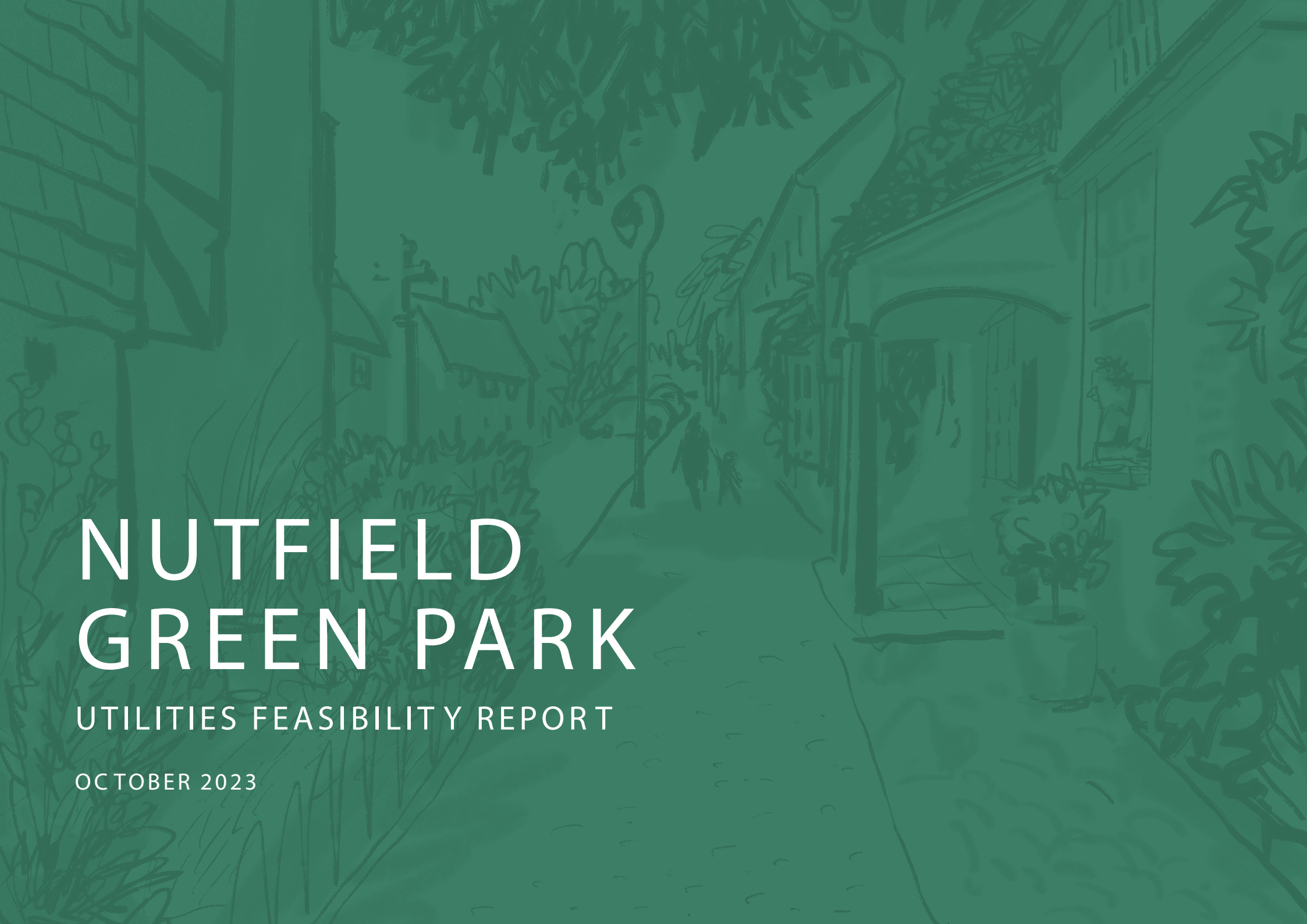

NUTFIELD GREEN PARK

UTILITIES FEASIBILITY REPORT

OCTOBER 2023

QODA

Contents

QODA

1 Executive Summary

This report, prepared by QODA Consulting (QODA), presents findings from assessments of electrical, heating and water loads for the proposed Nutfield Green Park development. These loads were evaluated against the capacities of local providers, UK Power Networks (UKPN) for electricity, and Sutton and East Surrey Water (SES) for water. The objective is to confirm the capacities in the local networks and identify any network deficiencies and the need for reinforcement to facilitate the successful development of the site.

