MERIDIAN WATER

Edmonton Leeside Area Action Plan
Scenario Testing

London Borough of Enfield
Karakusevic Carson Architects

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Artist's impression of the capacity test
run for the Spatial Framework

INTRODUCTION 1

Introduction

How to use this document

Enfield Borough Council (LBE) has commissioned Karakusevic Carson Architects to produce this document as a spatial appraisal of the "Evidence on Housing and Supporting Infrastructure" and "Evidence for Employment Land, Industries and Jobs" reports for the Meridian Water produced by AECOM in support of the revised Edmonton Leeside Area Action Plan (ELAAP) 2016. This revision has been produced to take account of several significant changes in LBE and GLA strategies for housing, employment, public transport and land use policy over recent years. As a result of these changes the anticipated number of homes and new jobs delivered in the Meridian Water area within Edmonton Leeside are likely to be greater than those referred to in earlier editions of the ELAAP and associated documents including the LDA Meridian Water Master Plan 2013.

Additional knowledge of the site's technical constraints has been established and, through the submission and approval of an outline planning application for the new station and a mixed use development west of the railway lines, a benchmark has been set for the level of quality and quantity considered appropriate for Meridian Water.

The ELAAP is supported by a set of reports that establish an evidence base to help define the appropriate quantum and mix for the new uses and support new policies within the revised ELAAP.
This document should therefore be read as part of the suite of supporting documents, described below, which are cross-referenced throughout:

» **Edmonton Leeside Area Action Plan (ELAAP) 2016**
The principle policy document for Edmonton Leeside.

» **Evidence on Housing and Supporting Infrastructure**

» **Evidence for Employment Land, Industries and Jobs**
These are technical appraisals, testing the likely quantum over a range of scenarios for employment, land use and housing mixes.

» **Scenario Testing**
A Spatial assessment of the scenarios based on the technical appraisals named above, including the following parameters:
- Residential Density & Scale
- Population - Supporting Uses and Community Infrastructure
- Open Space & Amenity
- Employment & Retail
- Parking

» **Transport appraisal of the technical appraisals above (Housing / Employment)**
Testing the transport and parking implications.

» **Spatial Framework - and vision for Meridian Water**
The Spatial Framework demonstrates a vision, a set of design principles and a potential way to deliver a high quality new mixed-use neighbourhood in Meridian Water at the upper level of the Scenarios of around 10,000 homes and 6,000 new jobs.

» **Socio Economic Study for the Leeside Area**

A considerable portion of the Meridian Water site is currently classified as Strategic Industrial Land (SIL) but, as recommended by this document, will be de-designated to enable a broader mix of uses. The ELAAP and supporting documents aim to assess and quantify an appropriate relationship between new development at Meridian Water and the release of the SIL by the planning authority as well as define a suitable range of uses and scale of development required to create an integrated and sustainable district of new neighbourhoods.

EXECUTIVE SUMMARY

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Executive Summary and Main Conclusions

2.1 Context

LBE and GLA strategies for housing growth, employment, public transport and land use policy have evolved over recent years. A new station, significant social and technical infrastructure and a comprehensive re-distribution of uses will be required to unlock the potential of the Meridian Water site and meet these aspirations. The improved accessibility of the site and increased range of amenity, employment and accommodation facilitated by these moves both increase the potential capacity of the site but also increase the allied enabling costs. Maximising these opportunities and meeting these costs will necessitate significantly higher levels of density and development intensity than envisaged in the previous draft of the ELAAP (Edmonton Leeside Area Acton Plan).

In order to support the policies and the strategy for Meridian Water within the revised ELAAP, the Evidence on Housing and Supporting Infrastructure and Evidence for Employment Land, Industries and Jobs reports have quantified the implications of 32 different scenarios across a range of unit and employment numbers and development mixes. Chapter 5 of this document provides an assessment of the spatial implications of these scenarios in order to identify those with an appropriate scale and quantum of development. This assessment has entailed spatial modelling that adopts the urban design principles stipulated in the Spatial Framework, which illustrates the strategies and codes for the development of a new master plan following the conditions of a particular scenario. In order to simplify from now on in the name "Spatial Framework" will indicate the scenario to which the document refers to(10,000 homes and 6,000 jobs with the Developer Mix). Policy conditions have also been identified as likely to be required to meet the revised ambitions of Enfield Borough Council for the redevelopment of Meridian Water.

2.2 Document Structure Supporting Conclusions

- The Summary Table 1 in Section 3 of this document condenses the spatial analysis of the scenarios and identifies an optimal development range with a summary explanation for their selection.
- Section 4 details the general Methodology used in our assessments and explains some key assumptions integral to the analysis.
- Section 5 illustrates, through tables, illustrations and text the comprehensive analysis of all scenarios; it demonstrates the Spatial Impact of the 32 scenarios and describes the role of the Spatial Framework. This Spatial Framework provides guidelines for development and illustrates them diagrammatically based on a detailed 3D model and test of Scenario 4.3b (10,000 homes and 6,000 jobs with the Developer Mix). It has also been used to provide further evidence to test the robustness of our methodology and assumptions in this document.
- Section 6 gives references and definitions of key criteria.

2.3 Conclusions

Based on the analysis within this study and identified in Section 3 Summary Table scenarios 3.2b, 4.2b & 4.3b were identified as lying within the optimal range on which future master planning and land acquisition should be based. In summary, the spatial analysis suggests that the following attributes and approach would optimise the delivery of Enfield's ambitions for the future master planning and development of the site:

1. Approximately 10,000 homes - to meet housing aspirations.
2. Approximately 6,000 jobs – to meet employment aspirations.

3. Between 6 and 8 average storeys – to maximise development but maintain adequate amenity.

4. Replacement of 100% SIL/Industrial – to access LVRP, allow east-west connections and support preferred housing capacity.

5. At least 40% residential parking in any phase and a minimum of 49% over all.

6. Delivery of social infrastructure - particularly education, health, culture and leisure, in proportion to demand (a minimum 90% delivery by completion and no less than 80% in any phase).

7. Delivery of Technical Infrastructure - to include the parallel delivery of station, bus and rail links up to and including Crossrail 2 and the comprehensive introduction of road, cycle and pedestrian routes including the Causeway, bridges and wider area junction and highway improvements.

2.4 Need for Meridian Water specific Policies

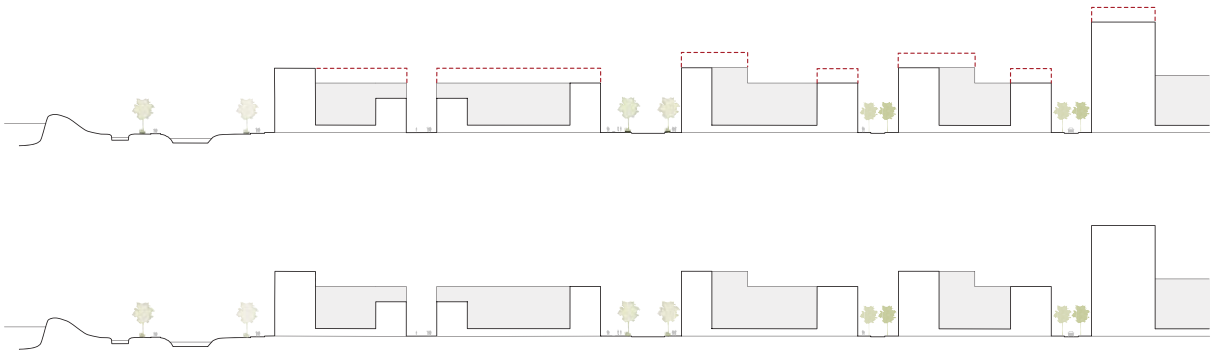
Delivering the identified optimisation of the site will depend greatly on defining the following variables, and creating suitable polices within the ELAAP to allow development control to react positively to future planning applications. Below are examples of these with an explanation of how they can critically affect the quality and quantity of development:

a. Residential Mix: Using LBE housing size mix rather than a Developer Partner mix would result in 15% more residential square footage or height, based on the same plan. It would require over twice as many family units (60% rather than 26%), which would be difficult to accommodate with suitable amenity and within predominantly 6-8 storey apartment blocks.

