE PREFERRED SIZE A 1500mm TWIN LAMP FITTING.
 - LIGHT FITTINGS SHALL BE FITTED WITH 39W OR 49W T8 OR T16 LINEAR FLUORESCENT TUBES OF THE HIGH FREQUENCY ENERGY EFFICIENT TYPE (TO BS EN 60081) OR EQUIVALENT LED. ALL LAMPS SHALL HAVE CAPS OF THE 'B' PIN TYPE AND A MINIMUM COLOUR TEMPERATURE OF 3500K (A WHITE APPEARANCE).
 - LIGHT FITTINGS SHOULD BE CONNECTED VIA A PLUG IN ROSE (OR SIMILAR) TO AID FUTURE MAINTENANCE. A PROTECTIVE CONDUCTOR SHALL BE CONNECTED TO THE EARTH TERMINAL OF EACH FITTING.
 - A SURFACE MOUNTED LIGHT SWITCH WITH NEON INDICATOR SHALL BE POSITIONED ADJACENT TO THE SUBSTATION DOOR. SUBSTATIONS WITH MULTIPLE POINTS OF ACCESS SHALL HAVE A LIGHT SWITCH ADJACENT TO EACH DOOR AND SHALL BE WIRED WITH 2-WAY LIGHTING.
 - ALL LIGHT SWITCHES SHALL BE MOUNTED AT 1400mm ABOVE FINISHED FLOOR LEVEL.
- EMERGENCY LIGHTING
- AN EMERGENCY LIGHT (TO BS EN 1838 AND BS 5286) SHALL BE PROVIDED AT EACH EXIT DOOR. AN ADDITIONAL EMERGENCY LIGHT SHALL BE INSTALLED WHERE THERE IS AN OPEN LV BOARD.
 - EMERGENCY LIGHTS SHALL HAVE A MINIMUM LUMINANCE OF 1 LUX AND SHALL BE THE INTEGRAL, SELF-CONTAINED TYPE (TO BS EN 60598-2-22) INCORPORATING A FLUORESCENT LAMP (OR LED EQUIVALENT) AND A POLYCARBONATE DIFFUSER. THE RATED DURATION OF EMERGENCY LIGHT SHALL BE 3 HOURS.
 - ABOVE DOOR EMERGENCY LIGHTS SHALL INCLUDE AN EXIT LEGEND PLATE.
 - LIGHT FITTINGS SHALL BE IP66 HEAVY DUTY 28W TC-T (OR EQUIVALENT LED) BULKHEAD TYPE CONSTRUCTED IN POLYCARBONATE WITH AN IMPACT RESISTANT POLYCARBONATE COVER, SEALED TO THE BODY WITH A SILICON RUBBER GASKET AND STAINLESS STEEL CAPTIVE FIXING SCREWS.
 - ALL EXTERNAL LIGHTING SHALL BE CONTROLLED BY PHOTOELECTRIC CONTROL UNITS (TO BS 5972) AND PIR MOVEMENT DETECTORS.
- POWER
- A MINIMUM OF TWO DOUBLE 13A SOCKET OUTLETS (TO BS 1363) SHALL BE INSTALLED ON OPPOSITE SIDES OF THE SUBSTATION.
 - AN ADDITIONAL SINGLE 13A SOCKET OUTLET (TO BS 1363) SHALL BE INSTALLED, DESIGNATED AND LABELLED AS A 'TEST EQUIPMENT SOCKET' AND SUPPLIED VIA A SEPARATE MCB.
 - ANY RTU/PLTU SHALL BE SUPPLIED BY AN UNSWITCHED FUSE CONNECTION UNIT (TO BS 1363) FUSED AT 6A AND INSTALLED ADJACENT TO THE EQUIPMENT.
 - RADIAL CIRCUITS SHALL BE USED FOR ALL POWER CIRCUITS.
 - ALL SMALL POWER ACCESSORIES SHOULD BE MOUNTED AT 1000mm ABOVE FINISHED FLOOR LEVEL.
- CABLING
- ALL CABLES SHALL BE 6491B LS0H TO BS EN 60525-3-41 AND SHALL COMPLY WITH BASEC. ALL INSULATION SHALL USE PHASE OR NEUTRAL COLOUR THROUGHOUT THE LENGTH OF THE CONDUCTOR IN ACCORDANCE WITH BS 7671. NOTE: THE USE OF COLOURED SLEEVES TO MARK CONDUCTORS IS NOT ACCEPTABLE.
 - ALL CABLES SHALL USE STRANDED COPPER CONDUCTORS WITH THE FOLLOWING MINIMUM CROSS SECTIONAL AREA:
 - CUT-OUT UNIT TAILS 25mm².
 - LIGHTING 1.5mm².
 - SMALL POWER 4.0mm².
 - ALL CABLES, EXCEPT ARMoured CABLES AND CUT-OUT TAILS, SHALL BE ENCLOSED IN PLASTIC CONDUIT OR TRUNKING. THE TYPES AND SIZES SHALL BE SUITABLE FOR THE OPERATING CONDITIONS.
 - ALL CABLES SHALL BE INSTALLED WITHOUT JOINTS OTHER THAN AT EQUIPMENT AND TERMINAL FITTINGS.
- CONDUIT, TRUNKING AND TRAYS
- ALL CABLING SHALL BE INSTALLED IN MINIMUM 20mm CONDUIT SIZED IN ACCORDANCE BS 7671.
 - ALL CONDUIT, BOXES AND FITTINGS SHALL BE HIGH IMPACT, NON-FLAME PROPAGATING, SELF-EXTINGUISHING, HEAVY-DUTY PVC CONDUIT (TO BS EN 61306-1). DIMENSIONS SHALL COMPLY WITH BS EN 60423.
 - THERE SHALL BE SUFFICIENT JUNCTION BOXES, DRAW-IN BOXES AND INSPECTION FITTINGS INSTALLED TO ALLOW CABLES TO BE INSPECTED, WITHDRAWN AND REPLACED IF NECESSARY. THE COMPLETE INSTALLATION SHALL BE ARRANGED USING A LOOP-IN TYPE SYSTEM WITH JOINTS BEING CARRIED OUT AT SWITCHES, ISOLATORS OR APPLIANCE FITTINGS.
 - ALL ADAPTABLE BOXES AND ACCESSORIES SHALL MATCH THE CONDUIT AND SHALL BE FITTED WITH EARTHING TERMINALS.
 - JOINTS BETWEEN CONDUITS MAY BE PUSH-FIT, COMPRESSION, MECHANICAL LOCKING OR SOCKET-END SEALED WITH PVC ADHESIVE. WHERE A WEATHERPROOF OR WATERTIGHT CONNECTION IS REQUIRED PUSH-FIT ARRANGEMENT ALONE IS NOT ACCEPTABLE.
 - ALL CONDUIT SHALL BE SECURED USING MATCHING DISTANCE SADDLES SPACED AT A MAXIMUM DISTANCE OF 750mm AND 200mm FROM ANY BEND JOINT OR ACCESSORY. ALL BOXES AND ACCESSORIES SHALL BE SECURED INDEPENDENTLY.
 - REFER TO EDS 07-0119 FOR TRUNKING AND CABLE TRAY REQUIREMENTS.
- LABELLING
- ALL LABELLING SHALL COMPLY WITH BS 7671.
 - ALL DISTRIBUTION BOARD WAYS SHALL BE PERMANENTLY LABELLED TO IDENTIFY CIRCUIT FUNCTION, CABLE SIZE AND PROTECTIVE DEVICE RATING.
- HOT SITES
- ALL SOCKETS SHALL BE DISCONNECTED OR REMOVED.
 - ALL LIGHTING AND RTU SUPPLIES FROM AUXILIARY TERMINALS SHALL BE VIA AN ISOLATION TRANSFORMER.
 - REFER TO ECS 06-0023 FOR FURTHER INFORMATION.
- TESTING AND CERTIFICATION
- UPON COMPLETION OF THE WORKS, THE INSTALLATION SHALL BE TESTED IN ACCORDANCE WITH BS 7671, AN ELECTRICAL INSTALLATION CERTIFICATE TOGETHER WITH A SCHEDULE OF TEST RESULTS AS DETAILED IN BS 7671 SHALL BE FORWARDED TO UK POWER NETWORKS.

Version	A	26-10-18	ORIGINAL	UA		RD
				UA		UKI
				Checked	Dr	
				Approved	Desig	
 UK Power Networks						
TITLE FREESTANDING BRICK-BUILT SUBSTATION FOR A TRANSFORMER UP TO 1500kVA - EARTH RING SMALL POWER & LIGHTING						
SCALE		NTS	@A1	APPROVED		Versic
DRAWING NO.						
EDS 07-3102.15		Sheet 3 of 3		A		
SITE		SECONDARY SITES				



PROPOSED SUBSTATION LOCATION TO BE ADVISED BY DEVELOPER AND AGREED WITH UK POWER NETWORKS PRIOR TO CONSTRUCTION.

IF WITHIN 10m OF A WATERCOURSE OR WITHIN 50m OF A BOREHOLE USE THE FULLY-BUNDED DESIGN DRAWING EDS 07-3102.02

- GENERAL NOTES**
- DO NOT SCALE FROM THIS DRAWING. NO VARIATION TO THE STATED DIMENSIONS OR MATERIALS SPECIFIED WILL BE PERMITTED WITHOUT PRIOR WRITTEN CONSENT FROM UK POWER NETWORKS.
 - ALL DIMENSIONS ARE IN MILLIMETRES.
 - THE RUNNING OF SPRINKLER SYSTEM, HEATING, GAS, TELECOMS, WATER AND OTHER SERVICES THROUGH OR UNDER THE SUBSTATION AREA IS NOT PERMITTED.
 - WORKMANSHIP AND MATERIALS TO CONFORM TO THE LATEST EDITION OF THE RELEVANT CODES OF PRACTICE OR BRITISH STANDARD AND EUROCODES.
 - LOCATION OF THE SITE SHALL BE OVERLAID ON THE ORDNANCE SURVEY MAP AND ADDED ONTO THE PROJECT SPECIFIC DRAWING.
- PLANNING, LOCATION AND POSITION**
- POSITION AND ORIENTATION OF THE SUBSTATION SHALL BE AGREED WITH UK POWER NETWORKS PRIOR TO THE COMMENCEMENT OF ANY BUILDING WORKS ON SITE.
 - SUBSTATIONS SHALL BE LOCATED ADJACENT TO A PUBLIC HIGHWAY OR REACHED BY A PRIVATE DEDICATED ACCESS WAY WITH FULL CONTROL AND ASSOCIATED LEGAL RIGHTS.
 - THE DEVELOPER IS RESPONSIBLE FOR OBTAINING ALL PLANNING CONSENTS AND BUILDING REGULATION APPROVALS.
 - UNIMPEDED ACCESS FOR UK POWER NETWORKS PERSONNEL IS REQUIRED AT ALL TIMES. 365 DAYS OF THE YEAR (24/7). ANY DOORS OR GATES ON THE ACCESS ROUTE SHALL BE LOCKED WITH THE STANDARD UK POWER NETWORKS LOCKING SUITE.
 - ACCESS VIA 24 HOUR SECURITY IS UNACCEPTABLE.
 - PROPOSED SOFT LANDSCAPING ADJACENT TO THE SUBSTATION (E.G. PLANTING SCHEMES) SHALL ALLOW FOR FUTURE PLANT GROWTH WITHOUT COMPROMISING ACCESS OR VENTILATION THROUGH DOORS AND LOUVRES.
 - GRP SUBSTATIONS SHALL BE AT LEAST 4m AWAY FROM THE NEAREST BUILDING UNLESS A 4HR FIRE BARRIER IS LOCATED IN BETWEEN.

- FOUNDATION AND REINFORCED CONCRETE**
- AS STATED ON DRAWING OR TO SUIT THE SITE CONDITION.
 - SUFFICIENT COVER TO THE REINFORCEMENT TO ACHIEVE A 4 HOUR FIRE RATING (60mm MINIMUM).
 - FOR PRELIMINARY DESIGN, ASSUME 50N/m² INCREASE IN GROUND PRESSURE AT FORMATION LEVEL.
 - STRUCTURAL CONCRETE TO BE POURED ON 50mm GEN 1 MIX CONCRETE BLINDING ON 1200 GAUGE GEOMEMBRANE, ON SAND BLINDING, ON WELL COMPACTED DTP1 TYPE MATERIAL.
 - REINFORCING BARS TO BE ELECTRICALLY CONTINUOUS.

- FLOOR SLAB**
- TO THE STRUCTURAL ENGINEER'S SPECIFICATIONS TO SUSTAIN LOADS SHOWN, THE ENTIRE ACCESS ROUTE IS TO BE CAPABLE OF SUSTAINING THE EQUIPMENT LOAD.
 - STANDARD FLOOR SLAB THICKNESS OF 225mm MINIMUM REINFORCED CONCRETE WITH A SUITABLE WEARING SCREED WITH A MINIMUM COMPRESSIVE STRENGTH OF 40N/mm² AFTER 28 DAYS. CONCRETE WORKS FINISHED WITH STEEL FLOAT TO WITHIN +2mm OVER 2000mm.
 - REINFORCEMENT TO DEVELOPER'S STRUCTURAL ENGINEER'S REQUIREMENTS.

- GRP ENCLOSURE**
- SUPPLIED AND INSTALLED BY UK POWER NETWORKS. USUALLY DELIVERED ASSEMBLED. FLAT PACK UNITS ARE AVAILABLE ON REQUEST.
 - TOTAL WEIGHT OF GRP ENCLOSURE IS 600kg.
 - THREE WAY LOCKING DEVICE WITH FREE ISSUED UK POWER NETWORKS PADLOCK.
 - THE THRESHOLD SECTION BELOW THE DOORS IS REMOVABLE TO FACILITATE PLANT MOVEMENT.
 - KEEP 1000mm CLEARANCE MINIMUM ABOVE ENCLOSURE FOR PRESSURE RELIEF AT ALL TIMES.
 - ALLOW 6500mm CLEAR HEADROOM FOR THE REMOVAL OF THE ENCLOSURE DURING MAINTENANCE OR REPLACEMENT OF THE TRANSFORMER.
 - MAXIMUM LOAD ON ROOF TO BE 2.5kN/m².
 - LOUVERED VENTS SHALL NOT BE OBSTRUCTED; A MINIMUM CLEAR AREA OF 500mm IS REQUIRED AROUND THE ENCLOSURE.
 - STANDARD COLOURS ARE MID BROWN 08-B-25 OR DARK GREEN 14-C-39 TO BS4800.