At the time of writing this report, capacity assessments by UKPN and SES are ongoing, and QODA is in anticipation of confirmation from each utility provider.

A summary of the calculated loads is outlined in the tables below.

Table 1: Table of Heating Loads

Zone	Undiversified Heating and DHW Load (kW_{th})	Diversified Heating and DHW Load (kW_{th})	Electrical Load (kW_{el})
1 (Residential)	775	388	150
2 (Residential)	793	397	155
3 (Residential)	311	156	60
4 (Residential)	1,336	668	255
IRC	375	375 [1]	144
Total	**3,590**	**1,606**	**620**
Reduction due to diversity (%)	-	45%	

[1] *Note: Diversity is not applied to the non-domestic spaces.*

Table 2: Table of Electrical Loads

Area type	After Diversity Maximum Demand Load (ADMD) kVA
Residential	1767
Integrated Retirement Community	769

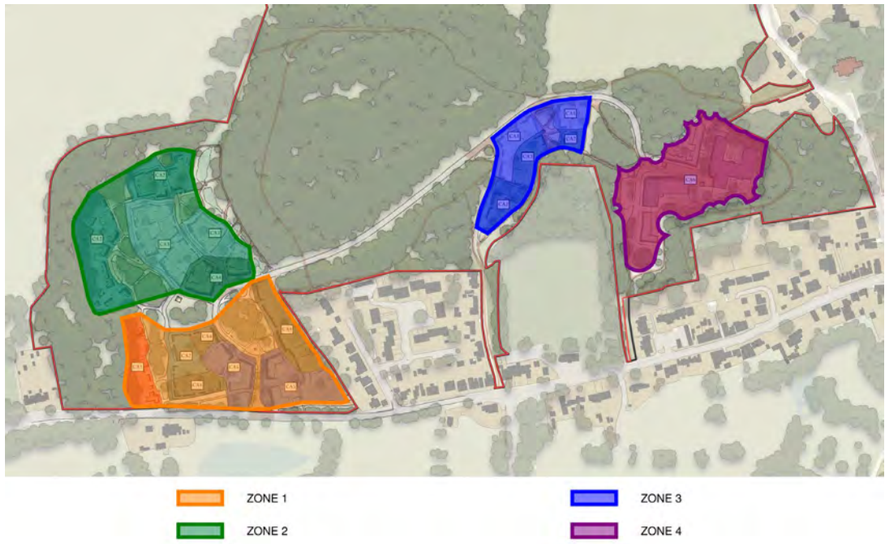

Figure 1: Assumed Site Zoning to inform initial load calculations

2 Introduction

2.1 Overview

This report, prepared for Nutfield Park Developments Limited, proposes Stage 1 master planning advice for the proposed Nutfield Green Park Development. It explains the initial assessments of mechanical, electrical, and public health (MEP) loads associated with the development that have been carried out, including load calculation methodologies and underlying assumptions.

Clarification has been requested from the Distribution Network Provider (DNO) and water utility provider regarding local load capacities and prospective resilience requirements, which are essential for informing subsequent design phases. These enquiries are ongoing and will inform the Full Reserved Matters stage.

The objectives of this report are.

- Provide outline MEP loads for the development.
- Provide a high-level description of the design methodologies used to develop the MEP loads.
- Provide clarification for the electrical and water capacities in the area.
- Identify any diversions that may be required for the main infrastructure services located within the site.
- Identify any resilience required for the main infrastructure services running within the site.
- Identify any issues requiring additional consideration during the subsequent design phases.

The report should be read in conjunction with the wider design team including but not limited to the Architects, Ecology Consultants, and the Planning Consultant.

2.2 Project Team

Table 3: Project Team

Role	Responsibility
Nutfield Park Developments Limited	Client
Adam Architecture	Master planning Architects
HGH Consulting	Planning Consultant
Vectos (Part of SLR)	Highway Consultant
FPCR	Ecology
FPCR	Arboriculture
FPCR	Landscape Visual Impact
MJCA	Contamination
Waterman	FRA & Drainage
Andrew Joseph Associates	Archaeology & Heritage
QODA	Utility Survey
QODA	Energy & Sustainability
Air Quality Consultants (AQC)	Air Quality
Air Quality Consultants (AQC)	Odour Assessment
Noise Solutions Ltd	Noise Impact
Turley	Socio Economic Services
Emery Planning	Housing Land Supply
Tetlow King	Affordable Housing Needs Assessment
Tetlow King	Care Needs Assessment
Tetlow King	Self-build and Custom Housing Needs Assessment

2.3 Existing Utilities

From the asset plans received from HGH consulting (31/05/2023) and available utility records, the following utilities were identified, and are summarised on Figure 2.