b. Parking ratio: Traditional LBE policy has favoured a high parking ratio up to and beyond 200%, however the public transport improvements and broad mix of amenity on site can justify an average ratio of around 49%, which can be discretely and efficiently housed under podium courtyards and partially on street – improving amenity, light and minimising adverse impact of parking.

c. Population related deliverables: Using LBE rather than Developer Partner mix would result in 17% higher population (3,802 people) and 37% or 1,572 more children with consequently higher impact on infrastructure needs including community & school related functions, amenity etc.

d. SIL and Developable Land: The retention of all the SIL (Strategic Industrial Land) would reduce the developable site by 35% from 52.05 ha. to 33.74 ha., with a critical reduction in capacity, and loss of access to other amenities and landscape features. The retention of smaller parts of Industrial land will equally compromise the spatial quality of the development, and limit drastically the permeability of the new urban neighbourhoods. Releasing Strategic Industrial Land is essential to enable the critical east-west connection across the site and the access to Lea Valley Regional Park.



Illustrative section indicating additional scale of LBE mix compared with the Developer Partner Mix

2.5 Conditions and Process required for delivering density through quality & innovation

High quality and innovative design and execution will be necessary to achieve an acceptable standard of quality in the buildings and place-making at the density levels envisaged for Meridian Water. Developer proposals will need to be progressed and administered through a process designed to both support the maximisation of opportunities whilst at the same time protecting the quality of development.
For example initial proposals should be established, firstly at a Master Plan level and then negotiated through a pre-application process involving Design Guidance and Codes, Specialist Consultant Analysis, and Design Panel review. Additional support and periodic review of the performance of each phase should be made by a specially selected Steering Group (drawn from experts in local authorities and the GLA, regeneration, finance and design) to help maintain the strategic direction of the re-development and provide expert direction for the inevitable adjustment of the strategy to deal with changing circumstances over time.

Furthermore, particularly where the scale and density of development is in the higher ranges, successful place-making will greatly rely on a coherent strategy for the delivery of the following (lead by either Enfield Borough Council, abbreviated LBE, or a Developer):

1. Diverse and active ground floor uses including retail. (LBE)
2. 'Meanwhile Uses' strategy capable of establishing the site as a destination, and supporting the establishment of new employment and uses. (LBE)
3. Social and technical infrastructure timed to meet the needs of the new community. (Developer)
4. High quality, diverse and easily accessed amenity and Public Realm. (Developer)

The importance of these will be even greater where the comprehensive development of the site is restricted by a significant retention of SIL and Industrial land.

The optimal solution may also be subject to future re-evaluation to take account of changes in technology, climate change or significant changes in national or regional economic circumstances.

SUMMARY TABLE 3

Summary table of scenarios against delivery risks & challenges

3.1 The Summary Table

The summary table compares the performance of all scenarios against a range of spatially sensitive parameters related to amenity, scale, density, parking and employment. It compares the performance to three benchmark levels, which indicate:

Key	
	The requirements can be comfortably met with standard solutions
	The requirements needs high quality or innovative design & execution to achieve an acceptable standard
	The scenario presents requirements not achieveable with acceptable spatial standards

The failure of a scenario under one category won't necessarily mean that scenario can't be made to work, with sufficient mitigation, design skill and quality of execution. However, failure or poor performance over several categories would strongly suggest the scenario is unsuitable for development. In all cases a developer mix is assumed, however an additional column 'H' for storey heights based on the LBE mix is used for reference to show the significance of this factor (to be compared to column 'E').

Table 1: Spatial scenario Testing summary Table

Scenarios					A	B	C	D	E	F	G	H
Scenario		Dwellings	No. Jobs	SIL/ industry	Total Public & Private Shared Amenity HA/1000 Res	Private Amenity m2/unit	Residential parking %/unit *	Non residential parking Spaces/ 1000 FTE's	Average storey heights Developer Mix	Net Density across site - dph	Assessment against standard - Incidence of failure	Average storey heights - LBE mix
1.1	a	5000	3000	100%	0.98	18	104%	183	6.7	148	3	7.7
	b		6000	100%	0.98	18	104%	91	7.6	148	2	8.5
1.2	a	8000	3000	100%	0.61	14	65%	183	10.1	237	4	11.6
	b		6000	100%	0.61	14	65%	91	11.0	237	3	12.4
1.3	a	10000	3000	100%	0.39	11	52%	183	12.3	296	5	14.2
	b		6000	100%	0.39	11	52%	91	13.3	296	4	15.1
1.4	a	12000	3000	100%	0.41	12	43%	183	14.6	356	4	16.8
	b		6000	100%	0.41	12	43%	91	15.5	356	3	17.7
2.1	a	5000	3000	50%	1.51	20	104%	183	5.8	130	2	6.6
	b		6000	50%	1.51	20	104%	91	6.5	130	1	7.3
2.2	a	8000	3000	50%	0.94	15	65%	183	8.6	208	3	9.9
	b		6000	50%	0.94	15	65%	91	9.4	208	2	10.6
2.3	a	10000	3000	50%	0.75	14	52%	183	10.5	260	4	12.1
	b		6000	50%	0.75	14	52%	91	11.3	260	3	12.8
2.4	a	12000	3000	50%	0.63	13	43%	183	12.4	312	4	14.3
	b		6000	50%	0.63	13	43%	91	13.2	312	3	15.1
3.1	a	5000	3000	25%	1.80	21	104%	183	4.9	114	2	5.6
	b		6000	25%	1.80	21	104%	91	5.6	114	1	6.2
3.2	a	8000	3000	25%	1.13	16	65%	183	7.3	182	1	8.4
	b		6000	25%	1.13	16	65%	91	8.0	182	1	9.0
3.3	a	10000	3000	25%	0.90	15	52%	183	8.9	227	4	10.3
	b		6000	25%	0.90	15	52%	91	9.6	227	3	10.9
3.4	a	12000	3000	25%	0.75	14	43%	183	10.5	272	4	12.2
	b		6000	25%	0.75	14	43%	91	11.2	272	3	12.8
4.1	a	5000	3000	0%	2.14	24	104%	183	4.1	96	2	4.6
	b		6000	0%	2.14	24	104%	91	4.6	96	1	5.1
4.2	a	8000	3000	0%	1.33	18	65%	183	6.1	154	1	7.0
	b		6000	0%	1.33	18	65%	91	6.6	154	0	7.5
4.3	a	10000	3000	0%	1.07	16	52%	183	7.4	192	1	8.5
	b		6000	0%	1.07	16	52%	91	7.9	192	0	9.0
4.4	a	12000	3000	0%	0.89	14	43%	183	8.7	231	4	10.1
	b		6000	0%	0.89	14	43%	91	9.3	231	3	10.6

Comfortably meets the standard.	>2.37 Ha/1000	>20m2/unit	40-60%	>30 cars/FTE	<6	94-185dph	1 or less	<6
Requires high quality or innovative design & execution	1-2.37 Ha/1000	12-20m2/unit	60-80%	15-30 cars/FTE	6<8	185-225dph	2	6<8
The scenario does not meet the standard.	<1 Ha/1000	<12m2/unit	<40% or >80%	<15 cars/FTE	>8	>225dph	3 or more	>8