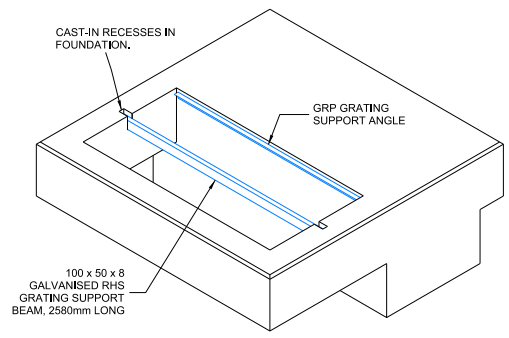
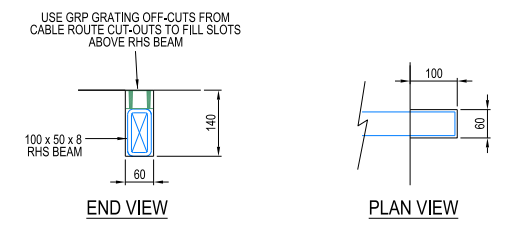
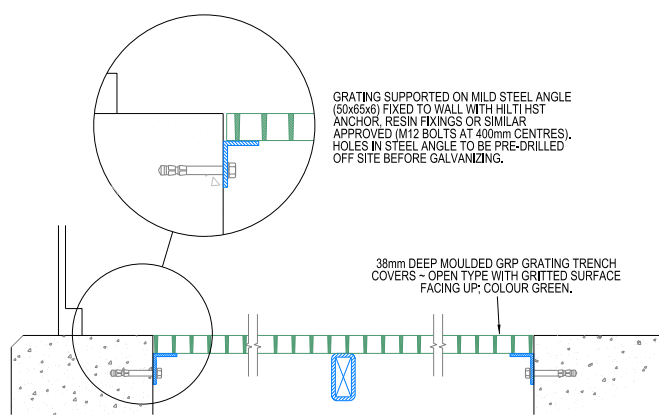
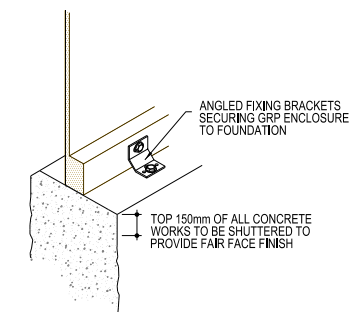
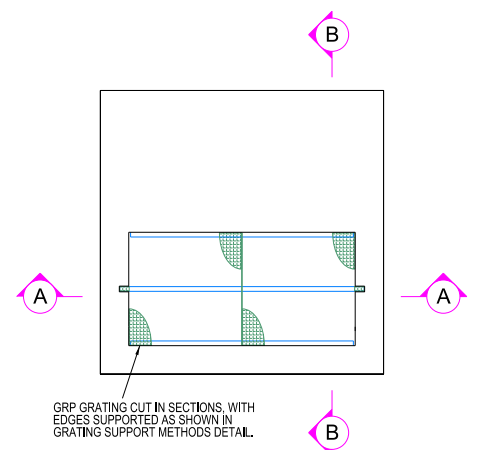
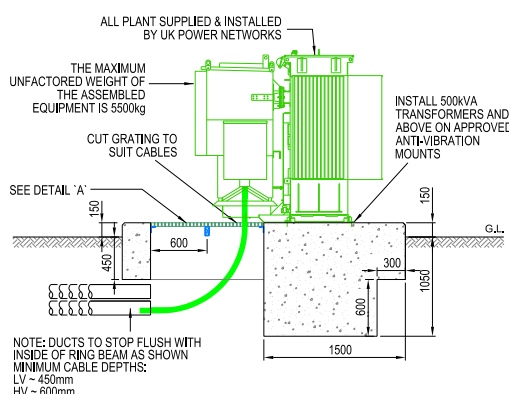
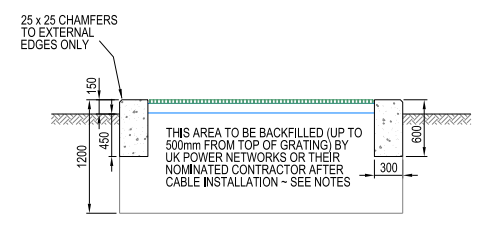
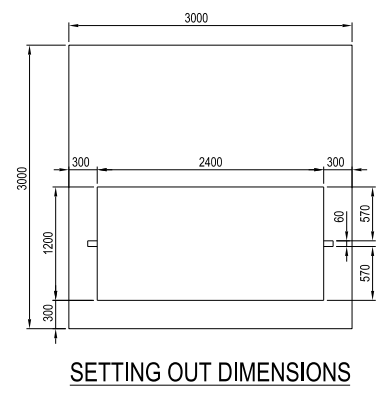
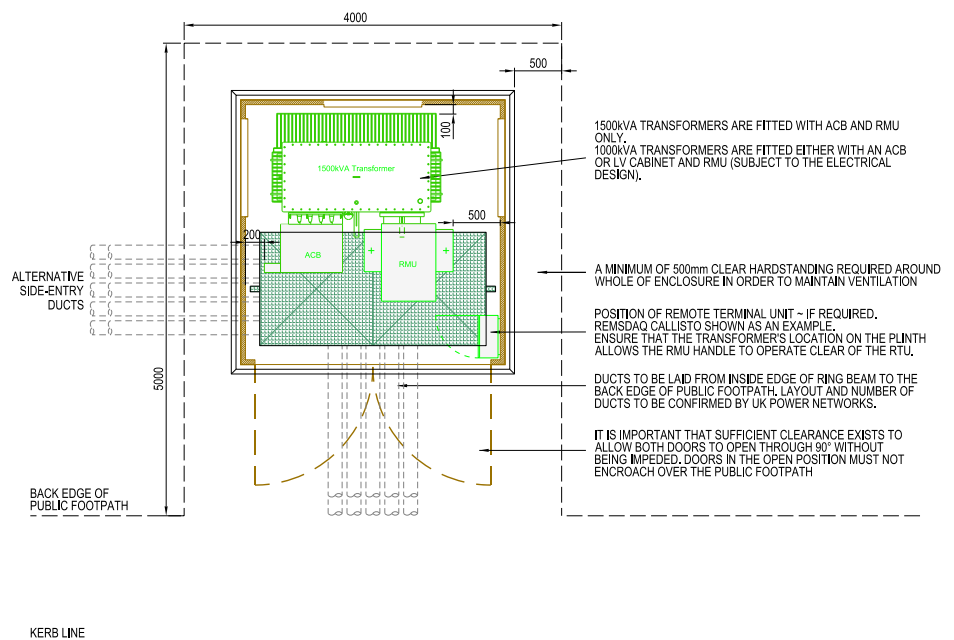
- DUCTS**
- 125mm INTERNAL DIAMETER TWIN WALLED HIGH DENSITY POLYETHYLENE DUCTING TO ESI 12-24 OR BS EN 81386, LAID FLAT AND LEVEL.
 - NUMBER AND ENTRY POSITIONS SHALL BE VERIFIED BY UK POWER NETWORKS.

- INFILL TO AREA AROUND CABLES**
- AFTER CABLE INSTALLATION, SEAL ALL CABLE DUCTS, FILL TRENCHES WITH SAND WITH 100mm ABOVE TOP DUCT AND TO A MINIMUM OF 500mm BELOW THE TOP OF GRATINGS.

- GRP GRATINGS AND SUPPORTS**
- USE APPROVED 38mm DEEP MOULDED GRP GRATINGS; OPEN TYPE WITH GRITTED SURFACE AND COLOUR GREEN.
 - GRATING SHALL BE FLUSH WITH TOP OF FOUNDATION AND SECURELY SUPPORTED, SEATED LEVEL WITH NO NOTICEABLE ROCKING OR SLIDING.
 - CUT OFF OPENINGS FOR CABLE PENETRATIONS ENSURING THE GRATINGS CAN BE REMOVED WITH CABLES IN-SITU WHILE STILL REMAINING STABLE.
 - STEELWORK FOR GRP GRATING SUPPORTS SHALL BE GALVANISED.

- REFERENCES**
- | SHEET | DESCRIPTION |
|-------------|---|
| SHEET 2 | EARTHING LAYOUT |
| SHEET 3 | SMALL POWER AND LIGHTING LAYOUT |
| EAS 07-0000 | APPROVED EQUIPMENT LIST - CIVIL |
| EAS 02-0000 | APPROVED EQUIPMENT LIST - CABLES & DUCTS |
| EDS 07-0119 | SUBSTATION ELECTRICAL SERVICES |
| EDS 07-3101 | PRE-DESIGN REQUIREMENTS FOR SECONDARY SUBSTATIONS |
| EDS 07-3102 | SECONDARY SUBSTATION CIVIL DESIGN STANDARD |

- EQUIPMENT WHICH MAY BE USED WITH THIS DESIGN**
- UNIT SUBSTATION WITH A 1500kVA TRANSFORMER OR BELOW.
 - MICRO SUBSTATION.
 - COMPACT SUBSTATION.

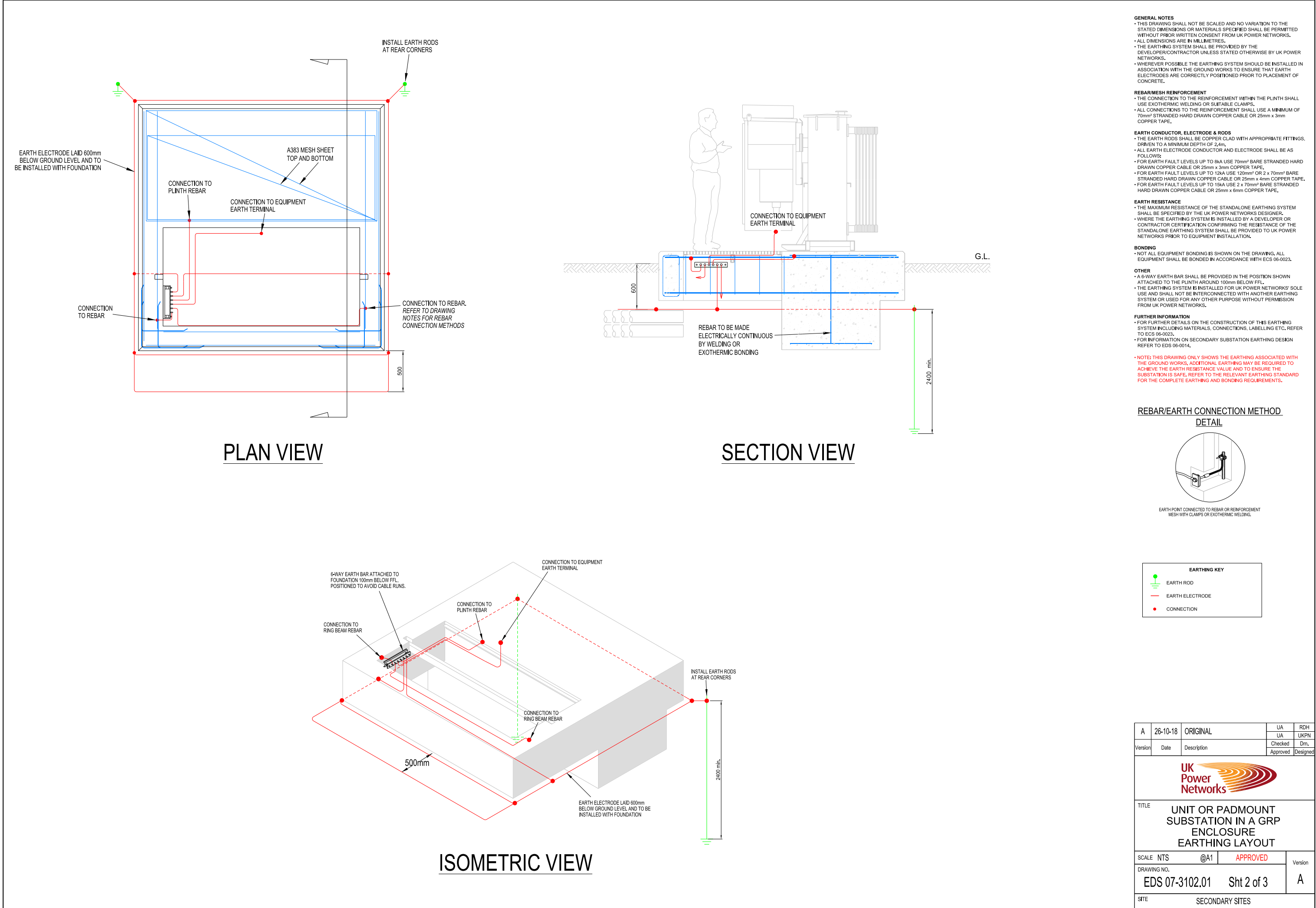


C	26-10-18	Design revised to show 1500kVA transformer	UA	RDH
B	05-01-18	Equipment positioning dimension added.	UA	RDH
A	09-08-17	ORIGINAL	UA	UKPN
Version	Date	Description	Checked	Dm.
			Approved	Designed

TITLE

UNIT OR PADMOUNT SUBSTATION IN A GRP ENCLOSURE CIVIL LAYOUT

SCALE	NTS	@A1	APPROVED	Version
DRAWING NO.	EDS 07-3102.01			Sht 1 of 3
SITE	SECONDARY SITES			



GENERAL NOTES

- THIS DRAWING SHALL NOT BE SCALED AND NO VARIATION TO THE STATED DIMENSIONS OR MATERIALS SPECIFIED SHALL BE PERMITTED WITHOUT PRIOR WRITTEN CONSENT FROM UK POWER NETWORKS.
- ALL DIMENSIONS ARE IN MILLIMETRES.
- THE EARTHING SYSTEM SHALL BE PROVIDED BY THE DEVELOPER/CONTRACTOR UNLESS STATED OTHERWISE BY UK POWER NETWORKS.
- WHEREVER POSSIBLE THE EARTHING SYSTEM SHOULD BE INSTALLED IN ASSOCIATION WITH THE GROUND WORKS TO ENSURE THAT EARTH ELECTRODES ARE CORRECTLY POSITIONED PRIOR TO PLACEMENT OF CONCRETE.

REBAR/MESH REINFORCEMENT

- THE CONNECTION TO THE REINFORCEMENT WITHIN THE PLINTH SHALL USE EXOTHERMIC WELDING OR SUITABLE CLAMPS.
- ALL CONNECTIONS TO THE REINFORCEMENT SHALL USE A MINIMUM OF 70mm² STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.

EARTH CONDUCTOR, ELECTRODE & RODS

- THE EARTH RODS SHALL BE COPPER CLAD WITH APPROPRIATE FITTINGS, DRIVEN TO A MINIMUM DEPTH OF 2.4m.
- ALL EARTH ELECTRODE CONDUCTOR AND ELECTRODE SHALL BE AS FOLLOWS:
 - FOR EARTH FAULT LEVELS UP TO 8kA USE 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.
 - FOR EARTH FAULT LEVELS UP TO 12kA USE 120mm² OR 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 4mm COPPER TAPE.
 - FOR EARTH FAULT LEVELS UP TO 15kA USE 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 6mm COPPER TAPE.

EARTH RESISTANCE

- THE MAXIMUM RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE SPECIFIED BY THE UK POWER NETWORKS DESIGNER.
- WHERE THE EARTHING SYSTEM IS INSTALLED BY A DEVELOPER OR CONTRACTOR CERTIFICATION CONFIRMING THE RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE PROVIDED TO UK POWER NETWORKS PRIOR TO EQUIPMENT INSTALLATION.

BONDING

- NOT ALL EQUIPMENT BONDING IS SHOWN ON THE DRAWING. ALL EQUIPMENT SHALL BE BONDED IN ACCORDANCE WITH ECS 06-0023.

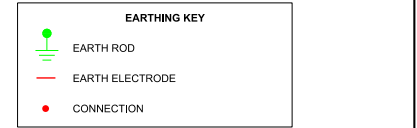
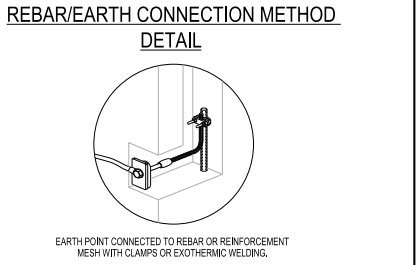
OTHER

- A 6-WAY EARTH BAR SHALL BE PROVIDED IN THE POSITION SHOWN ATTACHED TO THE PLINTH AROUND 100mm BELOW FFL.
- THE EARTHING SYSTEM IS INSTALLED FOR UK POWER NETWORKS' SOLE USE AND SHALL NOT BE INTERCONNECTED WITH ANOTHER EARTHING SYSTEM OR USED FOR ANY OTHER PURPOSE WITHOUT PERMISSION FROM UK POWER NETWORKS.

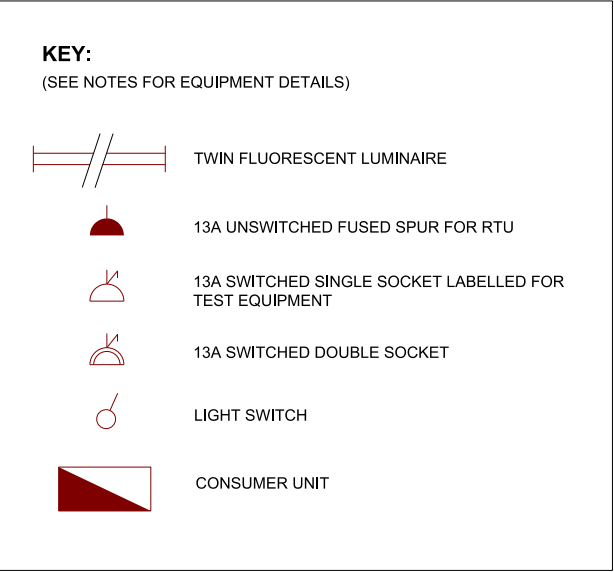
FURTHER INFORMATION

- FOR FURTHER DETAILS ON THE CONSTRUCTION OF THIS EARTHING SYSTEM INCLUDING MATERIALS, CONNECTIONS, LABELLING ETC. REFER TO ECS 06-0023.
- FOR INFORMATION ON SECONDARY SUBSTATION EARTHING DESIGN REFER TO EDS 06-0014.

NOTE: THIS DRAWING ONLY SHOWS THE EARTHING ASSOCIATED WITH THE GROUND WORKS, ADDITIONAL EARTHING MAY BE REQUIRED TO ACHIEVE THE EARTH RESISTANCE VALUE AND TO ENSURE THE SUBSTATION IS SAFE. REFER TO THE RELEVANT EARTHING STANDARD FOR THE COMPLETE EARTHING AND BONDING REQUIREMENTS.