The SES utility searches outline water distribution mains running East to West along the southern side of the site; this also branches to run North to South along the eastern side of the site. It is not anticipated that any diversions will be required to be made and the plan suggest multiple locations can be connected onto to provide water services to the site.

Although not considered as part of the feasibility assessment, the SGN utility search identifies low pressure gas mains running in a similar route to the water utilities, East to West along the southern side of the site, and North to South along its eastern side. No diversions are anticipated for these services.

UKPN HV network cables are present in the area, and feed the existing buildings. These cables are crossing the site in two locations. Based on the extend of the proposed development, it is likely that these HV cables will need to be diverted as part of the proposed development.

Records for telecommunication cables were not reviewed at this stage as they were not included in available survey information. The existing buildings are served by telecomms cables, so there is coverage in the area, which will need to be expanded to accommodate the new development. It may be the case that underground cables pass beneath the new development site. In the case that any telecommunication cables are crossing the site, they will need to be diverted.

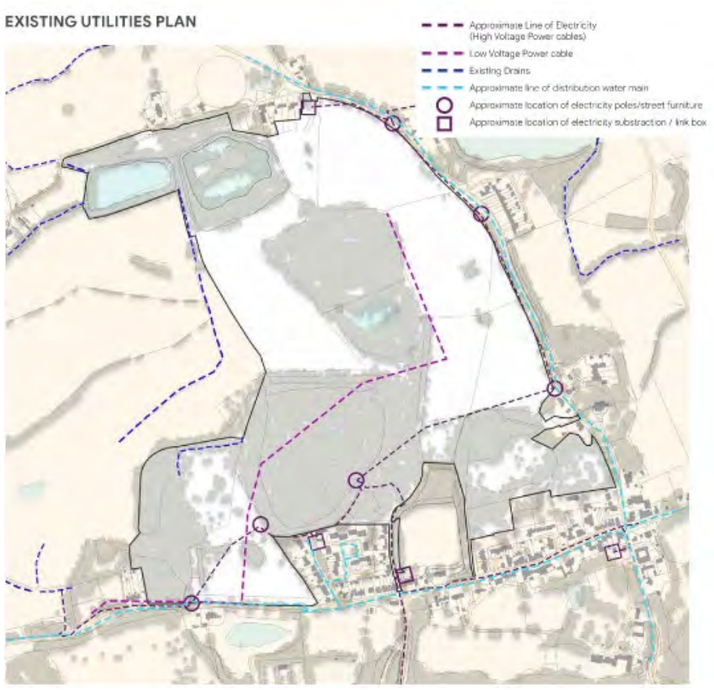

Figure 2 Existing Utilities Plan (Adam Architecture)

2.4 Site Zoning and Categorisation Strategy

To perform the mechanical and electrical load assessment, the site has been categorised into four zones, illustrated in Figure 3 overleaf. The composition of housing units has been determined using a weighted average approach based on data provided by Adam Architecture.

Initial assumptions on dwelling occupancy have been used to refine the load assessments, with higher-occupancy spaces requiring higher loads for heating, and other mechanical systems in each dwelling.

For the purposes of this assessment, the integrated retirement community has been assumed to be made up of individual apartments; each room is classified as an apartment. This will allow allocation of heating and diversity to be applied as outlined in subsequent sections of this report.

For the Class E(e) and F2 floorspace associated with the integrated retirement community, load estimates have been calculated based on assigning assumed loads per square metre of floor area for an indicative selection of typologies. The subsequent calculated loads are added into the total load for the site.