Table 2: Summary of test criteria

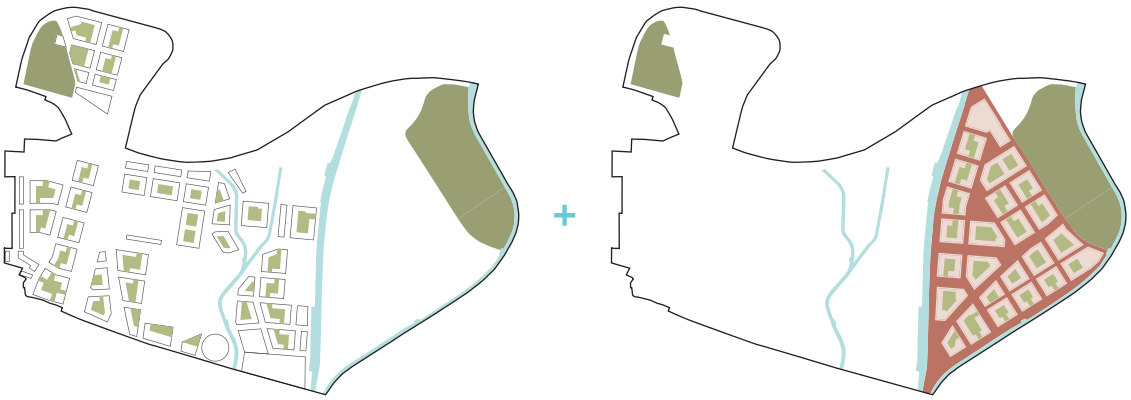
	Summary of test criteria & Assessment	Optimal Range
A	Total Public & Private Shared Amenity HA/1000 Res	1-2.37 Ha/1000
B	Private Amenity m2/unit	12-20m2/unit
C	Residential parking %/unit *	60-80%
D	Non residential parking Spaces/ 1000 FTE's	15-30 cars/FTE
E	Average storey heights Developer Mix	6<8
F	Net Density across site - dph	185-225dph
G	Assessment against standard - Incidence of failure	2
H	Average storey heights - LBE mix	6<8

3.2 Definition of test and selection criteria

The scenarios are tested against several measurements which are taken either from criteria set out in the Evidence on Housing and Supporting Infrastructure report, or other sources as described below. Unit numbers, employment numbers and the effect of SIL retention on developable land are the main variables. The amount of parking, amenity and non-residential uses delivered in any scenario has largely been based on a measurement of the quantum achieved when adopting the principles of the Spatial Framework and modelling for 10,000 homes and 6,000+ jobs with the Developer Partner Mix (See Chapter 5).

In addition, due to Enfield Council's desire to maximise jobs, all scenarios would need to deliver around 6,000 jobs and consequently have very similar distribution of uses and non-residential square footage. Given the ambition for the development we have assumed that an optimal performance will sit within the middle range of performance in the table. The density of accommodation within this range will require high quality or innovative design and execution to achieve an acceptable standard. The performance of each scenario is measured as follows:

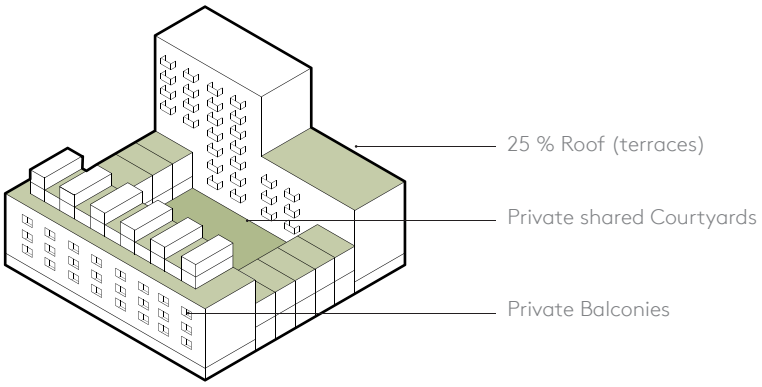
(A) **Total Public & Private Shared Amenity Ha/1000 Res:** LBE Open Space and Sports Assessment update (2011) targets 2.37 Ha/1000 residents as a target for public open space. Given the proximity of the 4,000 Ha of the Lea Valley Regional Park (LRVP) and other amenity areas, such as Kenninghall open space, it's considered acceptable in the present report to deliver anything over 1 Ha/1000 of high quality public and private shared amenity space. The 16.3 Ha of public amenity and 7.8 Ha of private shared amenity obtained when adopting the principles of the Spatial Framework has been apportioned to each scenario minus a deduction for any loss of this through the retention of SIL land. With 100% or 50% SIL retention the development would deliver less than 1 ha per 1000 residents, therefore it is recommended that at least 50% of the existing SIL land is de-designated.



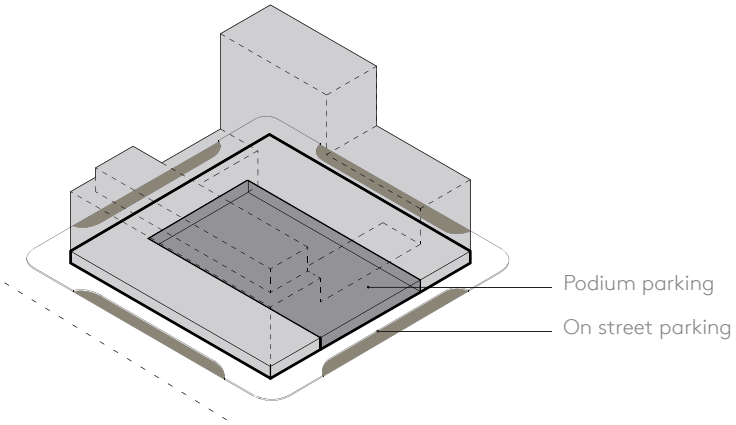
Ha Public and Private Shared Amenity

Ha % of SIL Land

(B) Private Amenity m²/unit: The London Plan Housing SPG 2015 requires a minimum of 5m² of private outdoor space to be provided for 1-2 person dwellings and an extra 1m² for each additional occupant. In addition 10m² of amenity space per child is required. With the Developer Mix a minimum of 12m²/unit would be needed (7m² for amenity and 5m² child allowance). Based on previously built residential projects, it is estimated that 8m²/unit private space for balconies/terraces would be achievable in all scenarios. 77,861m² of private shared amenity, achievable in the Spatial Framework, has been added to each scenario, minus deductions for losses due to SIL retention. The Spatial Framework delivers 16m²/unit.

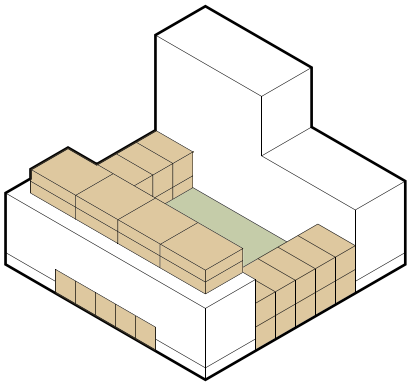


(C) Residential parking provision ratio (%/unit)
: the Transport appraisal analyses transport implications of the scenarios and, based on the PTAL range, calculates the residential parking requirement to be 49%, based on a lower provision ratio near the station and a higher one further to the east. The Spatial Framework achieves 49% based on a provision divided between 80% under podium and 20% on street parking. We have rejected scenarios which significantly over or under provide parking (<40% or >80%) for reasons of sustainability in the latter and significant under provision in the former.



(D) Non-residential parking Spaces/1000 FTE's: the Transport appraisal also makes assumptions for non-residential parking based on the anticipated number, mix and distribution of uses, in the various scenarios. A general rate of 15 cars per 1000 FTE's is proposed. All scenarios easily meet the parking standard with sufficient excess for Blue badge holders, visitors etc.