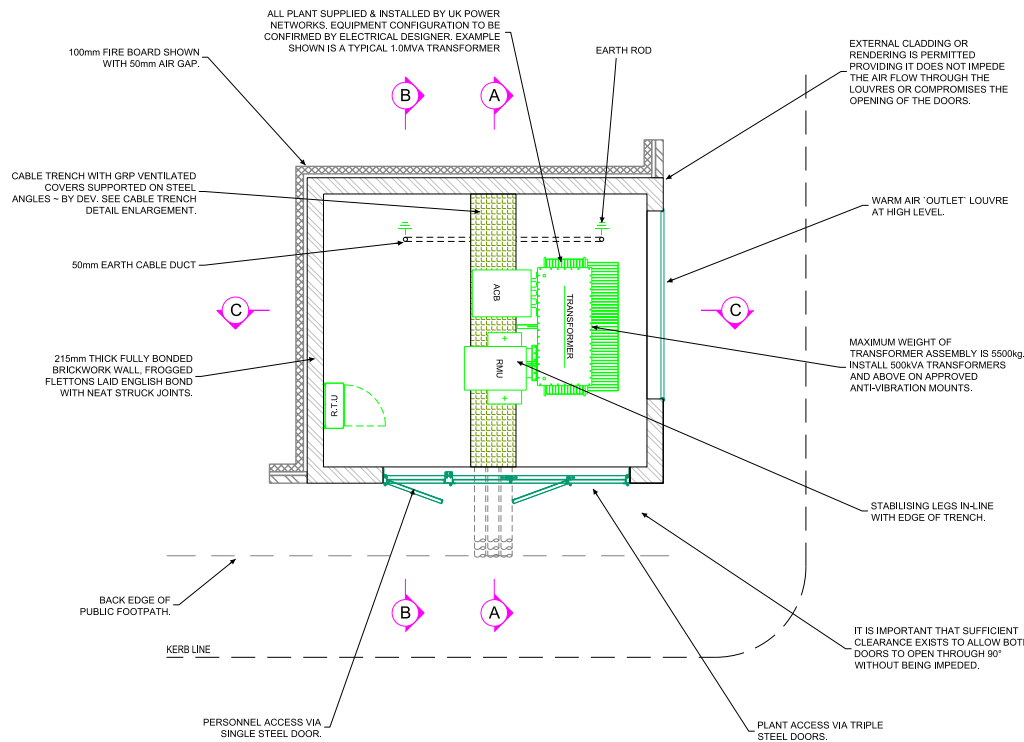


A	26-10-18	ORIGINAL	UA	RDH
Version	Date	Description	Checked	UKN
			Approved	Dm.
				Designed
TITLE UNIT OR PADMOUNT SUBSTATION IN A GRP ENCLOSURE EARTHING LAYOUT				
SCALE	NTS	@A1	APPROVED	Version
DRAWING NO.	EDS 07-3102.01	Sht 2 of 3		A
SITE	SECONDARY SITES			

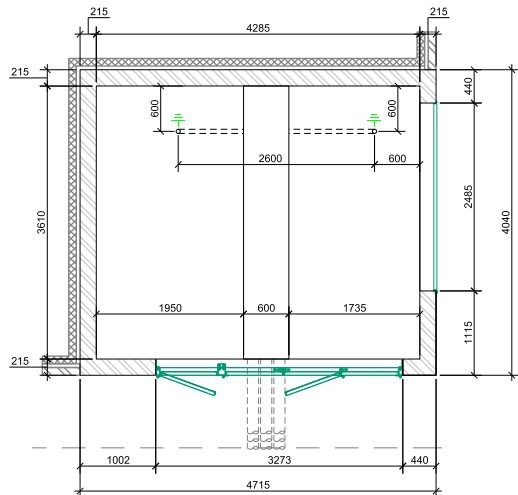


- TESTING AND CERTIFICATION**
- UPON COMPLETION OF THE WORKS, THE INSTALLATION SHALL BE TESTED IN ACCORDANCE WITH BS 7671, AN ELECTRICAL INSTALLATION CERTIFICATE TOGETHER WITH A SCHEDULE OF TEST RESULTS AS DETAILED IN BS 7671 SHALL BE FORWARDED TO UK POWER NETWORKS.

			
TITLE UNIT OR PADMOUNT SUBSTATION IN A GRP ENCLOSURE SMALL POWER & LIGHTING			
SCALE	NTS	@A1	APPROVED
DRAWING NO. EDS 37-3102.01			Version A
SITE SECONDARY SITES			



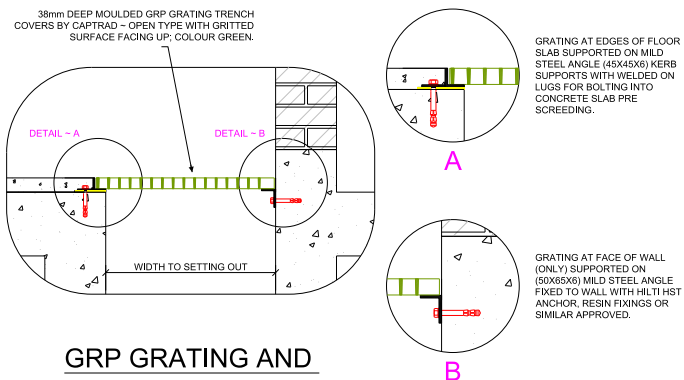
SUBSTATION ~ GENERAL ARRANGEMENT PLAN



SETTING OUT DIMENSIONS

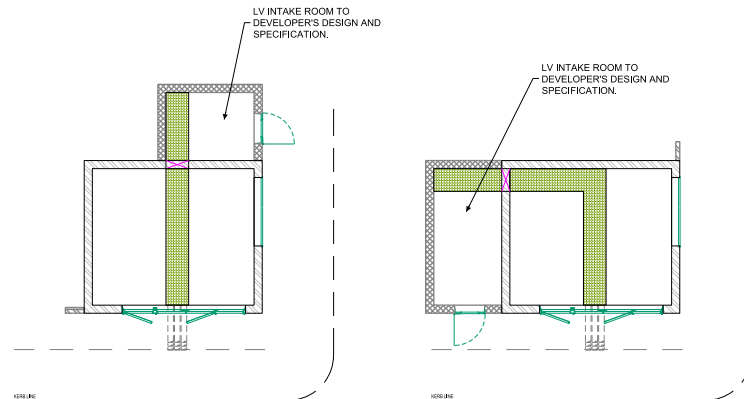
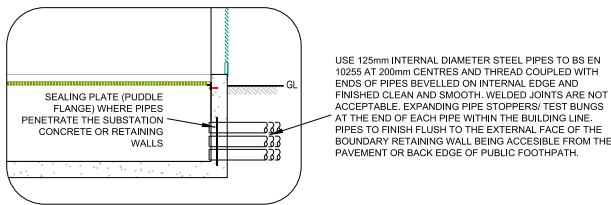
PROPOSED SUBSTATION
LOCATION TO BE ADVISED
BY DEVELOPER AND
AGREED WITH UK POWER
NETWORKS PRIOR TO
CONSTRUCTION

LOCATION PLAN

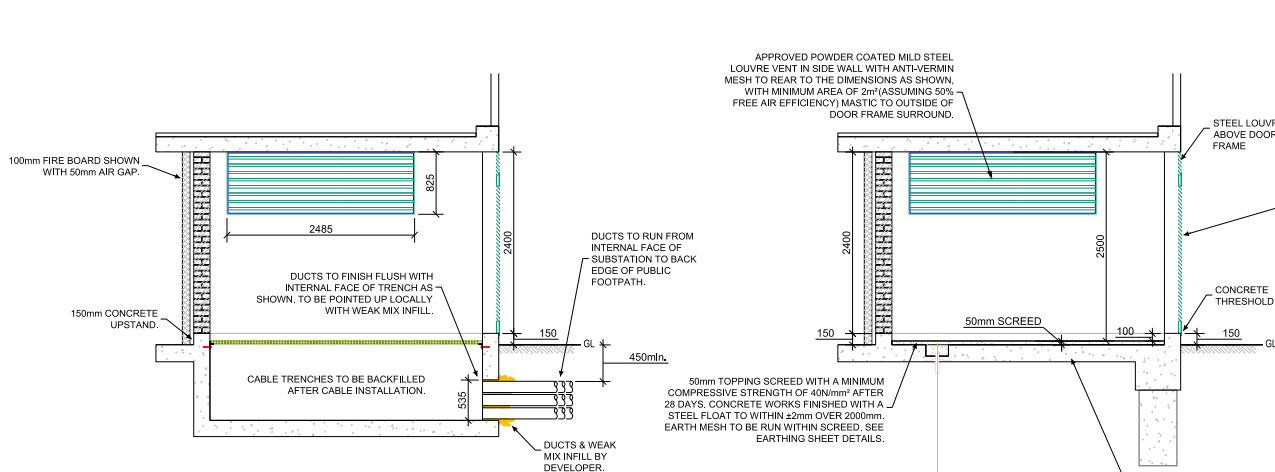


GRP GRATING AND
STEELWORK DETAIL

ALTERNATIVE CABLE ENTRY
USING STEEL PIPES
(For cable entries passing through and cast-in to RC)

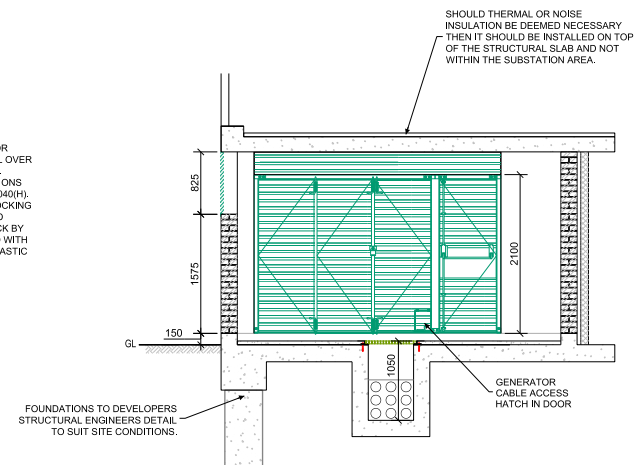


ALTERNATIVE SERVICE INTAKE POSITIONS



SECTION A~A

SECTION B~B



SECTION C~C

GENERAL NOTES

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- THE RUNNING OF SPRINKLER SYSTEM, HEATING, GAS, TELECOMS, WATER AND OTHER SERVICES THROUGH OR UNDER THE SUBSTATION AREA IS NOT PERMITTED.
- WORKMANSHIP AND MATERIALS TO CONFORM TO THE LATEST EDITION OF THE RELEVANT CODES OF PRACTICE OR BRITISH STANDARD AND EUROCODES.
- LOCATION OF THE SITE SHALL BE OVERLAID ON THE ORDNANCE SURVEY MAP AND ADDED ONTO THE PROJECT SPECIFIC DRAWING.

PLANNING, LOCATION AND POSITION

- POSITION AND ORIENTATION OF THE SUBSTATION SHALL BE AGREED WITH UK POWER NETWORKS PRIOR TO THE COMMENCEMENT OF ANY BUILDING WORKS ON SITE.
- SUBSTATIONS SHALL BE LOCATED ADJACENT TO A PUBLIC HIGHWAY OR REACHED BY A PRIVATE DEDICATED ACCESS WAY WITH FULL CONTROL AND ASSOCIATED LEGAL RIGHTS.
- THE DEVELOPER IS RESPONSIBLE FOR OBTAINING ALL PLANNING CONSENTS AND BUILDING REGULATION APPROVALS.
- UNIMPEDED ACCESS FOR UK POWER NETWORKS PERSONNEL IS REQUIRED AT ALL TIMES. 365 DAYS OF THE YEAR (24/7). ANY DOORS OR GATES ON THE ACCESS ROUTE SHALL BE LOCKED WITH THE STANDARD UK POWER NETWORKS LOCKING SUITE.
- ACCESS VIA 24 HOUR SECURITY IS UNACCEPTABLE.
- PROPOSED SOFT LANDSCAPING ADJACENT TO THE SUBSTATION (E.G. PLANTING SCHEMES) SHALL ALLOW FOR FUTURE PLANT GROWTH WITHOUT COMPROMISING ACCESS OR VENTILATION THROUGH DOORS AND LOUVRES.

FOUNDATIONS AND REINFORCED CONCRETE

- AS STATED ON DRAWING OR TO SUIT THE SITE CONDITIONS.
- SUFFICIENT COVER TO THE REINFORCEMENT TO ACHIEVE A 4 HOUR FIRE RATING (50mm MINIMUM).

FLOOR SLAB

- TO THE STRUCTURAL ENGINEER'S SPECIFICATIONS TO SUSTAIN THE LOADS SHOWN. THE ENTIRE ACCESS ROUTE IS TO BE CAPABLE OF SUSTAINING THIS LOAD.
- STANDARD FLOOR SLAB THICKNESS OF 225mm MINIMUM REINFORCED CONCRETE WITH A SUITABLE WEARING SCREED WITH A MINIMUM COMPRESSIVE STRENGTH OF 40N/mm² AFTER 28 DAYS. CONCRETE WORKS FINISHED WITH A STEEL FLOAT TO WITHIN 42mm OVER 2000mm.
- REINFORCEMENT TO DEVELOPER'S STRUCTURAL ENGINEER REQUIREMENTS.

ROOF

- 180mm MINIMUM NORMAL DENSITY REINFORCED CONCRETE OR GREATER TO SUIT THE SPAN WITH SUFFICIENT CONCRETE COVER TO REINFORCEMENT TO ACHIEVE A 4 HOUR FIRE RATING.
- HOLLOW BEAMS, PRECAST PLANKS OR LIGHTWEIGHT CONCRETE ON METAL DECKING OR SIMILAR WILL NOT BE PERMITTED.
- REINFORCEMENT TO DEVELOPER'S STRUCTURAL ENGINEER REQUIREMENTS.

WALLS

- OPTION 1: 215mm FULLY BONDED BRICKWORK. FROGGED FLETTONS CONSTRUCTED IN ENGLISH BOND WITH NEAT STRUCK JOINTS. WALLS TO BE FAIR FACED ON THE INSIDE.
- OPTION 2: TWO SKINS OF BRICKWORK LAID WITH E.M.L. HORIZONTAL BED JOINT REINFORCEMENT EVERY 3' COURSE WITH NO CAVITY. INNER SKIN TO BE OF COMMON FLETTONS. EXTERNAL SKIN TO HARMONISE WITH ADJACENT BRICKWORK.
- OPTION 3: 180mm MIN. RC CONCRETE WITH SUFFICIENT CONCRETE COVER TO REINFORCEMENT TO ACHIEVE A 4 HOUR FIRE RATING.
- ENGINEERING BRICK OR BLOCK ARE NOT PERMITTED.
- PROVIDING THAT NON-COMBUSTIBLE MATERIAL IS USED, BRICKWORK WALLS MAY BE RENDERED OR CLAD EXTERNALLY IF SPECIFICALLY REQUIRED BY THE PLANNING CONDITIONS.

DOORS AND VENTS

- ONLY UK POWER NETWORKS APPROVED ITEMS SHALL BE FITTED.
- SEE NOTES ON DRAWING FOR DOOR SPECIFICATION.

CABLE ENTRIES

- 125mm INTERNAL DIAMETER TWIN WALLED HIGH DENSITY POLYETHYLENE DUCTING TO ESI 12-24 OR BS EN 61386.
- TO BE LAID FLAT AND LEVEL. NO BENDS ARE PERMITTED.
- TO BE CLEAR OF ANY UTILITY SERVICES/PIPS/ VAULTS, ETC.

WATERPROOFING

- WHOLE OF THE SWITCHROOM MUST BE IMPERVIOUS TO THE INGRESS OF WATER.

FINISHES

- FLOOR TO RECEIVE TWO COATS OF GREY CONCRETE FLOOR PAINT.
- WALLS AND CEILINGS TO RECEIVE TWO COATS OF WHITE EMULSION.
- APPROVED DOORS AND VENTS TO RECEIVE POWER COATED FINISH. STANDARD COLOUR GREEN 14-C-39 OR DEVELOPER TO SPECIFY THE COLOUR TO HARMONISE WITH THE ADJACENT PREMISES AND ADVISE THE MANUFACTURER.

INFILL TO AREA AROUND CABLES

- AFTER CABLE INSTALLATION, SEAL ALL CABLE DUCTS, FILL TRENCHES WITH SAND WITH 100mm ABOVE TOP DUCT AND TO A MINIMUM OF 500mm BELOW THE TOP OF GRATINGS.

GRP GRATINGS AND SUPPORTS

- 38mm DEEP MOULDED GRP GRATINGS. OPEN TYPE WITH GRITTED SURFACE, GREEN.
- GRATINGS SHALL BE SEATED LEVEL WITH NO NOTICEABLE ROCKING OR SLIDING AND SHALL BE LEFT IN POSITION.
- CUT OFF OPENINGS FOR CABLE PENETRATIONS ENSURING THE GRATINGS CAN BE REMOVED WITH CABLES IN-SITU WHILE STILL REMAINING STABLE.
- STEELWORK FOR GRP GRATING SUPPORTS SHALL BE GALVANISED.