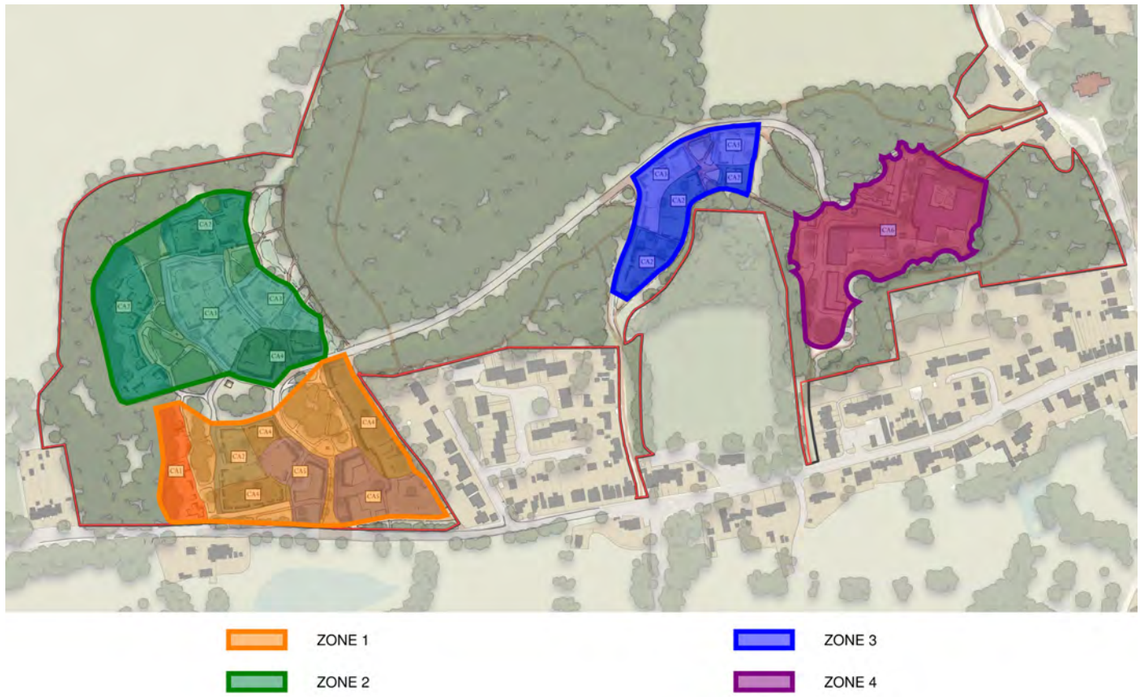

Figure 3: Assumed Site Zoning to inform initial load calculations

2.4.1 Space Heating and Hot Water Load Assessment

For the analysis of heating load, QODA has assumed the adoption of an all-electric Air Source Heat Pump (ASHP) strategy to supply heating and domestic hot water (DHW) to the dwellings and the integrated retirement community. This strategy assumes the implementation of community heating networks for the dwelling spaces within each of the outlined zones. This strategy aligns with industry trends and government targets for grid decarbonisation, and achieving net-zero carbon status.

Furthermore, the utilisation of community heating offers practical benefits through site-wide diversification. This diversification effectively reduces the aggregate peak heating demand across the site, resulting in a corresponding decrease in peak electrical demands.

The mechanical load assessment for heating and DHW is based on the following diversification design references:

- CIBSE Heat Networks Code of Practice (CP1)
- DW 439 - Danish Standard Code of Practice for Domestic Water Supply Systems

A conservative approach has been taken for diversification across the site when compared to typical diversification values that are achievable for community heating schemes of comparable sizes.

Communal heating has not been assessed for the integrated retirement community, as these spaces will function differently than residences; it is assumed that they are either open and occupied or closed and empty. Without integrating diversity, the heating allocation has been applied uniformly to all these areas.

The following design parameters have been employed to estimate the loads across the site:

- Space heating demands: 45 W/m² (Per Apartment)
- Space Heating and DHW demands: 100 W/m2 (non-residential areas)
- DHW peak demand: 7.8 kW (per apartment)
- ASHP Coefficient of Performance (COP): 2.6

Note: The COP of an ASHP reflects its efficiency in converting electrical energy into usable heat; a higher COP indicates better ASHP performance. A value of 2.6 is conservative, and a well-designed system can achieve even higher COP values.

Table 4 below outlines the typical heating and DHW loads that have been assumed per apartment, Table 5 shows the estimated load for the IRC, and Table 6 shows initial calculations for the overall site loads. The loads for the Zones in Table 6 have been calculated based on indicative unit mix assumptions for the proposed residential typology and density.