(E) Average storey heights: These have been calculated by applying the square footage required to accommodate the required floorspace at the Developer Mix over the available developable land based on a podium courtyard typology. Allowances have been made for non-residential uses and functional requirements for refuse, cycles, plant and under-podium parking. The Spatial Framework model was used to further test our assumptions, detailed later in this report, and test the impact of massing on light levels achieved in the courtyards as well as suitable locations for 3 bed+ or family type accommodation. This analysis indicates that beyond an average of 8 storeys, even with careful modulation of building mass and the use of some taller buildings, the scenarios were likely to fail the standards of light, amenity and street enclosure as well as the satisfactory inclusion of family accommodation considered appropriate to it context in this part of London. The Spatial Framework has an average of 7.8 storeys as shown in the column 'E' of the summary table. Column 'H' illustrates the additional height required if an LBE mix would be used.



The majority of 3 bed homes can be provided in stacked maisonettes or apartments with large terraces

(F) Net Density across site dph: Through calculation and modelling as well as an assessment of the developable site, both gross and net densities have been calculated. The gross figure excludes major roads, rail and retained retail boxes. Net density also excludes the Causeway, waterways and Lea Valley Park to make the density more comparable to precedents and the GLA (SRQ) density matrix from the London Plan 2016. The mid-band performance range is based on averaging the upper density over PTAL bands 2-6 for an Urban setting at LBE and Developer mixes. The upper limit is set by the maximum density within the suburban range. The Spatial Framework density is 192 dph (column 'F' of the summary table).

Table 3: Net Density across the site

Mix	Setting/mix	PTAL 2 to 3	PTAL 4 to 6	Average max 2-6
	Urban			
LBE mix	3.8 –4.6 hr/unit	45–120 u/ha	45–185 u/ha	153 u/ha
Developer mix	3.1–3.7 hr/unit	55–145 u/ha	55–225 u/ha	185 ha

3.3 Optimal Scenarios

Scenarios 3.2b, 4.2b, 4.3b have scored best under spatial analysis, which suggests that their common properties are critical factors in achieving Enfield's aims for the redevelopment, providing they are delivered through high quality or innovative design and execution. There are however additional considerations or conditions which may affect the choice or viability of a scenario.

There are significant costs to be considered for acquiring land and delivering the necessary infrastructure at Meridian Water. Many of these are fixed costs e.g. the train station, bridges, remediation etc. In response to these costs a minimum provision of houses and jobs has been considered acceptable to face costs to the redevelopment. In addition, Enfield Borough Council wish to maximise new homes and jobs in response to growing demand and ambitions to diversify and meet employment targets.

Consequently, to best meet the aspirations LBE have set for the spatial quality of development within Meridian Water, and by implication, maximise the number of homes and jobs, the following scenario attributes should be considered integral to the development of the site; only scenarios which meet:

- Approximately 8,000-10,000 homes - to meet housing aspirations.
- Approximately 6,000 jobs – to meet employment aspirations.
- Between 6 and 8 average storeys – to maximise development but with adequate amenity.
- Replacement of at least 50% SIL/Industrial – to access LVRP and forge east-west connections.
- At least 40% residential parking in any phase and a minimum of 48% over all.
- Delivery of social infrastructure - particularly education, health, culture and leisure, in proportion to demand (a minimum 90% delivery by completion and no less than 80% in any phase.
- Delivery of Technical Infrastructure - to include the parallel delivery of station, bus and rail links up to and including Crossrail 2 and the comprehensive introduction of road, cycle and pedestrian routes including the causeway, bridges and wider area junction and highway improvements.

Based on the above and identified in the Summary Table, future master planning and land acquisition should be developed around the following range of scenarios:

LBE Mix
Scenario 3.2b–25% SIL, 8,000 homes, 6,000 jobs
Scenario 4.2b – 0% SIL, 8,000 homes, 6,000 jobs

Developer Mix
Scenario 3.2b – 25% SIL, 8,000 homes, 6,000 jobs
Scenario 4.2b – 0% SIL, 8,000 homes, 6,000 jobs
Scenario 4.3b – 0% SIL, 10,000 homes, ,6000 jobs

All scenarios have been tested considering the presence of supporting uses, community infrastructures and public open space as central and non -negotiable in each possible development. The present study consider as subject of the analysis carried in these pages the only spatial impact of the residential and non residential provision in different conditions against the capacity of the site: the selection of preferable scenarios does not take into detail account the financial viability of the different scenarios or the tenure mix. It should be acknowledged that while a scenario with 10,000 homes and 6,000 jobs can optimize the delivery of Meridian Water, it produces a district that won't necessarily be of a density and character consistent with the most built up areas of London – indeed, there are few examples of such a large area averaging 6 to 8 storeys. While every effort in the modelling lying behind the scenario testing has been made to safeguard a public realm that will ensure a highly liveable environment, more in depth studies should be undertaken to ensure that Meridian Water's unique setting in the Upper Lea Valley and its Outer London location are acknowledged. In short, there may be value, in all sense of the word, in a development that realizes slightly fewer homes.

METHODOLOGY 4

Methodology and assumptions

4.1 AECOM assumptions

Aecom has been commissioned by LBE to produce two reports in order to provide evidence on housing and supporting infrastructure for the development of the Meridian Water site. This work aimed to support the policies promoted by the new Edmonton Leeside Area Action Plan. The scenario testing run by KCA in the present document has been informed by the AECOM work done in the Housing and Supporting Infrastructure report and Evidence for Employment Land, Industries and Jobs report (September 2016). Aecom evaluated 32 scenarios across a range of housing and employment targets to establish a quantum of deliverables such as amenity, community infrastructure, retail, employment, etc. for the development of the Meridian Water site.

Their calculations used an evidenced based methodology and were based on established Planning Policy and Local, GLA or National standards. The present work has been based on AECOM assumptions and where necessary referenced these and any additional assumptions relevant to our analysis.

4.2 Scenario testing baseline

In order to run a spatial test consistently across the different scenarios it was necessary to set a series of assumptions and methods (these are consistent across the supporting documents). As one of the most important values tested is density, the setting of the land which is calculated is of primary importance. The Meridian Water site occupies an area of approximately 82 hectares, of which not all can be considered suitable to build the new development on. The London Plan defines density in terms of net residential site area. However, counting very large, on-site, publicly accessible open spaces, such as some of those proposed for London Plan Opportunity Areas, could serve to artificially lower density calculations. Consequently, density scenarios have been calculated on the land considered developable area. This area is the result of an analysis of the existing constraints on the site and excludes some protected areas of open space and infrastructure footprints.

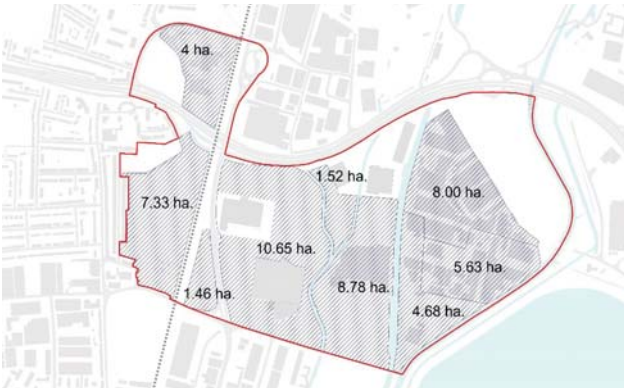
Developable land assumptions:
Land within the red line boundary but not considered for development (and not included in density calculations) includes:

- Angel Edmonton Road/Meridian Way
- Rail tracks of West Anglia Main Line
- Lea Valley Regional Park
- Kenninghall open space
- Ikea Building Footprint
- Tesco Building Footprint
- Ravenside Retail Park
- Waterways
- Site for Meridian Angel Primary School and Ladysmith Park