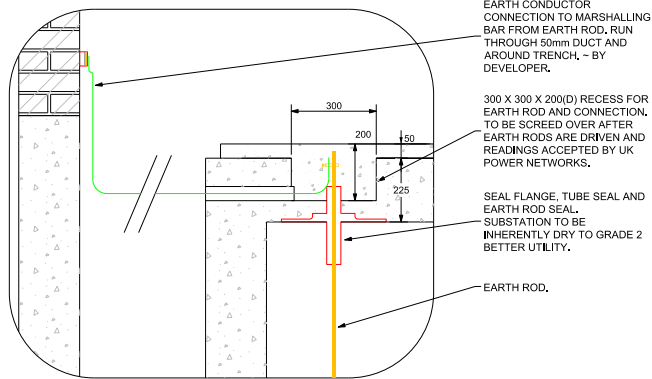
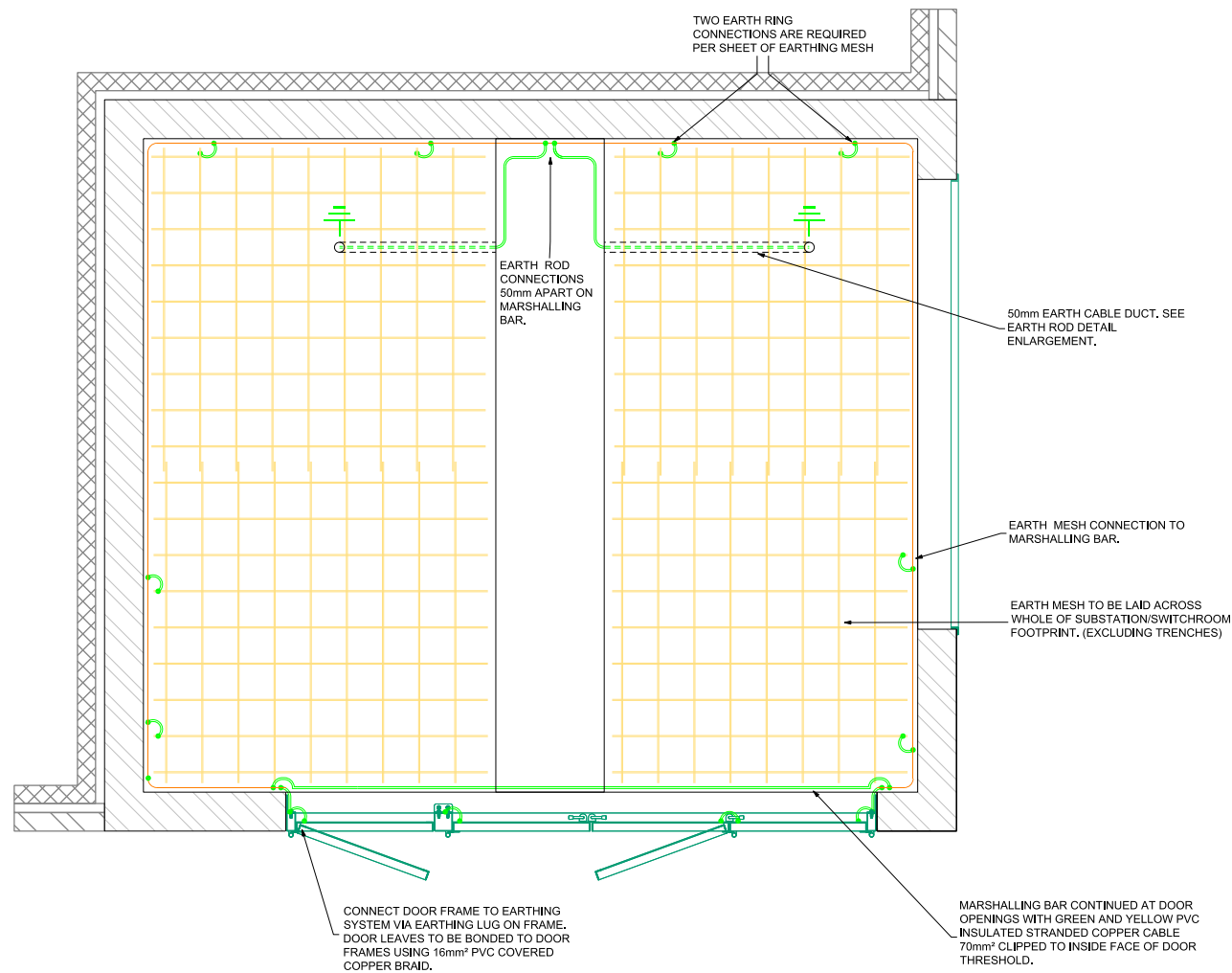
REFERENCES

SHEET 2	EARTHING LAYOUT
SHEET 3	SMALL POWER AND LIGHTING
EAS 07-0000	APPROVED EQUIPMENT LIST - CIVIL
EAS 02-0000	APPROVED EQUIPMENT LIST - CABLES & DUCTS
EDS 07-1119	SUBSTATION ELECTRICAL SERVICES
EDS 07-3101	PRE-DESIGN REQUIREMENTS FOR SECONDARY SUBSTATIONS
EDS 07-3102	SECONDARY SUBSTATION CIVIL DESIGN STANDARD

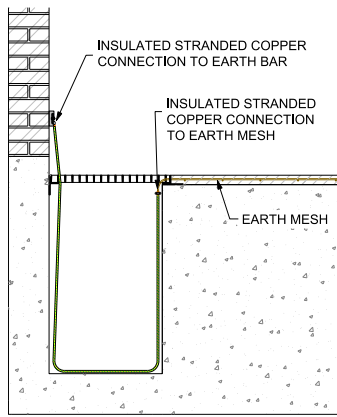
C	26-10-18	Revised doors and louvres. Earth ducts and rods revised.	UA	RDH
B	05-01-18	Title amended. Notes revised.	UA	RDH
A	09-08-17	ORIGINAL	UA	RDH
Version	Date	Description	Checked	Dm.
			Approved	Designed



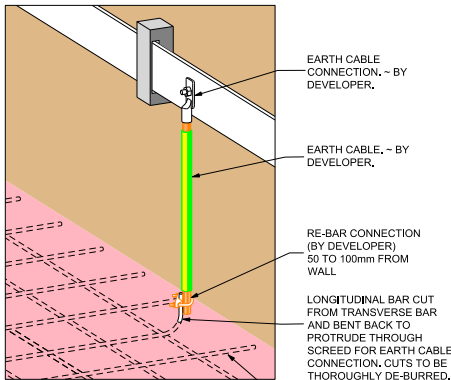
TITLE				
INTEGRAL SUBSTATION FOR A SINGLE TRANSFORMER UP TO 1500kVA				
CIVIL LAYOUT				
SCALE	NTS	@A1	APPROVED	Version
DRAWING NO.	EDS 07-3102.20	Sheet 1 of 3	C	
SITE	SECONDARY SITES			



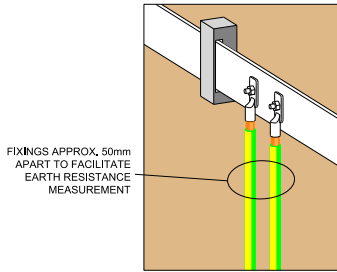
EARTH ROD DETAIL



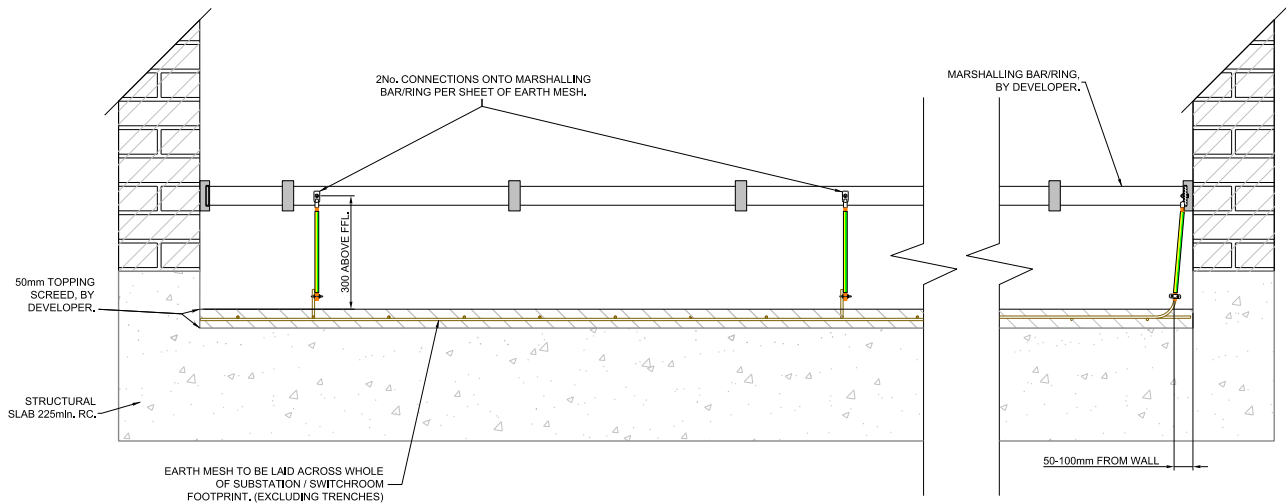
EARTH MESH CONNECTION
ACROSS TRENCH



EARTH MESH
CONNECTION DETAIL



EARTH ROD CONNECTION
TO EARTH BAR/RING



TYPICAL SECTION SHOWING EARTH MESH
AND CONNECTIONS TO MARSHALLING BAR

GENERAL NOTES

THIS DRAWING SHALL NOT BE SCALED AND NO VARIATION TO THE STATED DIMENSIONS OR MATERIALS SPECIFIED SHALL BE PERMITTED WITHOUT PRIOR WRITTEN CONSENT FROM UK POWER NETWORKS.

ALL DIMENSIONS ARE IN MILLIMETRES.

THE EARTHING SYSTEM SHALL BE PROVIDED BY THE DEVELOPER/CONTRACTOR UNLESS STATED OTHERWISE BY UK POWER NETWORKS.

WHEREVER POSSIBLE THE EARTHING SYSTEM SHOULD BE INSTALLED IN ASSOCIATION WITH THE GROUND WORKS TO ENSURE THAT EARTH ELECTRODES ARE CORRECTLY POSITIONED PRIOR TO PLACEMENT OF CONCRETE.

EARTH MESH DESIGN

THE EARTHING DESIGN SHOULD INCLUDE A MESH LAID WITHIN A TOPPING SCREED TO CONTROL THE TOUCH VOLTAGE AROUND THE EQUIPMENT.

EARTH MESH TO BE INDEPENDENT OF THE OVERALL BUILDING REINFORCEMENT, LAYING IT WITHIN A TOPPING SCREED ACHIEVES THIS.

EARTH MESH TO BE LAID ACROSS THE WHOLE OF THE SUBSTATION / SWITCHROOM FOOTPRINT, (EXCLUDING TRENCHES); SIZE AND NUMBER OF SHEETS TO THE DEVELOPER'S / BUILDER'S DIRECTION.

2 NO. CONNECTIONS FROM EACH SHEET TO BE MADE DIRECTLY TO THE MARSHALLING BAR / RING AS SHOWN.

EARTH MESH SPECIFICATION

STEEL FABRIC REINFORCEMENT SQUARE MESH TO BS 4483. A393, A252, A193 AND A142 ARE ACCEPTABLE.

EARTH MESH/MARSHALLING BAR/RING CONNECTION

ROD TO CABLE CLAMP TO BS 7430 OR EXOTHERMIC WELD. 70mm² GREEN AND YELLOW PVC COVERED STRANDED COPPER CABLE. COMPRESSION CRIMP CONNECTOR AND BOLTED ONTO MARSHALLING BAR/RING.

MARSHALLING BAR/RING

40mm x 6mm ALUMINIUM TAPE, 300mm ABOVE FFL, FIXED WITH 50mm x 6mm PLASTIC DC TAPE CLIPS AND RUN CONTINUOUSLY AROUND PERIMETER WALLS OF SUBSTATIONS/SWITCHROOM.

SCREED

50mm-100mm WITH A MINIMUM COMPRESSIVE STRENGTH OF 40N/mm² AFTER 28 DAYS. STEEL FLOAT FINISH TO ±2mm OVER 2000mm. NOTE: 50mm SUITS DEPTH OF TRENCH SUPPORT ANGLES IF PRESENT.

EARTH ELECTRODE

THE EARTH RODS SHALL BE COPPER CLAD WITH APPROPRIATE FITTINGS, DRIVEN TO A MINIMUM DEPTH OF 2.4m.

THE EARTH ELECTRODE SHALL BE AS FOLLOWS:

- FOR EARTH FAULT LEVELS UP TO 8kA USE 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 12kA USE 120mm² OR 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 4mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 15kA USE 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 6mm COPPER TAPE.

EARTH RESISTANCE

THE MAXIMUM RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE SPECIFIED BY THE UK POWER NETWORKS DESIGNER.

WHERE THE EARTHING SYSTEM IS INSTALLED BY A DEVELOPER OR CONTRACTOR CERTIFICATION CONFIRMING THE RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE PROVIDED TO UK POWER NETWORKS PRIOR TO EQUIPMENT INSTALLATION.

BONDING

NOT ALL EQUIPMENT BONDING IS SHOWN ON THE DRAWING. ALL EQUIPMENT SHALL BE BONDED IN ACCORDANCE WITH ECS 06-0023.

OTHER

STEEL DOORS SHALL BE BONDED TO THE EARTHING SYSTEM AS FOLLOWS:

- DOOR LEAVES TO DOOR FRAMES USING MINIMUM 16mm² COPPER BRAID.
- DOOR FRAME SURROUND TO EARTHING SYSTEM VIA EARTHING LUG ON FRAME USING MINIMUM 16mm² PVC COVERED STRANDED COPPER CABLE.

THE EARTHING SYSTEM IS INSTALLED FOR UK POWER NETWORKS' SOLE USE AND SHALL NOT BE INTERCONNECTED WITH ANOTHER EARTHING SYSTEM OR USED FOR ANY OTHER PURPOSE WITHOUT PERMISSION FROM UK POWER NETWORKS.

FURTHER INFORMATION

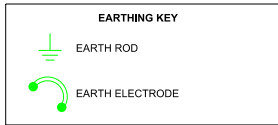
FOR FURTHER DETAILS ON THE CONSTRUCTION OF THIS EARTHING SYSTEM INCLUDING MATERIALS, CONNECTIONS, LABELLING ETC. REFER TO ECS 06-0023.

FOR INFORMATION ON SECONDARY SUBSTATION EARTHING DESIGN REFER TO EDS 06-0014.

THE EARTHING MESH PRINCIPLES MAY BE APPLIED TO SIMILAR SUBSTATIONS WHICH DIFFER IN SHAPE AND SIZE WITHOUT THE NEED FOR A SITE SPECIFIC EARTHING DRAWING.

NOTE: THIS DRAWING ONLY SHOWS THE EARTHING ASSOCIATED WITH THE GROUND WORKS. ADDITIONAL EARTHING MAY BE REQUIRED TO ACHIEVE THE EARTH RESISTANCE VALUE AND TO ENSURE THE SUBSTATION IS SAFE. REFER TO THE RELEVANT EARTHING STANDARD FOR THE COMPLETE EARTHING AND BONDING REQUIREMENTS.

THE MESH EARTHING DESIGN AS SHOWN IS ONLY SUITABLE FOR SUBSTATIONS WITH AN EPR (EARTH POTENTIAL RISE) BELOW 430V (COLD SITE). IF THIS DESIGN IS TO BE USED FOR SUBSTATIONS WITH AN EPR ABOVE 430V THEN ADDITIONAL EXTERNAL EARTHING IS REQUIRED TO CONTROL THE TOUCH AND STEP VOLTAGES.

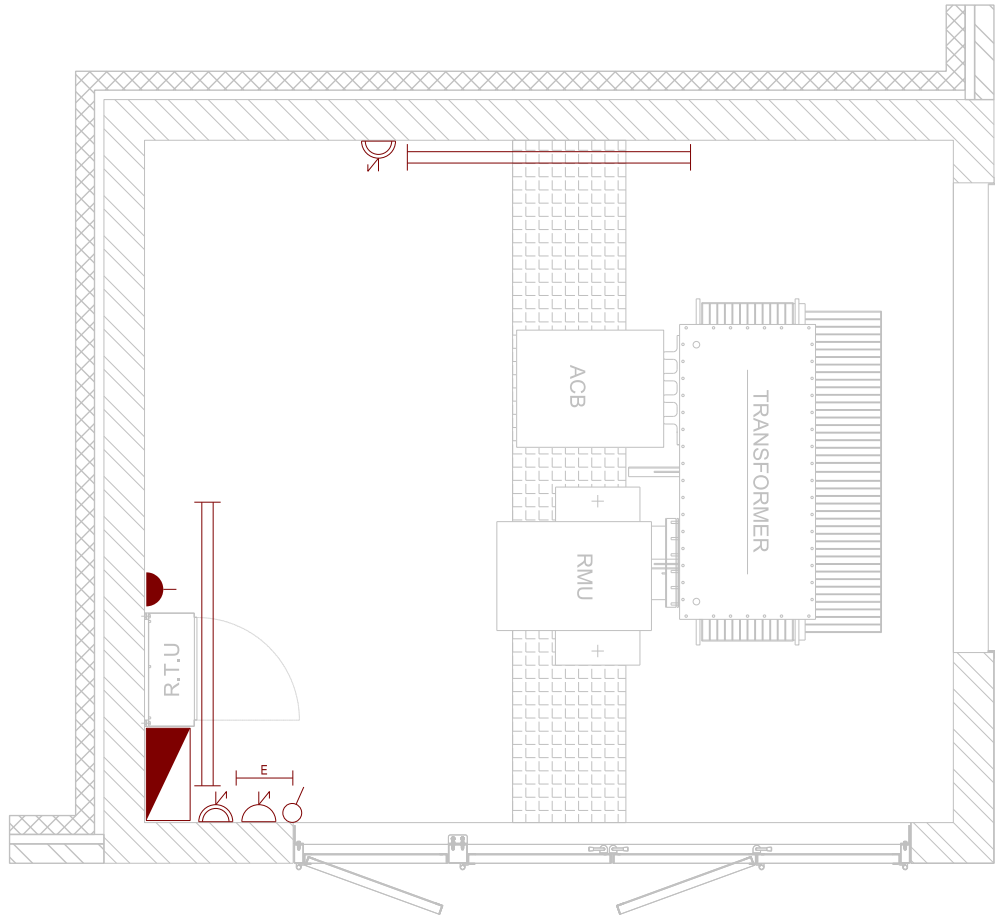


Version	Date	Description	Checked	Approved	Designed
A	26-10-18	ORIGINAL	UA	RDH	UKPN



TITLE
INTEGRAL SUBSTATION FOR A SINGLE TRANSFORMER UP TO 1500kVA
EARTHING LAYOUT

SCALE	NTS	@A1	APPROVED	Version
DRAWING NO.	EDS 07-3102.20	Sheet 2 of 3	A	
SITE	SECONDARY SITES			



KEY:
(SEE NOTES FOR EQUIPMENT DETAILS)

- TWIN FLUORESCENT LUMINAIRE
- EMERGENCY SELF CONTAINED LUMINAIRE
- 13A UNSWITCHED FUSED SPUR FOR RTU
- 13A SWITCHED SINGLE SOCKET LABELLED FOR TEST EQUIPMENT
- 13A SWITCHED DOUBLE SOCKET
- LIGHT SWITCH
- CONSUMER UNIT

GENERAL NOTES

- THE LIGHTING AND POWER REQUIREMENTS ARE SUMMARISED BELOW, REFER TO EDS 07-1119 FOR FURTHER DETAILS.
- ALL WORK AND TESTING SHALL BE CARRIED OUT BY SUITABLY COMPETENT OPERATIVES IN ACCORDANCE WITH BS 7671.
- ALL ACCESSORIES AND ACCESSORY MOUNTING BOXES OR ENCLOSURES SHALL BE IP56 SURFACE MOUNTED FROM THE MK MASTERSEAL RANGE OR EQUIVALENT.