Table 4: Breakdown of assumed domestic hot water loads per dwelling type

Dwelling Type	Domestic Hot Water Peak Load (KW_{th})	Dwelling Steady State Heat Load (KWt_h)
1-Bed	7.80	1.67
2-Bed	7.80	3.15
3-Bed	7.80	4.19
4-Bed	7.80	4.77
5-Bed	7.80	5.36

Table 5: Integrated Retirement Community mechanical loads

Space Type	Area (m^2)	Combined Heating and DHW Load (KW_{th})
Integrated Retirement Community	Reasonable assumptions based on the following: a) Up to 70 care home beds (Class C2); b) Up to 41 extra care facility beds; c) Up to 1,500 sqm Class E(e), F2 flexible use floorspace;	375

Table 6: Overall Undiversified vs Diversified Peak Loads

Zone	Undiversified Heating and DHW Load (kW_{th})	Diversified Heating and DHW Load (kW_{th})	Electrical Load (kW_{el})
1 (Residential)	775	388	150
2 (Residential)	793	397	155
3 (Residential)	311	156	60
4 (Residential)	1,336	668	255
IRC	375	375 [1]	144
Total	**3,590**	**1,606**	**620**
Reduction due to diversity (%)	-	45%	

[1] *Note: Diversity is not applied to the non-domestic spaces.*

2.5 Public Health Load Assessment

The assessment of domestic and wastewater factors follows the zoning approach detailed in earlier sections of this report. The numbers of sanitary fixtures assumed for each dwelling type are presented in Table 7.

Table 7: Quantity of Sanitary Fixtures per Dwelling Type

Dwelling type	Basin	WC	Sink	Washing Machine	Dish Washer	Shower	Urinal	Bath
1-Bed	1	1	1	1	1	1	0	0
2-Bed	1	1	1	1	1	1	0	0
3-Bed	2	2	1	1	1	1	0	1
4-Bed	3	3	1	1	1	2	0	2
5-Bed	3	3	1	1	1	2	0	2

The water load assessment has been carried based on the following design guidelines:

- BS EN 806: Specifications for installations inside buildings conveying water for human consumption
- Approved Document Part H
- BS EN 12056 Part 2 – Gravity drainage system inside buildings

The above fixture quantities are used to determine the total demand units associated with the development. This is calculated by multiplying these by an indicative breakdown of dwellings to give initial estimates. These are then converted into “loading units”, which allow the water utility to calculate the associated flow rates, incorporating the effects of diversity. The total loading unts estimated for each zone of the site are shown in Table 8. The loading units for the Zones in Table 8 have been calculated based on based on indicative unit mix assumptions for the proposed residential typology and density.

Table 8 Estimated water supply Loading Units for the development

Zone	Estimated Loading Units (for water supply capacity)
1	1873
2	2289
3	932
4	1999

This initial load assessment has been submitted to SES to allow them to confirm the local water supply’s capacity to accommodate the proposed development.

3 Electrical Utilities

3.1 Electrical Load Assessment

For the purposes of sizing the electrical supply we have assumed metered power supplies for each house and commercial unit and unmetered supplies for street and landscape lighting and electric vehicle charging points. The loads and diversity on the residential load are based on IET Electrical Installation Design Guide and UKPN ADMD guidance table.

3.2 Electrical Load Assumptions

3.2.1 Electric Vehicle Charging Points (EVCP)

The following quantities of charging points have been assumed in the load assessment:

- Residential: 1 fast charge socket per residential dwelling
- Commercial: 50% parking spaces with fast charge socket
- Visitor parking spaces: 50% provided with charge points

3.2.2 Equipment Loads (Residential)

The tabulated equipment loads were assumed for the residential load assessment - see Table 9 below. To conduct the electrical load assessment, an assumed breakdown of dwelling occupancies has been used, and multiplied by estimated electrical loads per dwelling. As mentioned above, the electrical loads and diversity are based on IET Electrical Installation Design Guide and UKPN ADMD guidance table.