Developable Land includes:

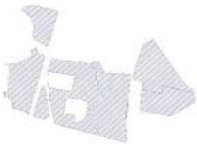
- Phase 1 land
- The Causeway footprint
- The space within 60m from the HV pylons along the east boundary of the site, assuming the pylons will be buried in future, releasing new land

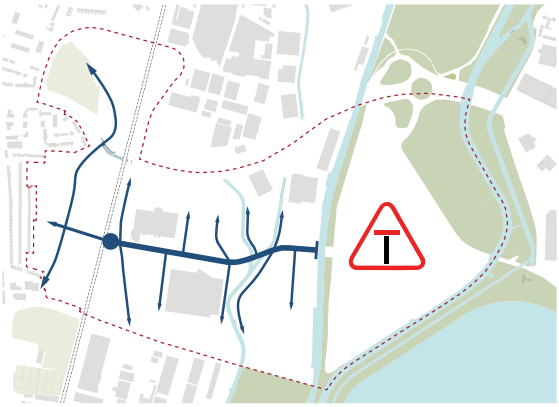
[1]"Residential density figures should be based on net residential area, which includes internal roads and ancillary open spaces." London Plan 2016, Policy 3.4 Optimising housing potential

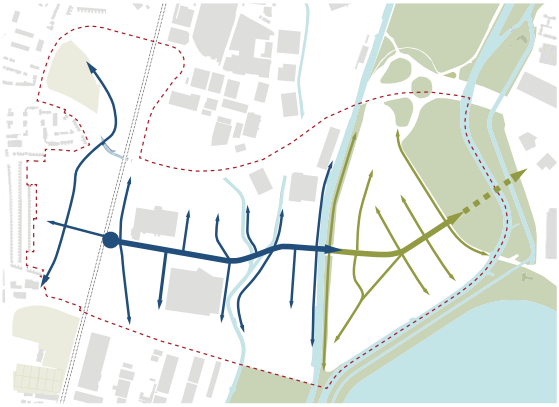


Developable land on site

Table 4: baseline for scenario testing

Developable Land Scenarios				
	Scenario 1:	Scenario 2:	Scenario 3:	Scenario 4:
Location Map				
Scenario SIL	100% SIL retention	Harbet Road SIL released	SIL IBP released	SIL IPL released
				
Developable land (ha.)	**33.74**	**38.42**	**44.05**	**52.05**





The de-designation of the SIL would ensure ease of east-west access to the wider Lee Valley and waterways as well as allow for the creation of spatially cohensive mixed use neighbourhoods

The different scenarios tested depend on 3 sets of variables:

- Land available for development
- Number of new houses provided on site
- Number of new jobs provided on site

The test will verify different kinds of density measurements, taking into account first the solely residential use, and then integrating the area required for supporting uses and employment. In order to be able to ensure the scenario testing calculations are meaningful, it was essential to equalize the kind of information provided by planning policies or other kind of documents, e.g. net or gross areas. Ratios have been applied to ensure consistency across data. The ratio has been specified in every section.

It should be noted that although we have represented density in different metrics there is, indeed, no definitive way to express the amount of people and built form on the site. For this reason different densities have been calculated and compared in order to highlight the difference between the scenarios given.

4.3 Two methodologies – Abstract and Applied

Two methodologies have been applied to carry out the spatial impact scenario testing. The first enables a desk-top appraisal of spatial implications and the second verifies these conclusions through a master planning exercise which adopts the principles of the Spatial Framework, taking into account contextual and place-making considerations.

Scenario testing methodologies:

Abstract. Requirement-driven method: The areas used to calculate requirements for dwellings, supporting uses, retail and employment are based on planning policy, starting from the assumptions established for the different scenarios. This data is then compared with the quantum of area that the site can provide in the different scenarios. Initially all 32 scenarios were abstractly tested using desk top analysis based on known and tested building typologies and associated efficiencies, parking strategies, floor heights etc. to assess massing implications and land take for different functions. Some basic assumptions about developable land, technical constraints, building typology etc. were also made, based on previous work, as a robust evidence base. Through tables and typological modelling, we could compare requirements set out in the Evidence on Housing and Supporting Infrastructure and Evidence for Employment Land, Industries and Jobs reports, with the quantum of area available on site provide based on our detailed knowledge of its constraints.

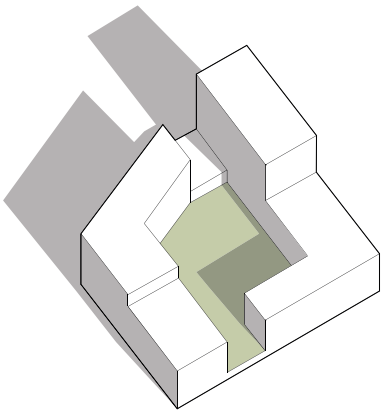


Illustration of Courtyard light at midday on 21st March

Applied. Site capacity method: The area the site can accommodate is used to demonstrate requirements for open spaces and parking spaces. The areas required are translated into percentages or ratios of the available land. This method has been adopted in recognition of the fact that these land uses are often subject to negotiation as they are often challenging to satisfy. In addition to the abstract desk-top tests we have carried out a design exercise. This has been based on a strategic approach to unlocking the potential of the site through diagrammatic master planning. We have used good urban design rules and an analysis of the sites constraints and opportunities to make decisions on the position and scale of community infrastructure, open space, movement networks and several other factors which enabled the assumptions of the abstract work to be tested and verified. To do this we have modelled a three-dimensional spatial framework informed by design guidelines reflecting best practice. This guidance is captured in the supporting document entitled 'Spatial Framework', and should be referred to when the development of a Master Plan comes forward.

The advantage of this 'checking' process has meant that we could challenge some of the assumptions in the Housing and Supporting Infrastructure report and Evidence for Employment Land, Industries and Jobs report (or find design solutions to resolve them outside the site boundary). For example, the easy access to Lea Valley Regional Park and its amenity meant that achieving all open space targets on site became less critical.

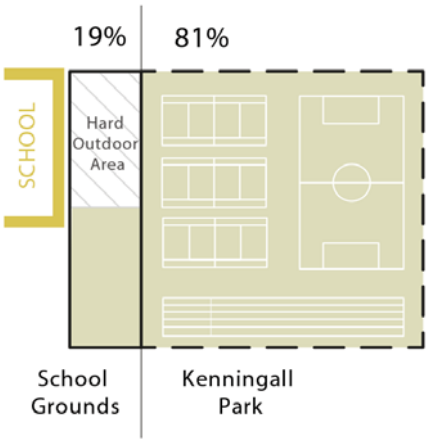
4.4 Additional effect of Standard based parameters

Some of the standards used to derive the target quantum and required areas in the Housing and Supporting Infrastructure report and Evidence for Employment Land, Industries and Jobs reports can have a big impact on the viability of a scenario or its practical delivery. We have made some reasonable interpretations of these particularly in the Spatial Framework model and this has been applied to evaluating the final selection of suitable scenarios.
Here are some examples:
Child Yield and Population driven figures: Using LBE rather than Developer mix would result in 17% or 3,802 higher population and 37% or 1,572 more children with consequently higher impact on infrastructure needs including Community and School related functions, Amenity etc. The actual population at Meridian Water may deviate from the assumptions made here, where a conservative approach to sourcing the data has been made. The following standards are affected by the population and child yield:

a. Open Space: LBE Open Space and Sports Assessment update (2011) has been used to dictate an Open Space requirement of 2.37 Ha/1,000 residents, however GLA would require a lower amount based on Private amenity (approx. average 7m^2/unit) and Child play space (10m^2/child). Given the proximity of the 4,000 Ha Lea Valley Regional Park and other amenity areas, such as Kenninghall, we believe that delivering far less than the LBE standard on site would be acceptable, providing access is given to it.

b. Department of Education Outdoor Space Standards: As with Open Space a sizeable amount of outdoor amenity required by school guidance could be met by re-purposing the use of Kenninghall and LVRP. Once again this would be dependent on the proximity of the school and access to it. Illustrative diagram of school outdoor facilities partly located outside the site.

c. Leisure requirements: Housing and Supporting Infrastructure report and Evidence for Employment Land, Industries and Jobs report expresses some leisure requirements in ways impractical to deliver e.g. 4.5 lanes of swimming pool per 10,000 homes. In the desk top studies of all the scenarios the total requirements have been assessed for all uses but with specific assumption s and ratios that allowed to convert the different requirements into a comprehensive square footage, e.g. the swimming pool lanes and games courts will be included in a leisure centre with a sufficient footprint.