POWER SUPPLY OPTIONS

- MINIMUM 4mm² SWA FROM THE LV CABINET/BOARD 32A AUXILIARY SUPPLY TERMINALS OR 35mm² SERVICE FROM LV PILLAR OR LV DISTRIBUTION NETWORK, ALL SUPPLIES SHALL BE TERMINATED IN A 100A CUT-OUT FUSED AT 30A.

DISTRIBUTION BOARD

- THE DISTRIBUTION BOARD SHALL BE A TYPE IP56 WITH A MINIMUM OF 5 WAYS AND INCLUDE:
 - A 100A/125A DOUBLE-POLE (PHASE AND NEUTRAL) DISCONNECTOR WITH 15KA BREAKING CAPACITY (TO BS EN 60947).
 - RCBOS (TO BS EN 61009-1) AND MCBS (TO BS EN 60898-2) WITH 15KA BREAKING CAPACITY.
 - 16/20A RCBO FOR THE 13A SOCKET OUTLET CIRCUIT.
 - 16A MCB FOR THE TEST EQUIPMENT 13A SOCKET OUTLET.
 - 6/10A MCB FOR THE LIGHTING CIRCUIT.
 - 6A MCB FOR EACH RTU OR PLTU (IF INSTALLED).
 - A SPARE WAY COMPLETE WITH BLANKING PLATE FOR FUTURE USE.
- THE DISTRIBUTION BOARD SHALL BE MOUNTED AT A HEIGHT OF 1350mm TO 1450mm ABOVE FINISHED FLOOR LEVEL.

INTERNAL LIGHTING

- THE SUBSTATION SHALL HAVE A MINIMUM LUMINANCE OF 300 LUX IN ACCORDANCE WITH HSE HSG38 PROVIDED BY A MINIMUM OF TWO LIGHT FITTINGS ON OPPOSITE SIDES OF THE SUBSTATION.
- THE LIGHT FITTINGS SHALL BE POSITIONED TO AVOID SHADOWS WHEN EQUIPMENT DOORS ARE OPEN.
- ALL LIGHT FITTINGS SHALL BE MOUNTED AT A MAXIMUM HEIGHT OF 2200mm ABOVE FINISHED FLOOR LEVEL AND BE POSITIONED TO AID FUTURE MAINTENANCE, LIGHT FITTINGS SHALL NOT BE INSTALLED ABOVE AN LV BOARD.
- GENERAL PURPOSE LIGHT FITTINGS SHALL BE OF THE FLUORESCENT IMPACT AND CORROSION RESISTANT TYPE, CORROSION RESISTANT WITH A POLYCARBONATE PRISMATIC DIFFUSER (TO BS EN 60598-1) AND SHALL HAVE A MINIMUM DEGREE OF PROTECTION OF IP56, THE PREFERRED SIZE IS A 1500mm TWIN LAMP FITTING.
- LIGHT FITTINGS SHALL BE FITTED WITH 35W OR 49W T5 OR T16 LINEAR FLUORESCENT TUBES OF THE HIGH FREQUENCY ENERGY EFFICIENT TYPE (TO BS EN 60081) OR EQUIVALENT LED, ALL LAMPS SHALL HAVE CAPS OF THE 'BI' PIN TYPE AND A MINIMUM COLOUR TEMPERATURE OF 3500K (A WHITE APPEARANCE).
- LIGHT FITTINGS SHOULD BE CONNECTED VIA A PLUG IN ROSE (OR SIMILAR) TO AID FUTURE MAINTENANCE, A PROTECTIVE CONDUCTOR SHALL BE CONNECTED TO THE EARTH TERMINAL OF EACH FITTING.
- A SURFACE MOUNTED LIGHT SWITCH WITH NEON INDICATOR SHALL BE POSITIONED ADJACENT TO THE SUBSTATION DOOR. SUBSTATIONS WITH MULTIPLE POINTS OF ACCESS SHALL HAVE A LIGHT SWITCH ADJACENT TO EACH DOOR AND SHALL BE WIRED WITH 2-WAY LIGHTING.
- ALL LIGHT SWITCHES SHALL BE MOUNTED AT 1400mm ABOVE FINISHED FLOOR LEVEL.

EMERGENCY LIGHTING

- AN EMERGENCY LIGHT (TO BS EN 1838 AND BS 5266) SHALL BE PROVIDED AT EACH EXIT DOOR, AN ADDITIONAL EMERGENCY LIGHT SHALL BE INSTALLED WHERE THERE IS AN OPEN LV BOARD.
- EMERGENCY LIGHTS SHALL HAVE A MINIMUM LUMINANCE OF 1 LUX AND SHALL BE THE INTEGRAL, SELF-CONTAINED TYPE (TO BS EN 60598-2-22) INCORPORATING A FLUORESCENT LAMP (OR LED EQUIVALENT) AND A POLYCARBONATE DIFFUSER, THE RATED DURATION OF EMERGENCY LIGHTS SHALL BE 3 HOURS.
- ABOVE DOOR EMERGENCY LIGHTS SHALL INCLUDE AN EXIT LEGEND PLATE.
- LIGHT FITTINGS SHALL BE IP65 HEAVY DUTY 26W TC-T (OR EQUIVALENT LED) BULKHEAD TYPE CONSTRUCTED IN POLYCARBONATE WITH AN IMPACT RESISTANT POLYCARBONATE COVER, SEALED TO THE BODY WITH A SILICON RUBBER GASKET AND STAINLESS STEEL CAPTIVE FIXING SCREWS.
- ALL EXTERNAL LIGHTING SHALL BE CONTROLLED BY PHOTOELECTRIC CONTROL UNITS (TO BS 5972) AND PIR MOVEMENT DETECTORS.

POWER

- A MINIMUM OF TWO DOUBLE 13A SOCKET OUTLETS (TO BS 1363) SHALL BE INSTALLED ON OPPOSITE SIDES OF THE SUBSTATION.
- AN ADDITIONAL SINGLE 13A SOCKET OUTLET (TO BS 1363) SHALL BE INSTALLED, DESIGNATED AND LABELLED AS A 'TEST EQUIPMENT SOCKET' AND SUPPLIED VIA A SEPARATE MCB.
- ANY RTU/PLTU SHALL BE SUPPLIED BY AN UNSWITCHED FUSE CONNECTION UNIT (TO BS 1363) FUSED AT 5A AND INSTALLED ADJACENT TO THE EQUIPMENT.
- RADIAL CIRCUITS SHALL BE USED FOR ALL POWER CIRCUITS.
- ALL SMALL POWER ACCESSORIES SHOULD BE MOUNTED AT 1000mm ABOVE FINISHED FLOOR LEVEL.

CABLING

- ALL CABLES SHALL BE 6491B LS0H TO BS EN 50525-3-41 AND SHALL COMPLY WITH BASEC, ALL INSULATION SHALL USE PHASE OR NEUTRAL COLOURS THROUGHOUT THE LENGTH OF THE CONDUCTOR IN ACCORDANCE WITH BS 7671. NOTE: THE USE OF COLOURED SLEEVES TO MARK CONDUCTORS IS NOT ACCEPTABLE.
- ALL CABLES SHALL USE STRANDED COPPER CONDUCTORS WITH THE FOLLOWING MINIMUM CROSS SECTIONAL AREA:
 - CUT-OUT UNIT TAILS 25mm².
 - LIGHTING 1.5mm².
 - SMALL POWER 4.0mm².
- ALL CABLES, EXCEPT ARMoured CABLES AND CUT-OUT TAILS, SHALL BE ENCLOSED IN PLASTIC CONDUIT OR TRUNKING, THE TYPES AND SIZES SHALL BE SUITABLE FOR THE OPERATING CONDITIONS.
- ALL CABLES SHALL BE INSTALLED WITHOUT JOINTS OTHER THAN AT EQUIPMENT AND TERMINAL FITTINGS.

CONDUIT, TRUNKING AND TRAYS

- ALL CABLING SHALL BE INSTALLED IN MINIMUM 20mm CONDUIT SIZED IN ACCORDANCE BS 7671.
- ALL CONDUIT, BOXES AND FITTINGS SHALL BE HIGH IMPACT, NON-FLAME PROPAGATING, SELF-EXTINGUISHING, HEAVY-DUTY PVC CONDUIT (TO BS EN 61386-1), DIMENSIONS SHALL COMPLY WITH BS EN 60423.
- THERE SHALL BE SUFFICIENT JUNCTION BOXES, DRAW-IN BOXES AND INSPECTION FITTINGS INSTALLED TO ALLOW CABLES TO BE INSPECTED, WITHDRAWN AND REPLACED IF NECESSARY, THE COMPLETE INSTALLATION SHALL BE ARRANGED USING A LOOP-IN TYPE SYSTEM WITH JOINTS BEING CARRIED OUT AT SWITCHES, ISOLATORS OR APPLIANCE FITTINGS.
- ALL ADAPTABLE BOXES AND ACCESSORIES SHALL MATCH THE CONDUIT AND SHALL BE FITTED WITH EARTHING TERMINALS.
- JOINTS BETWEEN CONDUITS MAY BE PUSH-FIT, COMPRESSION, MECHANICAL LOCKING OR SOCKET-END SEALED WITH PVC ADHESIVE, WHERE A WEATHERPROOF OR WATERTIGHT CONNECTION IS REQUIRED PUSH-FIT ARRANGEMENT ALONE IS NOT ACCEPTABLE.
- ALL CONDUIT SHALL BE SECURED USING MATCHING DISTANCE SADDLES SPACED AT A MAXIMUM DISTANCE OF 750mm AND 200mm FROM ANY BEND, JOINT OR ACCESSORY, ALL BOXES AND ACCESSORIES SHALL BE SECURED INDEPENDENTLY.
- REFER TO EDS 07-0119 FOR TRUNKING AND CABLE TRAY REQUIREMENTS.

LABELLING

- ALL LABELLING SHALL COMPLY WITH BS 7671.
- ALL DISTRIBUTION BOARD WAYS SHALL BE PERMANENTLY LABELLED TO IDENTIFY CIRCUIT FUNCTION, CABLE SIZE AND PROTECTIVE DEVICE RATING.

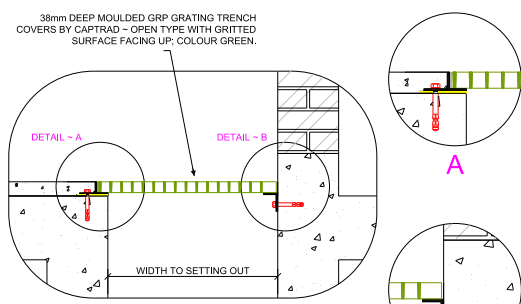
HOT SITES

- ALL SOCKETS SHALL BE DISCONNECTED OR REMOVED.
- ALL LIGHTING AND RTU SUPPLIES FROM AUXILIARY TERMINALS SHALL BE VIA AN ISOLATION TRANSFORMER.
- REFER TO ECS 06-0023 FOR FURTHER INFORMATION.

TESTING AND CERTIFICATION

- UPON COMPLETION OF THE WORKS, THE INSTALLATION SHALL BE TESTED IN ACCORDANCE WITH BS 7671, AN ELECTRICAL INSTALLATION CERTIFICATE TOGETHER WITH A SCHEDULE OF TEST RESULTS AS DETAILED IN BS 7671 SHALL BE FORWARDED TO UK POWER NETWORKS.

A	26-10-18	ORIGINAL	UA	RDH
Version	Date	Description	Checked	Dm.
			Approved	Designed
UK Power Networks 				
TITLE				
INTEGRAL SUBSTATION FOR A SINGLE TRANSFORMER UP TO 1500kVA SMALL POWER & LIGHTING				
SCALE	NTS	@A1	APPROVED	Version
DRAWING NO. EDS 07-3102.20 Sheet 3 of 3				
SITE				A
SECONDARY SITES				



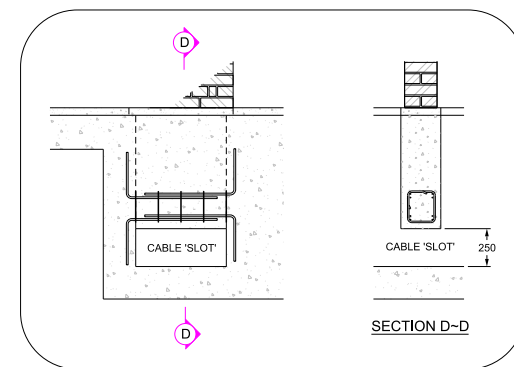
PROPOSED SUBSTATION
LOCATION TO BE ADVISED
BY DEVELOPER AND
AGREED WITH UK POWER
NETWORKS PRIOR TO
CONSTRUCTION

— N —

Diagram illustrating the correct installation of a sealing plate (puddle flange) where pipes penetrate the substation concrete or retaining walls. The diagram shows the sealing plate being installed around the pipes, with a label 'GL' indicating the ground level.

USE 125mm INTERNAL DIAMETER STEEL PIPES TO BS EN 10255 AT 200mm CENTRES AND THREAD COUPLED WITH ENDS OF PIPES BEVELLED ON INTERNAL EDGE AND FINISHED CLEAN AND SMOOTH. WELDED JOINTS ARE NOT ACCEPTABLE. EXPANDING PIPE STOPPERS/ TEST BUNGS AT THE END OF EACH PIPE WITHIN THE BUILDING ULE. PIPES TO FINISH FLUSH TO THE EXTERNAL FACE OF THE BOUNDARY RETAINING WALL BEING ACCESSIBLE FROM THE PAVEMENT OR BACK EDGE OF PUBLIC FOOTPATH.

(For cable entries passing through and cast-in to RC)



FIRE WALL SUPPORT DETAIL
REINFORCEMENT TO STRUCTURAL
ENGINEER'S DESIGN

APPROVED POWDER COATED MILD STEEL LOUVER VENT NEXT TO ACCESS DOOR WITH ANTI-VERMIN MESH TO REAR. MASTIC TO OUTSIDE OF DOOR FRAME SURROUND.

150mm CONCRETE UPSTAND

GL

50mm SCREED

2500

1050

600

600

APPROVED POWDER COATED MILD STEEL DOUBLE LOUVER DOOR WITH ANTI-VERMIN MESH TO REAR. THRESHOLD ELEVATIONS TO BE 225 MAX. +100mm MIN. EXTERNAL AND INTERNAL. TO THE DIMENSIONS AS SHOWN WITH MINIMUM CLEAR OPENING OF 1585(W) x 2100(H). ACTIVE LEAF TO BE RH AND FITTED WITH A 2 POINT LOCKING SYSTEM SECURED EXTERNALLY BY HASP & STAPLE AND OPERATED INTERNALLY BY BRITON PANIC BAR (PADLOCK BY UK POWER NETWORKS). MASTIC TO OUTSIDE FRAME SURROUND

PRECAST CONCRETE LINTEL

2100

2500

EDGE OF FIRE WALL

REINFORCED CONCRETE SUPPORT FOR FIRE WALL ACROSS TRENCH (SEE DETAIL)

GL

150

50

1050

600

600

250 'SLOT' FOR CABLES

CABLE BACK THEIR CONT INSTA NOTE

225mm THICK CONCRETE SLAB REINFORCED
WITH 2 LAYERS OF A393 MESH. 1 TOP &
BOTTOM LAID ON 1200 GAUGE POLYTHENE
SHEET DPM ON 50 CONC. BLINDING ON WELL
CONSOLIDATED LAYERS OF HARDCORE

100mm FIRE BOARD SHOWN WITH 50mm AIR GAP

50mm TOPPING SCREED WITH A MINIMUM COMPRESSIVE STRENGTH OF 40N/mm² AFTER 28 DAYS. CONCRETE WORKS FINISHED WITH A STEEL FLOAT TO WITHIN ±2mm OVER 2000mm. EARTH MESH TO BE RUN WITHIN SCREED. SEE EAKTSHING SHEET DETAILS.

1050

500

1050

500

FOUNDATIONS TO DEVELOPERS

GL

450mm.