Table 9: Dwelling Loads

Load type	kW
Electric Heat Demand	2
Electric Oven	3.40
Electric Hob	7.30
Fridge	0.03
Dishwasher	0.03
Washing machine	0.02
Sockets	3.00
Lighting	1.00

3.2.3 Integrated Retirement Community Loads

The integrated retirement community buildings are assumed to be all-electric for heating and hot water. The load calculations are based on the floor area as shown previously on Table 5. Small power, lighting and ventilation loads have been calculated based on the rates illustrated in Table 10, which have been taken from the IET Electrical Installation Design Guide

Table 10: Typical Electrical Loads

Lighting (W/m²)	Small power (W/m²)	Ventilation (W/m²)
8	10	5

3.2.4 Results

Table 11: Electrical Load Assessment

Space Type	Total (kVA)	Total (A)	Total (MVA)
Residential	1767	2550	
Integrated retirement community	769	1110	
Total	2535	3660	2.54

The total estimated load is higher than is likely to be able to be supplied by the existing substations in the area. There are several substations around the proposed development areas that potentially can feed parts of the development.

This initial load assessment has been passed to UK Power Networks (UKPN) to carry out a capacity check, which is currently under way.

It is likely that new substations will be required in the area to support the needs of the proposed development. The number of the new substations is to be confirmed at a later stage when more detailed information will be available. An assumption of 2no. new substations can be made at this stage. The new substations can be integrated into the new buildings.

3.3 Utility Diversions

3.3.1 Electricity

The electrical utility supplying the area is UKPN. The High Voltage (HV) existing network crosses the site at two places as shown in the mark-up below – Figure 4.

The HV cables will need to be diverted and the HV network will need to be extended with possibly 2no. new substations to be added to supply the new development. The information is extracted from the UKPN website, further network investigation will need to be done at a later stage to determine whether further diversions are needed.

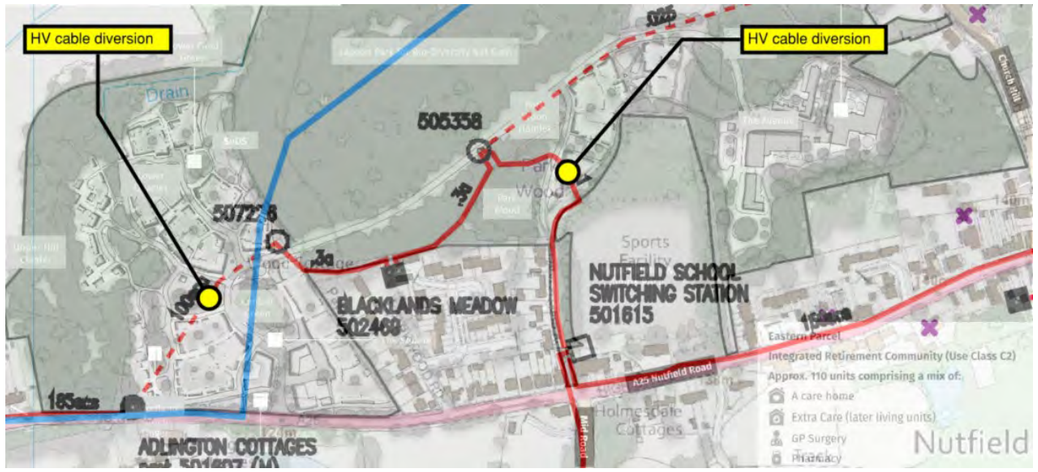

Figure 4: UKPN existing network. HV cables in red colour

3.3.2 Telecoms

A communication connection to BT and/or Virgin will be needed on each dwelling and each block.

BT have assets in the area, and it is likely they can extend their network as necessary to cover the new development. It is recommended that telecoms providers records are obtained at a later stage, to identify service routes and determine any need for comms diversions.

It is possible that cables in the area might need to be diverted if running underground or poles relocated if supply cables are running above ground. BT asset records were not confirmed with the provider at this stage but will be reviewed at the next stage.

4 Conclusion

Water and electrical utility supplies will be required to supply the proposed development at Nutfield Green Park. The initial utilities load calculations have estimated electrical and water load requirements as illustrated in Tables 12 and 13. The utility loads for the residential zones were calculated based on based on indicative unit mix assumptions for the proposed residential typology and density.

Table 12 Summary of proposed development electrical loads

Area type	Diversified Electrical load (kVA)
Residential	1767
Integrated Retirement Community	769

Table 13 Estimated water supply loading units for the development

Zone	Estimated Loading Units (for water supply capacity)
1	1873
2	2289
3	932
4	1999

Both the local electrical utility company (UKPN) and local water utility company (SES) have been contacted to carry out a capacity check, determining the ability of the local supply networks to serve the site. These checks are currently under way, and their outcome will be reviewed at the Reserved Matters stage.