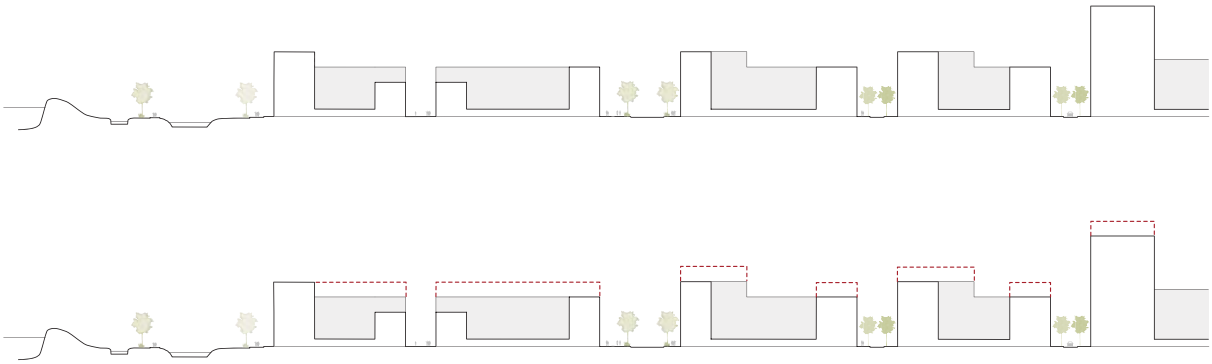


Illustrative diagram of School outdoor facilities partly located outside the site.

4.5 Spatial impact focus, scenario 4.3.b

The Applied method (see the methodologies paragraph page 24-25) has resulted in the creation of a more detailed analysis of one scenario by developing a design proposal and three-dimensional model, based on good urban design and site analysis principles. This evolved to be equivalent to scenario 4.3b based on 10,000 units and 6,000 new jobs accommodated on site with 0% SIL retention. This has allowed us to verify the method used for the other scenarios and the assumptions related to it (housing typology, average building heights etc.).

The 3D modelling exercise, adhering to the urban design guidance within the Spatial Framework document, has established what density and volume of buildings would be necessary to host all residential and non-residential activities on site and test the impact this has on urban design quality (i.e. daylight and sunlight, privacy, legibility, etc). Different uses have been assigned to the floor space generated by the model, with attention to public buildings and community uses, i.e. leisure centre, schools, etc. The ground floor has been modelled to highlight active uses and to see where a mixed used block may limit the space available for specific functions, for example, car parking.



Illustrative section indicating additional scale of LBE mix.

Using light modelling and manipulating massing has enabled us to check how the average building height can be distributed across different areas of the site whilst still achieving reasonable light levels in amenity areas. This has supported the choice of the courtyard typology as an efficient way to accommodate parking discretely whilst improving courtyard light and amenity. It has also allowed us to verify the assumed parking capacity capable of being achieved with predominantly courtyard blocks as well as a few multi storey parking blocks for non-residential use.

The success of this modelling has meant that it has been further developed to create a Spatial Framework to support the ELAAP. It includes guidance on how to achieve the design quality required to justify the scale of development with respect to massing, use, amenity, layout, and grain. It also includes additional guidance on movement and amenity networks, reaching out beyond the site, which are required to ensure it properly integrates into the surrounding area. These are supported by transport and analysis and modelling.

The Spatial Framework is described through a series of scaled diagrams which map out streets, open spaces and building plots for different uses. Given the range of scenarios falls between 5-12,000 homes and 3-6,000 jobs we believe that the ratio of buildings to streets and open space would be consistent for all scenarios (minus a proportion of any land retained for SIL) because almost all scenarios will require buildings on average 5 storeys or greater. This means that for example if 16.3 Ha of Open Space is achievable in the Spatial Framework then more or less the same amount will be achievable in the other Scenarios with the same amount of SIL. Therefore if one scenario has 5,000 and another has 10,000 homes then the pro rata open space provided in the former will be twice as much.

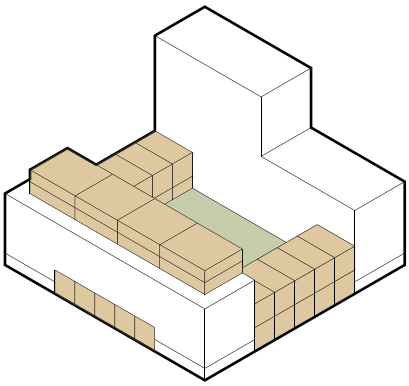


Illustration of potential to accommodate the majority of 3 bed homes in stacked maisonettes or apartments with large terraces.

SCENARIO TESTING

5

5.1 Assessment of key parameters

The conclusions outlined in the executive summary (chapter 2) are the result of a comparative analysis based on a series of assumptions and methodologies that are explained in chapter 4. Chapter 5 illustrates the calculations that underlie the analytical work. The comparisons between scenarios will be shown and supplemented with comments and references.

The relationships between the different parameters allowed us to draw out the cumulative impact of planning development decisions that might influence the built form and spatial outcome of the development on site.

The first part of the chapter will explore the different metrics of the following parameter:

- **density**

It is critical to recognise that there are different metrics articulating density for different planning and design purposes. Each calculation will yield a slightly different outcome. In the first instance the quantity of proposed units has been divided by the area of the developable land in hectares. This first calculation is not affected by the tenure and dwelling size mix applied to the new development, and is therefore represented by a single table (Table 5). The tenure and the three different dwelling size mixes have subsequently been introduced in a further calculation. These can be compared to the London Plan Sustainable residential quality (SRQ) density matrix.

As a second series of parameters, the following quanta associated with uses have been calculated:

- **population** density is calculated in base of the residential density based on the population estimate from the GLA Yield calculator[2]
- the amount of **employment** on site.
- the **supporting uses** and **retail space** are calculated following on the population estimate
- the **open space and amenity** on site
- the **parking ratios** complete the assessment of key parameters necessary to demonstrate the spatial impact across the different scenarios.

The ultimate goal of this exercise is to extract a spatial dimension from the data relative to the different scenarios without having to design and spatially model every different case. In order to do so it is essential to quantify the floor space in Gross External Area (GEA) for all uses, as this represent the area of buildings or spaces measured to their full extent. This will enable a true calculation of the intensity of each development scenario, and to trace what would be its correspondent spatial outcome.