DUCTS & WEAK MIX INFILL

GENERATOR CABLE ACCESS HATCH IN DOORS

SECTION C~C

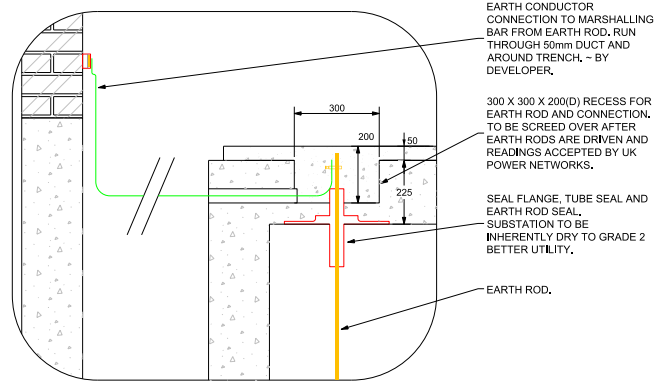
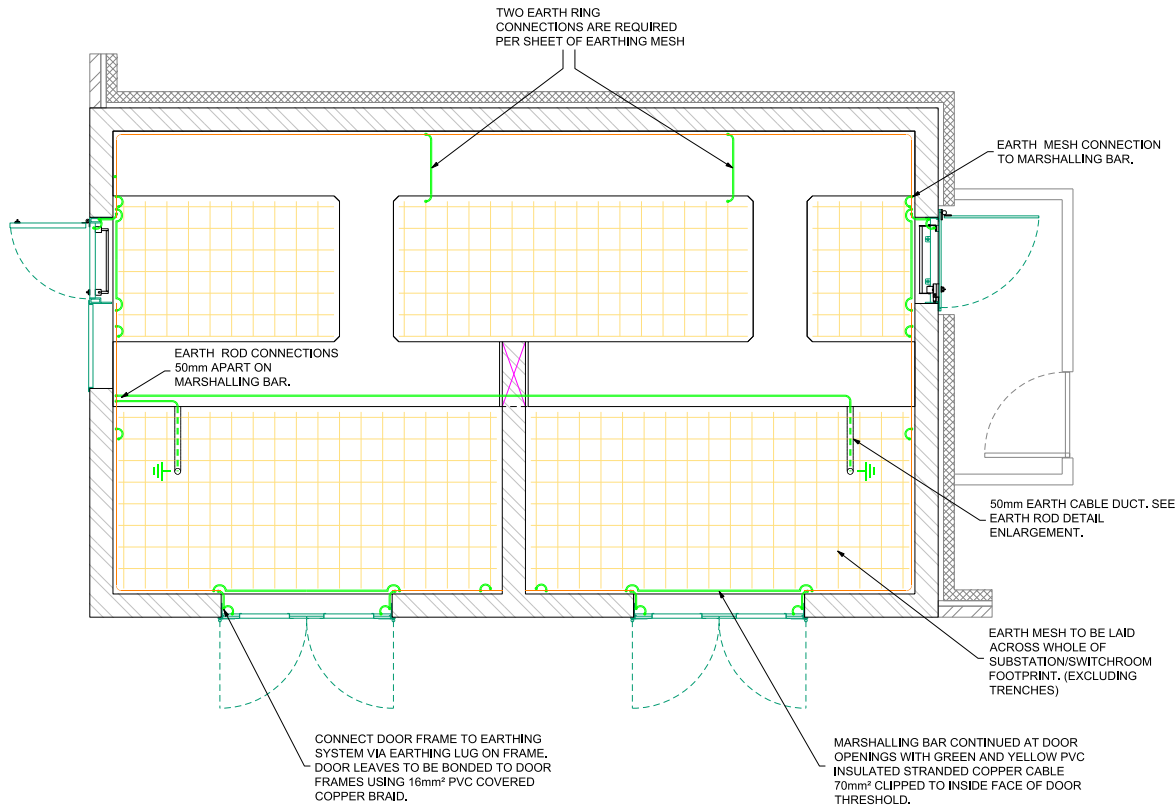
- | REFERENCES | |
|-------------|---|
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| SHEET 3 | SMALL POWER AND LIGHTING |
| EAS 07-0000 | APPROVED EQUIPMENT LIST - CIVIL |
| EAS 02-0000 | APPROVED EQUIPMENT LIST - CABLES & DUCTS |
| EDS 07-1119 | SUBSTATION ELECTRICAL SERVICES |
| EDS 07-3101 | PRE-DESIGN REQUIREMENTS FOR SECONDARY SUBSTATIONS |
| EDS 07-3102 | SECONDARY SUBSTATION CIVIL DESIGN STANDARD |

C	26-10-18	Drawing notes and earth rods revised.	UA	RDH
			UA	UKPN
B	05-01-18	LV trench depths increased to 1050mm. Title and notes revised.	UA	RDH
			UA	UKPN
A	09-08-17	ORIGINAL	UA	RDH
			UA	UKPN
Version	Date	Description	Checked	Dim.
			Approved	Design

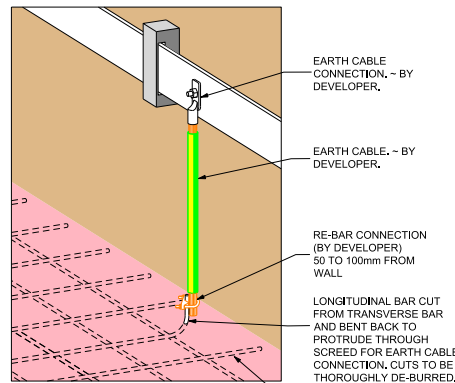


TITLE	INTEGRAL SUBSTATION FOR TWO TRANSFORMERS UP TO 1000kVA EACH CIVIL LAYOUT
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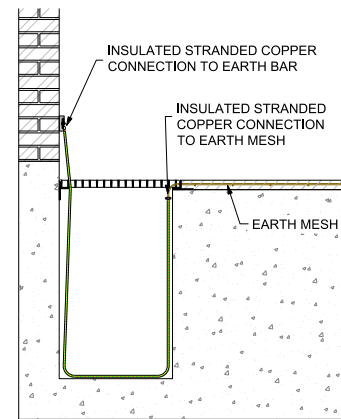
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DRAWING NO. EDS 07-3102.22 Sheet 1 of 3				
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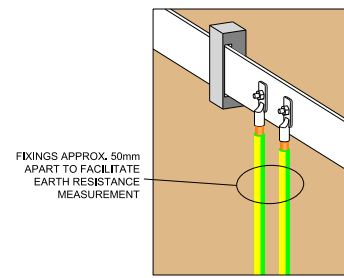
EARTH ROD DETAIL



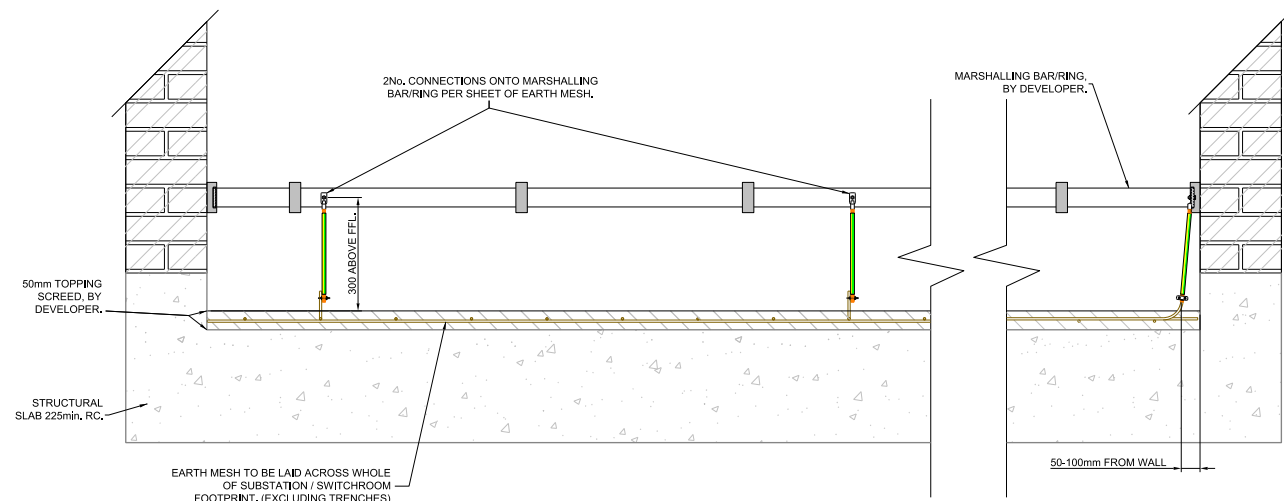
EARTH MESH CONNECTION DETAIL



EARTH MESH CONNECTION ACROSS TRENCH



EARTH ROD CONNECTION TO EARTH BAR/RING



TYPICAL SECTION SHOWING EARTH MESH AND CONNECTIONS TO MARSHALLING BAR

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EARTH MESH DESIGN

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EARTH MESH TO BE INDEPENDENT OF THE OVERALL BUILDING REINFORCEMENT, LAYING IT WITHIN A TOPPING SCREED ACHIEVES THIS.

EARTH MESH TO BE LAID ACROSS THE WHOLE OF THE SUBSTATION / SWITCHROOM FOOTPRINT, (EXCLUDING TRENCHES); SIZE AND NUMBER OF SHEETS TO THE DEVELOPER'S / BUILDER'S DIRECTION.

2 NO. CONNECTIONS FROM EACH SHEET TO BE MADE DIRECTLY TO THE MARSHALLING BAR / RING AS SHOWN.

EARTH MESH SPECIFICATION

STEEL FABRIC REINFORCEMENT SQUARE MESH TO BS 4483. A393, A252, A193 AND A142 ARE ACCEPTABLE.

EARTH MESH/MARSHALLING BAR/RING CONNECTION

ROD TO CABLE CLAMP TO BS 7430 OR EXOTHERMIC WELD. 70mm² GREEN AND YELLOW PVC COVERED STRANDED COPPER CABLE. COMPRESSION CRIMP CONNECTOR AND BOLTED ONTO MARSHALLING BAR/RING.

MARSHALLING BAR/RING

40mm x 6mm ALUMINIUM TAPE, 300mm ABOVE FFL, FIXED WITH 50mm x 6mm PLASTIC DC TAPE CLIPS AND RUN CONTINUOUSLY AROUND PERIMETER WALLS OF SUBSTATION/SWITCHROOM.

SCREED

50mm-100mm WITH A MINIMUM COMPRESSIVE STRENGTH OF 40N/mm² AFTER 28 DAYS. STEEL FLOAT FINISH TO 42mm OVER 2000mm. NOTE: 50mm SUITS DEPTH OF TRENCH SUPPORT ANGLES IF PRESENT.

EARTH ELECTRODE

THE EARTH RODS SHALL BE COPPER CLAD WITH APPROPRIATE FITTINGS, DRIVEN TO A MINIMUM DEPTH OF 2.4m.

THE EARTH ELECTRODE SHALL BE AS FOLLOWS:

- FOR EARTH FAULT LEVELS UP TO 8kA USE 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 3mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 12kA USE 120mm² OR 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 4mm COPPER TAPE.
- FOR EARTH FAULT LEVELS UP TO 15kA USE 2 x 70mm² BARE STRANDED HARD DRAWN COPPER CABLE OR 25mm x 6mm COPPER TAPE.

EARTH RESISTANCE

THE MAXIMUM RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE SPECIFIED BY THE UK POWER NETWORKS DESIGNER.

WHERE THE EARTHING SYSTEM IS INSTALLED BY A DEVELOPER OR CONTRACTOR CERTIFICATION CONFIRMING THE RESISTANCE OF THE STANDALONE EARTHING SYSTEM SHALL BE PROVIDED TO UK POWER NETWORKS PRIOR TO EQUIPMENT INSTALLATION.

BONDING

NOT ALL EQUIPMENT BONDING IS SHOWN ON THE DRAWING. ALL EQUIPMENT SHALL BE BONDED IN ACCORDANCE WITH ECS 06-0023.

OTHER

STEEL DOORS SHALL BE BONDED TO THE EARTHING SYSTEM AS FOLLOWS:

- DOOR LEAVES TO DOOR FRAMES USING MINIMUM 16mm² COPPER BRAID.
- DOOR FRAME SURROUND TO EARTHING SYSTEM VIA EARTHING LUG ON FRAME USING MINIMUM 16mm² PVC COVERED STRANDED COPPER CABLE.

THE EARTHING SYSTEM IS INSTALLED FOR UK POWER NETWORKS' SOLE USE AND SHALL NOT BE INTERCONNECTED WITH ANOTHER EARTHING SYSTEM OR USED FOR ANY OTHER PURPOSE WITHOUT PERMISSION FROM UK POWER NETWORKS.

FURTHER INFORMATION

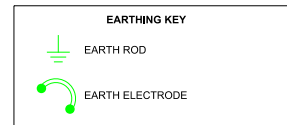
FOR FURTHER DETAILS ON THE CONSTRUCTION OF THIS EARTHING SYSTEM INCLUDING MATERIALS, CONNECTIONS, LABELLING ETC. REFER TO ECS 06-0023.

FOR INFORMATION ON SECONDARY SUBSTATION EARTHING DESIGN REFER TO EDS 06-0014.

THE EARTHING MESH PRINCIPLES MAY BE APPLIED TO SIMILAR SUBSTATIONS WHICH DIFFER IN SHAPE AND SIZE WITHOUT THE NEED FOR A SITE SPECIFIC EARTHING DRAWING.

NOTE: THIS DRAWING ONLY SHOWS THE EARTHING ASSOCIATED WITH THE GROUND WORKS. ADDITIONAL EARTHING MAY BE REQUIRED TO ACHIEVE THE EARTH RESISTANCE VALUE AND TO ENSURE THE SUBSTATION IS SAFE. REFER TO THE RELEVANT EARTHING STANDARD FOR THE COMPLETE EARTHING AND BONDING REQUIREMENTS.

THE MESH EARTHING DESIGN AS SHOWN IS ONLY SUITABLE FOR SUBSTATIONS WITH AN EPR (EARTH POTENTIAL RISE) BELOW 430V (COLD SITE). IF THIS DESIGN IS TO BE USED FOR SUBSTATIONS WITH AN EPR ABOVE 430V THEN ADDITIONAL EXTERNAL EARTHING IS REQUIRED TO CONTROL THE TOUCH AND STEP VOLTAGES.



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TITLE				
INTEGRAL SUBSTATION FOR TWO TRANSFORMERS UP TO 1000kVA EACH EARTHING LAYOUT				
SCALE	NTS	@A1	APPROVED	Version
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KEY:
(SEE NOTES FOR EQUIPMENT DETAILS)



TWIN FLUORESCENT LUMINAIRE



EMERGENCY SELF CONTAINED LUMINAIRE



13A UNSWITCHED FUSED SPUR FOR RTU



13A SWITCHED SINGLE SOCKET LABELLED FOR TEST EQUIPMENT



13A SWITCHED DOUBLE SOCKET



LIGHT SWITCH



CONSUMER UNIT

- GENERAL NOTES
- THE LIGHTING AND POWER REQUIREMENTS ARE SUMMARISED BELOW, REFER TO EDS 07-1119 FOR FURTHER DETAILS.
 - ALL WORK AND TESTING SHALL BE CARRIED OUT BY SUITABLY COMPETENT OPERATIVES IN ACCORDANCE WITH BS 7671.
 - ALL ACCESSORIES AND ACCESSORY MOUNTING BOXES OR ENCLOSURES SHALL BE IP66 SURFACE MOUNTED FROM THE MK MASTERSEAL RANGE OR EQUIVALENT.

- POWER SUPPLY OPTIONS
- MINIMUM 4mm² SWA FROM THE LV CABINET/BOARD 32A AUXILIARY SUPPLY TERMINALS OR 35mm² SERVICE FROM LV PILLAR OR LV DISTRIBUTION NETWORK. ALL SUPPLIES SHALL BE TERMINATED IN A 100A CUT-OUT FUSED AT 30A.

- DISTRIBUTION BOARD
- THE DISTRIBUTION BOARD SHALL BE A TYPE IP66 WITH A MINIMUM OF 5 WAYS AND INCLUDE:
 - A 100A/125A DOUBLE-POLE (PHASE AND NEUTRAL) DISCONNECTOR WITH 15KA BREAKING CAPACITY (TO BS EN 60947).
 - RCBOs (TO BS EN 61009-1) AND MCBs (TO BS EN 60898-2) WITH 15KA BREAKING CAPACITY.
 - 16/20A RCBO FOR THE 13A SOCKET OUTLET CIRCUIT.
 - 16A MCB FOR THE TEST EQUIPMENT 13A SOCKET OUTLET.
 - 6/10A MCB FOR THE LIGHTING CIRCUIT.
 - 6A MCB FOR EACH RTU OR PLTU (IF INSTALLED).
 - A SPARE WAY COMPLETE WITH BLANKING PLATE FOR FUTURE USE.
 - THE DISTRIBUTION BOARD SHALL BE MOUNTED AT A HEIGHT OF 1350mm TO 1450mm ABOVE FINISHED FLOOR LEVEL.

- INTERNAL LIGHTING
- THE SUBSTATION SHALL HAVE A MINIMUM LUMINANCE OF 300 LUX IN ACCORDANCE WITH HSE HSG38 PROVIDED BY A MINIMUM OF TWO LIGHT FITTINGS ON OPPOSITE SIDES OF THE SUBSTATION.
 - THE LIGHT FITTINGS SHALL BE POSITIONED TO AVOID SHADOWS WHEN EQUIPMENT DOORS ARE OPEN.
 - ALL LIGHT FITTINGS SHALL BE MOUNTED AT A MAXIMUM HEIGHT OF 2200mm ABOVE FINISHED FLOOR LEVEL AND BE POSITIONED TO AID FUTURE MAINTENANCE. LIGHT FITTINGS SHALL NOT BE INSTALLED ABOVE AN LV BOARD.
 - GENERAL PURPOSE LIGHT FITTINGS SHALL BE OF THE FLUORESCENT IMPACT AND CORROSION RESISTANT TYPE. CORROSION RESISTANT WITH A POLYCARBONATE PRISMATIC DIFFUSER (TO BS EN 60598-1) AND SHALL HAVE A MINIMUM DEGREE OF PROTECTION OF IP66. THE PREFERRED SIZE IS A 1500mm TWIN LAMP FITTING.
 - LIGHT FITTINGS SHALL BE FITTED WITH 35W OR 49W T5 OR T16 LINEAR FLUORESCENT TUBES OF THE HIGH FREQUENCY ENERGY EFFICIENT TYPE (TO BS EN 60081) OR EQUIVALENT LED. ALL LAMPS SHALL HAVE CAPS OF THE 'BI' PIN TYPE AND A MINIMUM COLOUR TEMPERATURE OF 3500K (A WHITE APPEARANCE).
 - LIGHT FITTINGS SHOULD BE CONNECTED VIA A PLUG IN ROSE (OR SIMILAR) TO AID FUTURE MAINTENANCE. A PROTECTIVE CONDUCTOR SHALL BE CONNECTED TO THE EARTH TERMINAL OF EACH FITTING.
 - A SURFACE MOUNTED LIGHT SWITCH WITH NEON INDICATOR SHALL BE POSITIONED ADJACENT TO THE SUBSTATION DOOR. SUBSTATIONS WITH MULTIPLE POINTS OF ACCESS SHALL HAVE A LIGHT SWITCH ADJACENT TO EACH DOOR AND SHALL BE WIRED WITH 2-WAY LIGHTING.
 - ALL LIGHT SWITCHES SHALL BE MOUNTED AT 1400mm ABOVE FINISHED FLOOR LEVEL.