5.2 Density

Density 1: dwellings per hectare

Based on the developable land agreed between KCA and Aecom the residential density is calculated for the different scenarios using the metric of units per hectare. This value is largely used in density studies and it allows for comparison with other urban areas. The density values illustrated in the next table are not affected by the dwelling size and tenure mix:

[2]Table 4.2, 4.4 and 4.6 AECOM ELAAP: Evidence on Housing and Supporting Infrastructure Report

Table 5: Density 1 - Dwelling Units/hectare

Main Scenario	Dwellings	SIL Retention	Land available ha.	Average Housing density u/ha.
1.1	5000	100%	33.74	**148.19**
1.2	8000	100%	33.74	**237.11**
1.3	10000	100%	33.74	**296.38**
1.4	12000	100%	33.74	**355.66**
2.1	5000	50%	38.42	**130.14**
2.2	8000	50%	38.42	**208.22**
2.3	10000	50%	38.42	**260.28**
2.4	12000	50%	38.42	**312.34**
3.1	5000	25%	44.05	**113.51**
3.2	8000	25%	44.05	**181.61**
3.3	10000	25%	44.05	**227.01**
3.4	12000	25%	44.05	**272.42**
4.1	5000	0%	52.05	**96.06**
4.2	8000	0%	52.05	**153.70**
4.3	10000	0%	52.05	**192.12**
4.4	12000	0%	52.05	**230.55**

The calculation has been based on the developable land as specified in "Scenario testing baseline" Section 4.2, p 23. This provisional residential density allows a few conclusions to be drawn:

- Scenario 1.4 is the densest with 100% retention SIL and 12,000 units, while the least dense scenario is the 4.1, with 5,000 units distributed on a developable area of 52.05 hectares
- Only the worst case scenario (1.4) would achieve what is defined as hyper-dense development[3] (more than 350 units per hectare).
- Residential densities achieved in scenarios 1 and 2 reach levels of density that are not present in any part of London with similar locational or public accessibility conditions – i.e. an outer London context, poor PTAL.
- From the "Superdensity" case studies ("Case studies summary sheet"[4]) it seems that similar levels of density have been achieved in other parts of London. These precedents have been measured on the basis of the single plot, and therefore they are not directly comparable with the scenario testing, which has been measured on the basis of the all developable land available, including streets and public realm rather than on a plot by plot basis.
- Several scenarios, where not all of the SIL will be released, achieve levels of density over 200 units per hectares, comparable with the relativity dense areas of central London, such as Bayswater or Pimlico[5]
- All the scenarios are well beyond a suburban level of density. This can be seen as consistent with the aspiration to develop Meridian Water as a new 'urban' area (as defined by The London Plan).

A general residential density value makes it possible to make high level comparison between scenarios, however, it is limited as it doesn't provide enough information about the household size and tenure of the residents that are expected to move into Meridian Water. These factors can significantly affect square footage and population yield. In order to explore in more detail the residential density in Meridian Water it's necessary to make assumptions about the dwelling sizes and the tenure mix.
In order to be consistent with the AAP's supporting document - Evidence on Housing and Supporting Infrastructure Report, only one tenure mix has been taken into account: the Core Strategy Mix adopted by Enfield Council in 2010. The dwelling tenure mix is illustrated in the following page:

Table 6: Dwelling Tenure Mix

Tenure Mix - Core Strategy mix	
Private Market	**60%**
Affordable	**40%**

[3]"Superdensity - the Sequel: Designing high density housing and sustainable places", Pollard Thomas Edwards, PRP architects, HTA, Levitt Bernstein, 2015, p.6. Densities around 300 units per hectares are comparable with the centre of Paris, a range of 500 dwellings per hectare are typical of the East Village in New York
[4]Density and Urban Neighbourhoods in London, Final Report, Minerva LSE Research Group, 2004, pp. 42-43
[5]Density and Urban Neighbourhoods in London, ibid., p. 11

The residential density will be then calculated across 3 very different dwelling unit size mixes:

- Enfield Core strategy as an example of a public policy led mix
- Strategic Housing Market Assessment (SHMA)[6]
- The Developer Partner Tenure Mix as an example of a market oriented mix

Table 7: Dwelling Size Mix

Dwelling size Mix				
Core Strategy mix	1b	2b	3b	4b
Average dwelling size mix	20%	20%	30%	30%
SHMA mix	1b	2b	3b	4b
Average dwelling size mix	25%	25%	25%	25%
Developer partner mix	1b	2b	3b	4b
Average dwelling size mix	30%	44%	19%	7%

The introduction of mix as an additional variable in the scenario testing is justified by the necessity to verify how much the density, is effected by the dwelling mix, and whether this impact is big enough to compromise the viability of the development through its effect on population and supporting uses. In order to translate numbers and mix into 'built area' we have to quantify the requirement for various supporting uses and convert them into a comprehensive floorspace. The dwelling floorspace has been calculated based on the assumption that across the site an apartment typology is adopted. These values are inclusive of communal corridors, staircases, lifts and external walls, and are expressed in square meters:

Table 8: Dwelling - Average Gross Area (GEA)

Dwelling Gross Area (GEA) Core strategy mix						
	1b	2b	3b	4b		
Min from London Plan	50	70	95	103.5	sq m	
10% floorspace added on minimum for inefficiency	55	77	104.5	113.85	sq m	
mix	20%	20%	30%	30%		
Proportion	11	15	31	34	92	Average Floor Space
	NIA conversion into GIA			77%	119	
	GIA conversion into GEA			96%	124	sq m GEA average unit

Dwelling Gross Area (GEA) per Unit - SHMA mix						
	1b	2b	3b	4b		
Min from London Plan	50	70	95	103.5	sq m	
10% floorspace added on minimum for inefficiency	55	77	104.5	113.85	sq m	
mix	25%	25%	25%	25%		
Proportion	14	19	26	28	88	Average Floor Space
	NIA conversion into GIA			77%	114	
	GIA conversion into GEA			96%	118	sq m GEA average unit

Dwelling Gross Area (GEA) per Unit -Developer partner mix						
	1b	2b	3b	4b		
Min from London Plan	50	70	95	103.5	sq m	
10% floorspace added on minimum for inefficiency	55	77	104.5	113.85	sq m	
mix	30%	44%	19%	7%		
Proportion	17	34	20	8	78	Average Floor Space
	NIA conversion into GIA			77%	102	
	GIA conversion into GEA			96%	106	sq m GEA average unit

Conclusions:

The Core mix will take up more built floorspace per the same number of units, with an average of aprox. 17% more floorspace than the Developer Mix.

[6]Aecom Central Leeside Area Action Plan Task A, p. 20

Density 2: habitable room per hectare
In order to consider densities generated at a finer grain, a density based on habitable rooms per hectare has been calculated following the Core Strategy Mix and the Developer Partner Mix. Habitable rooms per hectare is the metric most commonly used in planning policy.

The following table shows how many habitable rooms[7] are calculated per dwelling:

Table 9: Habitable rooms per dwelling size

Habitable rooms ref.					
Dwelling size	1b	2b	3b	4b	average hr/unit
No. habitable rooms	3	4	5	6	4.5

Using this data it is possible to calculate densities across the different scenarios, where the average habitable rooms per units has been recalculated depending on the dwelling size mix considered.

Table 10: Density 2 - habitable rooms/hectare

				Core Strategy Mix		SHMA Mix		Developer Partner Mix	
Main Scenario	Dwellings	SIL Retention	Land available ha.	Housing density Habitable rooms/ha.	Average hr/unit	Housing density Habitable rooms/ha.	Average hr/unit	Housing density Habitable rooms/ha.	Average hr/unit
1.1	5000	100%	33.74	637.2	4.3	592.8	4.0	487.6	3.3
1.2	8000	100%	33.74	1019.6	4.3	948.4	4.0	780.1	3.3
1.3	10000	100%	33.74	1274.5	4.3	1185.5	4.0	975.1	3.3
1.4	12000	100%	33.74	1529.3	4.3	1422.6	4.0	1170.1	3.3
2.1	5000	50%	38.42	559.6	4.3	520.6	4.0	428.2	3.3
2.2	8000	50%	38.42	895.4	4.3	832.9	4.0	685.1	3.3
2.3	10000	50%	38.42	1119.2	4.3	1041.1	4.0	856.3	3.3
2.4	12000	50%	38.42	1343.1	4.3	1249.3	4.0	1027.6	3.3
3.1	5000	25%	44.05	488.1	4.3	454.0	4.0	373.4	3.3
3.2	8000	25%	44.05	780.9	4.3	726.4	4.0	597.5	3.3
3.3	10000	25%	44.05	976.2	4.3	908.1	4.0	746.9	3.3
3.4	12000	25%	44.05	1171.4	4.3	1089.7	4.0	896.3	3.3
4.1	5000	0%	52.05	413.1	4.3	384.2	4.0	316.0	3.3
4.2	8000	0%	52.05	660.9	4.3	614.8	4.0	505.7	3.3
4.3	10000	0%	52.05	826.1	4.3	768.5	4.0	632.1	3.3
4.4	12000	0%	52.05	991.4	4.3	922.2	4.0	758.5	3.3

The values calculated in the Table 10 above have been checked against the Public Transport Accessibility Level (PTAL). PTAL levels are considered indicative, but this methodology allows us to establish what kind of public transport network would be viable and necessary to serve the number of residents on site. It also allows us to re-affirm the nature of the piece of city being developed – i.e. as stated above: 'urban'.