- EMERGENCY LIGHTING
- AN EMERGENCY LIGHT (TO BS EN 1838 AND BS 5266) SHALL BE PROVIDED AT EACH EXIT DOOR. AN ADDITIONAL EMERGENCY LIGHT SHALL BE INSTALLED WHERE THERE IS AN OPEN LV BOARD.
 - EMERGENCY LIGHTS SHALL HAVE A MINIMUM LUMINANCE OF 1 LUX AND SHALL BE THE INTEGRAL, SELF-CONTAINED TYPE (TO BS EN 60598-2-22) INCORPORATING A FLUORESCENT LAMP (OR LED EQUIVALENT) AND A POLYCARBONATE DIFFUSER. THE RATED DURATION OF EMERGENCY LIGHTS SHALL BE 3 HOURS.
 - ABOVE DOOR EMERGENCY LIGHTS SHALL INCLUDE AN EXIT LEGEND PLATE.
 - LIGHT FITTINGS SHALL BE IP65 HEAVY DUTY 26W TC-T (OR EQUIVALENT LED) BULKHEAD TYPE CONSTRUCTED IN POLYCARBONATE WITH AN IMPACT RESISTANT POLYCARBONATE COVER. SEALED TO THE BODY WITH A SILICON RUBBER GASKET AND STAINLESS STEEL CAPTIVE FIXING SCREWS.
 - ALL EXTERNAL LIGHTING SHALL BE CONTROLLED BY PHOTOELECTRIC CONTROL UNITS (TO BS 5972) AND PIR MOVEMENT DETECTORS.

- POWER
- A MINIMUM OF TWO DOUBLE 13A SOCKET OUTLETS (TO BS 1363) SHALL BE INSTALLED ON OPPOSITE SIDES OF THE SUBSTATION.
 - AN ADDITIONAL SINGLE 13A SOCKET OUTLET (TO BS 1363) SHALL BE INSTALLED, DESIGNATED AND LABELLED AS A 'TEST EQUIPMENT SOCKET' AND SUPPLIED VIA A SEPARATE MCB.
 - ANY RTU/PLTU SHALL BE SUPPLIED BY AN UNSWITCHED FUSE CONNECTION UNIT (TO BS 1363) FUSED AT 5A AND INSTALLED ADJACENT TO THE EQUIPMENT.
 - RADIAL CIRCUITS SHALL BE USED FOR ALL POWER CIRCUITS.
 - ALL SMALL POWER ACCESSORIES SHOULD BE MOUNTED AT 1000mm ABOVE FINISHED FLOOR LEVEL.

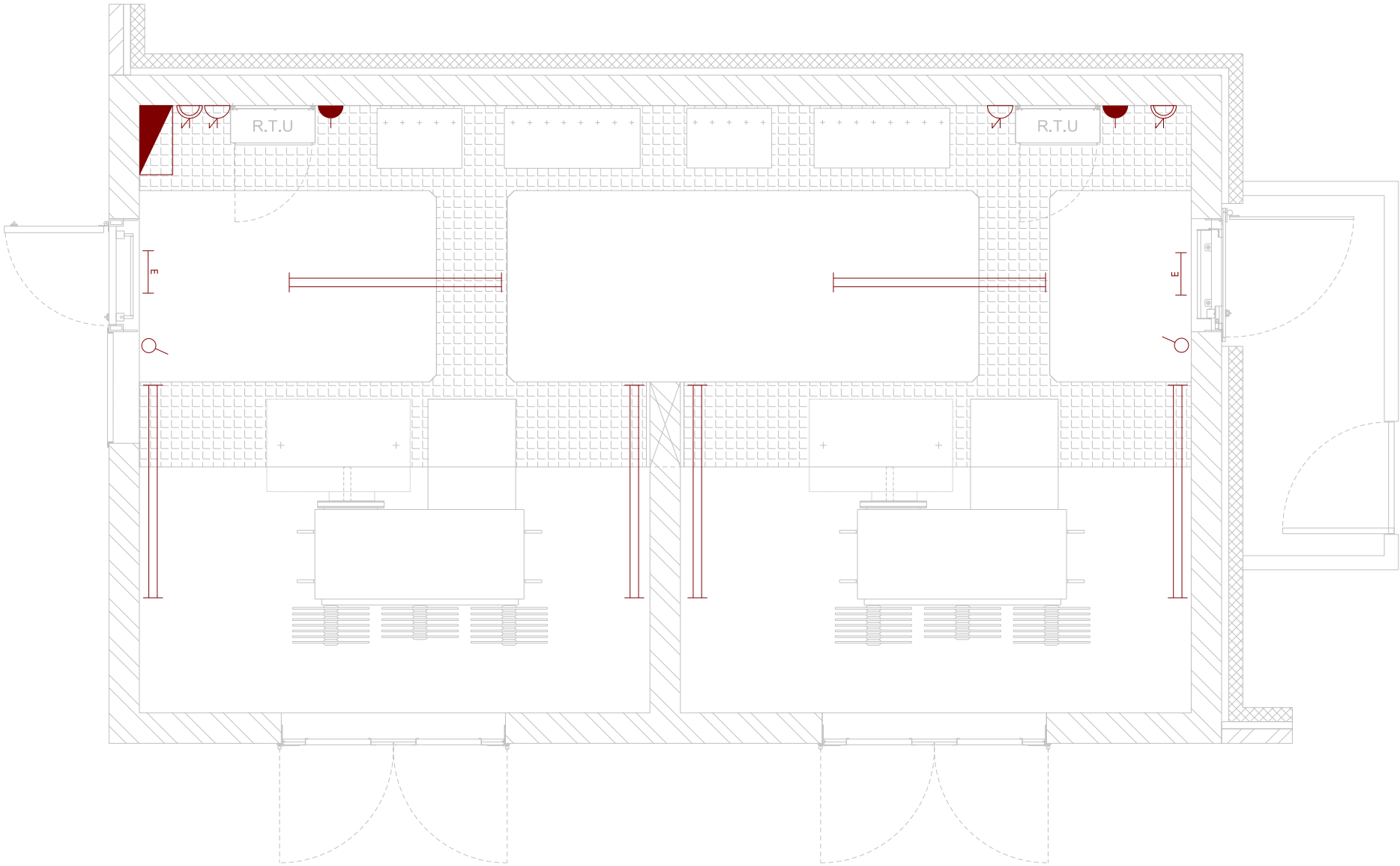
- CABLING
- ALL CABLES SHALL BE 6491B LS0H TO BS EN 50525-3-41 AND SHALL COMPLY WITH BASEC. ALL INSULATION SHALL USE PHASE OR NEUTRAL COLOURS THROUGHOUT THE LENGTH OF THE CONDUCTOR IN ACCORDANCE WITH BS 7671. NOTE: THE USE OF COLOURED SLEEVES TO MARK CONDUCTORS IS NOT ACCEPTABLE.
 - ALL CABLES SHALL USE STRANDED COPPER CONDUCTORS WITH THE FOLLOWING MINIMUM CROSS SECTIONAL AREA:
 - CUT-OUT UNIT TAILS 25mm².
 - LIGHTING 1.5mm².
 - SMALL POWER 4.0mm².
 - ALL CABLES, EXCEPT ARMoured CABLES AND CUT-OUT TAILS, SHALL BE ENCLOSED IN PLASTIC CONDUIT OR TRUNKING. THE TYPES AND SIZES SHALL BE SUITABLE FOR THE OPERATING CONDITIONS.
 - ALL CABLES SHALL BE INSTALLED WITHOUT JOINTS OTHER THAN AT EQUIPMENT AND TERMINAL FITTINGS.

- CONDUIT, TRUNKING AND TRAYS
- ALL CABLING SHALL BE INSTALLED IN MINIMUM 20mm CONDUIT SIZED IN ACCORDANCE BS 7671.
 - ALL CONDUIT, BOXES AND FITTINGS SHALL BE HIGH IMPACT, NON-FLAME PROPAGATING, SELF-EXTINGUISHING, HEAVY-DUTY PVC CONDUIT (TO BS EN 61386-1). DIMENSIONS SHALL COMPLY WITH BS EN 60423.
 - THERE SHALL BE SUFFICIENT JUNCTION BOXES, DRAW-IN BOXES AND INSPECTION FITTINGS INSTALLED TO ALLOW CABLES TO BE INSPECTED, WITHDRAWN AND REPLACED IF NECESSARY. THE COMPLETE INSTALLATION SHALL BE ARRANGED USING A LOOP-IN TYPE SYSTEM WITH JOINTS BEING CARRIED OUT AT SWITCHES, ISOLATORS OR APPLIANCE FITTINGS.
 - ALL ADAPTABLE BOXES AND ACCESSORIES SHALL MATCH THE CONDUIT AND SHALL BE FITTED WITH EARTHING TERMINALS.
 - JOINTS BETWEEN CONDUITS MAY BE PUSH-FIT, COMPRESSION, MECHANICAL LOCKING OR SOCKET-END SEALED WITH PVC ADHESIVE. WHERE A WEATHERPROOF OR WATERTIGHT CONNECTION IS REQUIRED PUSH-FIT ARRANGEMENT ALONE IS NOT ACCEPTABLE.
 - ALL CONDUIT SHALL BE SECURED USING MATCHING DISTANCE SADDLES SPACED AT A MAXIMUM DISTANCE OF 750mm AND 200mm FROM ANY BEND, JOINT OR ACCESSORY. ALL BOXES AND ACCESSORIES SHALL BE SECURED INDEPENDENTLY.
 - REFER TO EDS 07-0119 FOR TRUNKING AND CABLE TRAY REQUIREMENTS.

- LABELLING
- ALL LABELLING SHALL COMPLY WITH BS 7671.
 - ALL DISTRIBUTION BOARD WAYS SHALL BE PERMANENTLY LABELLED TO IDENTIFY CIRCUIT FUNCTION, CABLE SIZE AND PROTECTIVE DEVICE RATING.

- HOT SITES
- ALL SOCKETS SHALL BE DISCONNECTED OR REMOVED.
 - ALL LIGHTING AND RTU SUPPLIES FROM AUXILIARY TERMINALS SHALL BE VIA AN ISOLATION TRANSFORMER.
 - REFER TO ECS 06-0023 FOR FURTHER INFORMATION.

- TESTING AND CERTIFICATION
- UPON COMPLETION OF THE WORKS, THE INSTALLATION SHALL BE TESTED IN ACCORDANCE WITH BS 7671. AN ELECTRICAL INSTALLATION CERTIFICATE TOGETHER WITH A SCHEDULE OF TEST RESULTS AS DETAILED IN BS 7671 SHALL BE FORWARDED TO UK POWER NETWORKS.



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Version	Date	Description	UA	UKPN
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TITLE INTEGRAL SUBSTATION FOR TWO TRANSFORMERS UP TO 1000kVA EACH SMALL POWER & LIGHTING				
SCALE	NTS	@A1	APPROVED	Version
DRAWING NO.	EDS 07-3102.22 Sheet 3 of 3			
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SECONDARY SITES				

Appendix G

G.1 Memo Provided to Thames Water



AECOM Limited
Midpoint, Alencon Link
Basingstoke
Hampshire RG21 7PP
United Kingdom

T: +44(0)1256 824500
aecom.com

Project name:
Shaping Guildford's Future

Project ref:
60647579

From:
Neil Tims

Date:
30 May 2022

Document Ref:
GERP-ACM-XX-XX-MO-UT-000003 P01

To:
Nick Lazarow, Thames Water

CC:

Memo

Subject: Shaping Guildford's Future, Anticipated Potable Water Demand

Introduction

This Memo has been prepared to outline the anticipated potable water demand loads for five development sites which for part of the Guildford Borough Council ‘Shaping Guildford’s Future’ study.

Shaping Guildford’s Future (SGF) is seeking to regenerate a number of locations within Guildford town centre in the coming years. At this time, an initial masterplan is being developed and from this we are seeking to understand the challenges, opportunities and risks, which can then be reported back to Guildford Borough Council.

The emerging masterplan is considering five key sites (the locations are shown in Figure 1), which have a mixture of residential and commercial uses. The following table provides summary information regarding the five sites:

Site	Residential	Commercial	Estimated Delivery
Bedford Wharf	954 units	26,763m² *	Spring 2029 to end 2033
Woodbridge Meadows	2,151 units	8,464m²	Phase 1 from the start of 2031
Town Wharf	259 units	10,954m²	End of 2031
Millbrook Car Park	92 units	N/A	Summer 2027
Millmead	T.B.A.	T.B.A.	Spring 2027

* Bedford Wharf Commercial includes a proposed 120 room hotel.

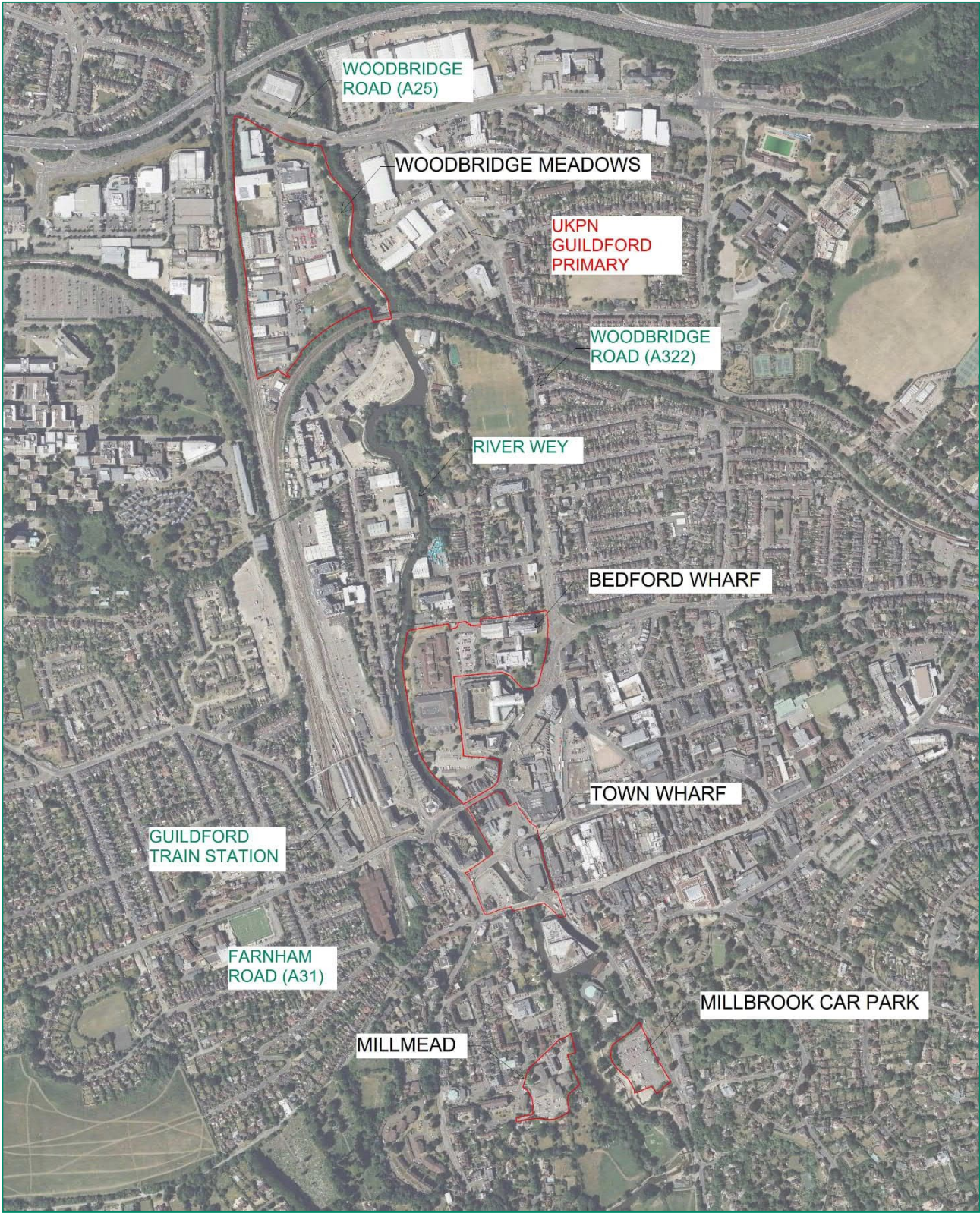


Figure 1: SGF Development Opportunity Locations

Potable Water Demand

With the exception of Town Wharf, the masterplan has differing options for the remaining four sites. For ease within this initial engagement, we have provided our anticipated potable water demand estimate for the worst case of the sites. At this time, we do not have sufficient information for Millmead, so we will provide this when received from the Masterplanner. We also have little information on the types of commercial development and have therefore based the demand estimate on previous experience and some assumptions.

We have undertaken an initial assessment of the four sites to anticipate a potable water demand estimate for each development. The following table shows our assessment:

Site	Residential	Peak Flow Rate	Commercial	Peak Flow Rate	Hotel	Peak Flow Rate	Total Peak Flow Rate
Bedford Wharf	954 flats	8.42 l/s	26,763m²	14.04 l/s	120 rooms	1.25 l/s	23.71 l/s
Woodbridge Meadows	2,151 flats	17.93 l/s	8,464m²	19.70 l/s	N/A	N/A	37.63 l/s
Town Wharf	259 flats	2.16 l/s	10,954m²	2.54 l/s	N/A	N/A	4.70 l/s
Millbrook Car Park	92 flats	0.75 l/s	N/A	N/A	N/A	N/A	0.75 l/s
Millmead	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.	T.B.A.

Potable Water Demand Assumptions

We have prepared the above estimates based on the following assumptions:

- Residential units are assigned a potable water demand of 210 l/bedroom for 1-bedroom units and 130 l/bedroom for 2-bedroom units.
- Commercial units have been assigned potable water demands based on previous experience and assumptions. For instance, we may have assumed a worst-case for potable water for a proportion of the commercial, so as to start this exercise.
- The assessment does not consider the potable water capacity which would become available from existing buildings on the development sites as they are decommissioned and demolished.

Thames Water Assessment / Advice

We would be grateful for Thames Waters assessment/advice on:

- The emerging masterplan and potable water demand loads as summarised in this Memo;
- The available potable water capacity within the Guildford area that these developments might be able to utilise;
- Thames Waters route / timeframe to provision of increased capacity as a result of future developments; and
- Timeframe for undertaking water modelling for each of the identified sites and confirmation that Thames Water have an up-to-date Flow Monitoring Zone model for Guildford and other internal information required to inform the development modelling.
- Are Thames Water able to provide advice on the potable water capacity which might become available from demolition of existing buildings at the identified development sites, which could offset the estimated demand loads for the new developments?

It would also be helpful to understand whether Thames Water have any future plans for increasing potable water capacity within Guildford and if so, the timeframes for these.

Wider Guildford Area

We are trying to secure further details of committed / planned developments for the wider Guildford area from GBC to enable a strategic review of the current and future potable water challenges / opportunities / risks that Guildford face. We will provide this information once received from GBC.

Appendix H

H.1 Thames Water Capacity Report and Underwriting Agreement



Our reference: DS6095881

Your site address: Guildford Town Centre, Guildford GU1 1DY

Customer: AECOM

Clean water capacity report

Status: Capacity concerns

Date: 15 June 2022

Validity: Valid until 14 June 2023 or for the duration of your Local Authority planning permission when this report is used to support your application.

We confirm that there will be sufficient capacity in our existing clean water network to serve the following:

The first 50 residential properties or commercial equivalent across all development areas Woodbridge Meadows, Bedford Wharf, Town Wharf (east of the River Wey), Millbrook Car Park and Millmead.

The first 50 residential properties or commercial equivalent in development area Town Wharf (west of the River Wey). This would need to take into account a development enquiry for Guildford Car Park GU2 7NN (25 houses and 219 flats).

However, we're unable to confirm capacity for your all development areas of 3,456 residential units and 46,181sqm commercial (Millmead TBA) without further investigation. How to make a request for us to progress with network modelling activity is listed in the accompanying email.

Please be aware that this report is based upon the details and drawings provided. If there are any subsequent changes to these, then the contents of this report will become invalid and a new assessment will be needed.

Please note that the below POC is based on desktop study and it might change after capacity check study or site-specific survey.

Nearest points of connection:

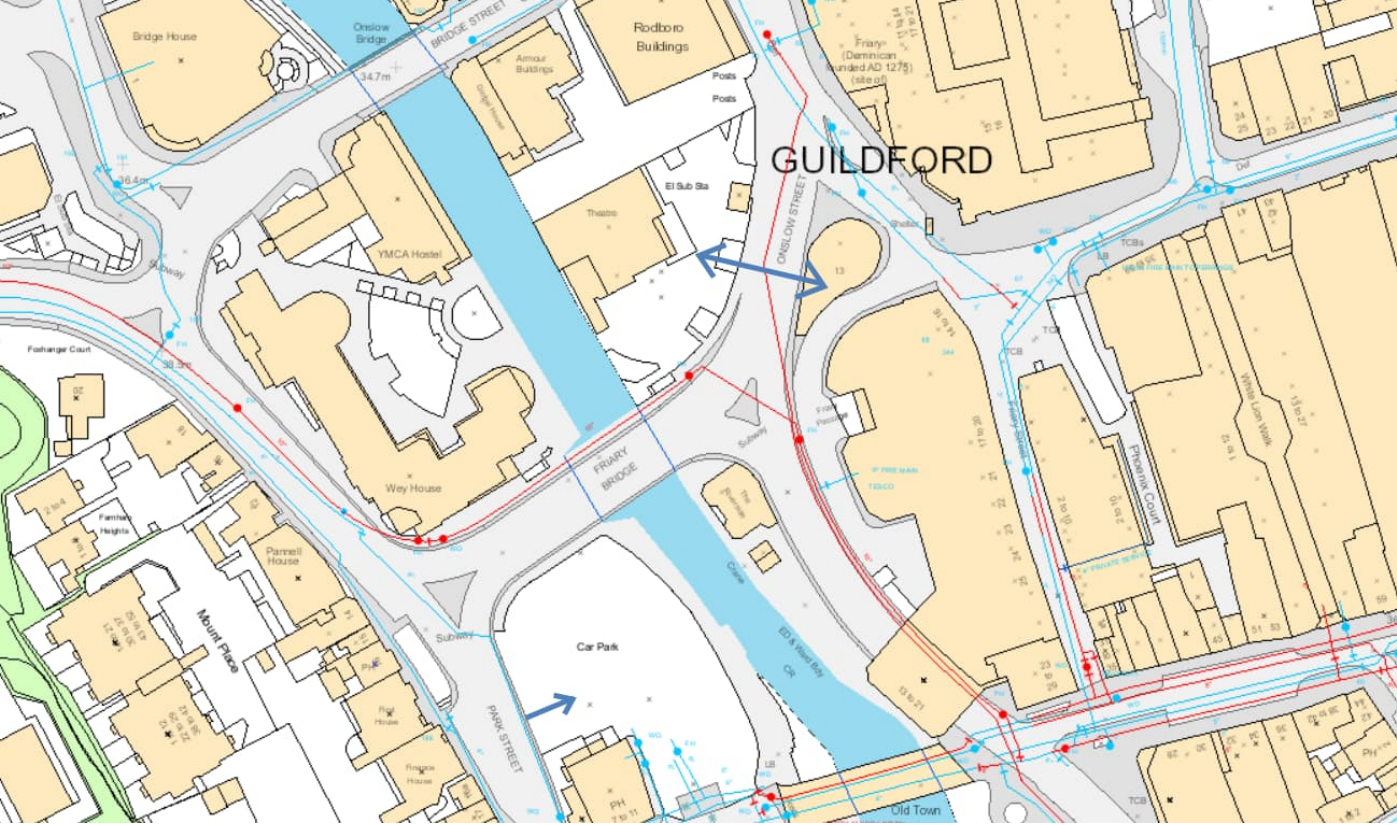
Woodbridge Meadows



Bedford Wharf



Town Wharf



DATED

THAMES WATER UTILITIES LIMITED
as Thames Water

and

[NAME]
as Developer

AGREEMENT FOR PROVISION OF WATER CONNECTION INFORMATION

DATED

BETWEEN:

- (1) THAMES WATER UTILITIES LIMITED (company no 2366661) whose registered office is at Clearwater Court, Vastern Road, Reading, Berkshire RG1 8DB ("Thames Water"); and
- (2) [NAME] (company number [NUMBER]) whose registered office is at [ADDRESS] "DEVELOPER"

BACKGROUND

The Developer wants Thames Water to provide the Deliverable in respect of its development at [DEVELOPMENT]. Thames Water has agreed to provide the Deliverable on the terms set out in this Agreement and for the Fee (if demanded).

1 DEFINITIONS

1.1 In these terms and conditions the following expressions shall (where the context so admits) have the following meanings:
'Deliverable' shall mean that part of the network capacity letter for the completion of the connection(s) that relates to the modelling or study to be carried out to determine the extent of any offsite reinforcement by Thames Water following its capacity modelling that will allow the Developer to discharge the relevant planning condition(s) in respect of the provision of water to the relevant development.
'Fee' shall mean the flat fee charged by Thames Water for providing the Deliverable.
'Purpose' the purpose for which the Developer shall use the Deliverable, namely the discharge of relevant planning conditions and the programming of works.

2. Deliverable

2.1 Subject to the remainder of this Agreement, Thames Water agrees to use all reasonable endeavours to provide the Deliverable by no later than [DATE].

3 Timescales for Deliverable

3.1 Thames Water shall provide the Deliverable to the Developer in accordance with the requirements of this Agreement. Although Thames Water will use its reasonable endeavours to make the Deliverable available in accordance with the estimated delivery date set out above, such delivery date is only an estimate and accordingly Thames Water accepts no responsibility or liability, financial or otherwise, in the event that the said estimated delivery date is not met. In particular and without limitation of the generality of the foregoing, Thames Water shall not be liable to reimburse the Developer in respect of any delay payments or other penalties for which the Developer may become liable to any customer of the Developer as a result of any delay or failure by Thames Water (whether or not Thames Water is aware of the Developer's potential liability to pay the same).
3.2 Thames Water shall use its reasonable endeavours to notify the Developer of any delay in the estimated delivery date for the provision of the Deliverable, and to propose a revised estimated delivery date to the Developer. Any onward notification of such delay to customers of the Developer shall be the sole responsibility of the Developer.
3.3 The contents of the Deliverable are protected by copyright laws. The owner of the copyright information on the Deliverable is Thames Water. The Developer shall not modify, copy, reproduce, republish, upload, post, transmit or distribute, by any means or in any manner, any material or information contained within the Deliverable including but not limited to text, graphics and maps without Thames Water's prior written consent.
3.4 The Developer acknowledges that following Thames Water undertaking the capacity modelling pursuant to this Agreement, Thames Water may determine (in its absolute discretion) that proceeding to a detailed design is unnecessary and in those circumstances Thames Water shall notify the Developer that a detailed design is not required within 14 days of determining the same.

4 Force Majeure

4.1 Thames Water shall not have any liability in respect of any delay in carrying out or failure to carry out any of its obligations under this Agreement caused by any circumstances outside the reasonable control of Thames Water including without limitation

war, terrorism, fire, extreme weather, flood, explosion or civil commotion or acts of Government.

4.2 Thames Water shall have the right to extend the estimated delivery schedule by a period of time sufficient to take due account of the event occurring as set out in Clause 4.1. If, however, such extension continues for a period of 60 days, the Developer may, on the expiry of that period, terminate this Agreement forthwith without liability to Thames Water other than reimbursement on the same terms as provided in Clause 3.3.

5 Fee and payment

5.1 The Fee shall be £11,000.00 plus VAT which shall be paid by the Developer at the prevailing rate.

5.2 Thames Water shall invoice the Developer for, and the Developer shall pay, the Fee if once Thames Water has provided the Deliverable to the Developer, the Developer has not provided Thames Water with reasonable evidence that it has achieved a date of first occupation for the development within five years from the date of this Agreement.

5.3 Payment of Thames Water's invoices shall be made in pounds sterling within 28 days of the invoice date. Where chargeable, value added tax and any other applicable taxes or duties shall be added to the invoice at the current rate or rates in force at the relevant times.

5.4 The Developer shall pay interest (whether before or after judgment) at a rate of 4% per annum above Barclays Bank Plc base rate in force from time to time from the due date for payment until actual payment.

6 Defects

6.1 Subject to the provisions of 6.3 below, any error or defect in the Deliverable shall be notified to Thames Water in writing by the Developer within three months of receipt of the Deliverable, and Thames Water agrees that it will make resources available to investigate the defect and to rectify the Deliverable if required.

6.2 Except as set out in 6.1, Thames Water accepts no liability in respect of any error or defect in the Deliverable, or the consequences thereof, and gives no warranty in respect thereof.

6.3 The Deliverable is provided by Thames Water to the Specification and on the basis that it is for the sole use of the Developer, for the Purpose. The Developer shall not use the Deliverable or any information contained therein other than for the Purpose and shall not communicate nor disclose the Deliverable or any information contained therein to any third party whether or not in connection with the Purpose without the prior written consent of Thames Water (which shall not be unreasonably withheld).

6.4 Should the Developer use the Deliverable or any information contained therein contrary to the foregoing provisions the Developer will be solely liable to any third party for any error or defect in the Deliverable or information, and or the consequences thereof, and will indemnify Thames Water against all loss, actions, claims, costs, demands, expenses and liabilities whatsoever (if any) which Thames Water may incur either at common law or by statute as a result of a breach of clause 6.3.

7 Limitation of liability

7.1 In no circumstances shall Thames Water be liable, in contract, tort (including negligence or breach of statutory duty) or otherwise howsoever, and whatever the cause thereof:

- (a) for any loss of profit or anticipated profit, loss of business or business opportunity, loss of contracts or revenues or anticipated savings, or
- (b) for any loss costs, expenses or damages incurred by any third party;
- (c) for any special indirect or consequential damage or loss of any nature whatsoever arising directly or indirectly.

7.2 Subject to the provisions of paragraph 7.4 below, the total aggregate liability of Thames Water arising out of or in connection with this Agreement (whether in contract, tort or otherwise) shall in no circumstance exceed the level of the Fee.

7.3 Thames Water and the Developer agree that the exclusions and limitations of liability and the resulting allocation of risk and liability contained in this Agreement are reasonable in all the circumstances and having regard to all relevant facts including the charges which take account of the allocation of risk and liability.

7.4 Nothing in this Agreement shall limit the liability of either party for:

- (a) Fraudulent misrepresentation or mis-statement;
- (b) Death or personal injury caused by negligence.

7.5 For the avoidance of doubt, Thames Water shall not be liable for any loss, damage or delay suffered by the Developer to the extent that such loss, damage or delay is attributable to written instructions given by or on behalf of the Developer.

8. Term and Termination

8.1 This Agreement comes into force on the date hereof and will continue until the sooner of:

- a) the date it is terminated by either party in accordance with its terms;
- b) the date the Developer provides Thames Water with reasonable evidence of first occupancy of the relevant development; or
- c) the date the Developer pays the Fee in full.

8.2 This Agreement may be terminated by written notice forthwith:

- a) by either party if the other commits any material or persistent breach of any term of this Agreement and, in the case of a breach capable of remedy, fails to remedy the same within 28 days after receipt of a written notice giving full particulars of the breach and requiring it to be remedied;
- b) by either party if the other becomes bankrupt or insolvent (except for the purpose of a bona fide amalgamation or reconstruction) or any receiver or administrator or similar person is appointed in respect of that party or enters into any arrangement with its creditors or takes or suffers any similar actions in consequence of a debt;
- c) by either party if they reasonably believe that any of the events mentioned in Clause 8.2 (b) above is about to occur in relation to the other party and notifies the other party accordingly;
- d) by Thames Water if the Developer ceases or threatens to cease to carry on business

8.3 This Agreement may be terminated at any time by Thames Water by providing no less than 7 days' written notice to the Developer

8.4 The termination of this Agreement is without prejudice to the rights, duties and liabilities of either party that accrued prior to termination. In the event that this Agreement is terminated by Thames Water under clause 8.2, the Developer shall be liable to pay for all work completed up to the date of termination.

8.5 The clauses in this Agreement which expressly or impliedly have effect upon or after expiration or earlier termination shall continue to be enforceable notwithstanding expiration or earlier termination and (except as otherwise expressly provided herein) shall not prejudice any remedies available to either party to this Agreement.

9 General provisions

9.1 Neither party shall be entitled to assign the rights, benefits or obligations under this Agreement, without the prior written consent of the other party, such consent not to be unreasonably withheld or delayed.

9.2 Except as otherwise provided herein, the rights of either party under the Agreement shall not be prejudiced or restricted by any indulgence or forbearance extended by one party to the other and no waiver by one party of its rights in relation to any breach of the Agreement shall affect its rights in respect of any subsequent breach.

9.3 Any demand, notice or other communication given or made under or in connection with the Agreement shall be in writing.

9.4 All notices shall be deemed properly served if delivered in person or if sent by fax or first class post to the address for the party to be served stated in the Agreement, their registered office address or any subsequent address from time to time notified to the other party. A notice sent by fax will be deemed to have been served at the time of successful transmission, provided a confirmatory copy is also sent by first class post. A notice sent by first class post shall be deemed served two working days after posting, or seven working days if posted from or to an address outside the United Kingdom.

9.5 If any provision of these conditions is held by any competent authority to be invalid or unenforceable in whole or in part the validity of the other provisions of these conditions and the remainder of the provisions in question shall not be affected thereby.

9.6 The Agreement constitutes the entire agreement between Thames Water and the Developer with respect to the matters contained therein and supersedes all prior oral or written representations and agreements.

9.7 The formation, existence, construction, performance, validity and all aspects of the Agreement shall be governed by English law and the parties submit to the exclusive jurisdiction of the English courts

9.8 The provisions of the Agreements (Rights of Third Parties) Act 1999 shall not apply to the Agreement and are hereby expressly excluded.

Signed by [name of duly authorised person] for and on behalf of [name of company] :)
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Signed by Nick Ayling for and on behalf of THAMES WATER UTILITIES LIMITED:)
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Duly authorised person

Duly authorised person