[7]Habitable rooms are considered rooms used for dwelling purposes but which are not solely a kitchen, utility room, bathroom, cellar or sanitary accommodation., source the Planning Portal

Table 11: Sustainable residential quality (SRQ) density matrix (habitable rooms and dwellings per hectare) from the London Plan 2016

Setting	Public Transport Accessibility Level (PTAL)		
	0 to 1	2 to 3	4 to 6
Surburban	150 - 200 hr/ha	150 - 250 hr/ha	200 - 350 hr/ha
3.8 - 4.6 hr/unit	35 - 55 u/ha	35 - 65 u/h	45 - 90 u/ha
3.1 - 3.7 hr/unit	40 - 65 u/ha	40 - 80 u/ha	55 - 115 u/ha
2.7 - 3.0 hr/unit	50 - 75 u/ha	50 - 95 u/ha	70 - 130 u/ha
Urban	150 - 250 hr/ha	200 - 450 hr/ha	200 - 700 hr/ha
3.8 - 4.6 hr/unit	35 - 65 u/ha	45 - 120 u/h	45 - 185 u/ha
3.1 - 3.7 hr/unit	40 - 80 u/ha	55 - 145 u/ha	55 - 225 u/ha
2.7 - 3.0 hr/unit	50 - 95 u/ha	70 - 170 u/ha	70 - 260 u/ha
Central	150 - 300 hr/ha	300 - 650 hr/ha	650 - 1100 hr/ha
3.8 - 4.6 hr/unit	35 - 80 u/ha	65 - 170 u/h	140 - 290 u/ha
3.1 - 3.7 hr/unit	40 - 100 u/ha	80 - 210 u/ha	175 - 355 u/ha
2.7 - 3.0 hr/unit	50 - 110 u/ha	100 - 240 u/ha	215 - 405 u/ha

As illustrated in Table 11[8] the change of mix can affect the acceptable density in spatial terms depending on the size of the houses provided.
Assessment of this residential density allows for a few conclusions to be drawn:

- In the Core Strategy and the SHMA mix the scenarios 1.3, 1.4 and 2.4 are beyond the maximum density values considered, therefore it is implied that it would be difficult to support these levels of density through public transport provision.
- In the Developer Partner mix none of the scenarios presents a density beyond the maximum value shown in the PTAL table.
- In the Core Strategy mix the vast majority of values in the different scenarios reach the level of density defined as 'Central', which doesn't match the locational conditions of the site – i.e. an outer London context with poor PTAL in parts of the site
- In the Developer Partner mix the density values which reach the 'Urban' level are in found in scenarios 1.1, 2.1, 2.2, 3.1, 3.2, 3.3 and all scenarios 4.1, 4.2, 4.3, 4.4.
- Even in the case of the lowest values reached in scenarios 4.1, both mixes require an 'urban' level of public transport accessibility. It is, therefore, understood that the development will require urban design initiatives to improve the connectivity across the site and to increase the provision of public transport.

As suggested in the London Plan, it is not appropriate to apply Table 11 mechanistically[9] but it was considered as a valuable instrument to understand the grade of connectivity that needs to be achieved from scenario to scenario. In particular the land currently classified as SIL today presents the worst PTAL (0) and it's therefore essential to prioritise the introduction of public transport to that part of the site.

The optimal scenarios would result in a level of development that would include a wide range of employment, retail and community uses, which along with the improved transport links provided by the new station and increased bus routes could justifiably allow the site to be considered at the higher levels of 'Urban' or even lower levels of 'Central' within the definition in the London Plan PTAL/Density matrix. The PTAL is expected to drop from 4-6 range near the station to 2-4 in the east. However east of the River also gives the best views or access to The Lee Valley Regional Park (LVRP) therefore net densities ranging from 153 to 225 dph may be acceptable here. From a density point of view 8,000 - 12,000 homes could be acceptable at the developer mix combined with the de-designation and use of the current SIL land.

[8]Source: London Plan 2016, https://www.london.gov.uk/what-we-do/planning/london-plan/current-london-plan
[9] London Plan 2016, Policy 3.4 Optimising housing potential

5.3 Population

Just as the different tenure mixes affect footage, habitable rooms and density, they also affect population and child yield. The population has been calculated with using the GLA Population Yield Calculator[10] and integrated with the study illustrated in the Evidence on Housing and Supporting Infrastructure. These have been tested to highlight how the change of tenure mix and dwelling size could impact on the requirements for the supporting uses.

When considering the number of residents to be accommodated on the site it is essential to calculate the area requirements of the supporting uses listed below:

- Open space provision
- Playspace
- Education
- Sports facilities
- Healthcare
- Library, arts and culture space
- Retail

Table 12: Residential population density scenarios

				Core Strategy Mix		SHMA		Developer Partner Mix	
Main Scenario	Dwellings	SIL Retention	Land available ha.	Population	residents per hectare	Population	residents per hectare	Population	residents per hectare
1.1	5000	100%	33.74	13,203	391.3	12,644	374.7	11,302	335.0
1.2	8000	100%	33.74	21,125	626.1	20,230	599.6	18,083	536.0
1.3	10000	100%	33.74	26,406	782.6	25,288	749.5	22,604	669.9
1.4	12000	100%	33.74	31,688	939.2	30,346	899.4	27,125	803.9
2.1	5000	50%	38.42	13,203	343.6	12,644	329.1	11,302	294.2
2.2	8000	50%	38.42	21,125	549.8	20,230	526.5	18,083	470.7
2.3	10000	50%	38.42	26,406	687.3	25,288	658.2	22,604	588.3
2.4	12000	50%	38.42	31,688	824.8	30,346	789.8	27,125	706.0
3.1	5000	25%	44.05	13,203	299.7	12,644	287.0	11,302	256.6
3.2	8000	25%	44.05	21,125	479.6	20,230	459.3	18,083	410.5
3.3	10000	25%	44.05	26,406	599.5	25,288	574.1	22,604	513.1
3.4	12000	25%	44.05	31,688	719.4	30,346	688.9	27,125	615.8
4.1	5000	0%	52.05	13,203	253.7	12,644	242.9	11,302	217.1
4.2	8000	0%	52.05	21,125	405.9	20,230	388.7	18,083	347.4
4.3	10000	0%	52.05	26,406	507.3	25,288	485.8	22,604	434.3
4.4	12000	0%	52.05	31,688	608.8	30,346	583.0	27,125	521.1

The density values shown in Table 12 have been calculated on the basis of developable land available, and this data suggests a certain amount of people occupying spaces in specific hours of the day and night - i.e. generally the density refers to the number of people living in a specific area. As well, it should be noted that the land considered by many studies published by the GLA for density calculation are based on areas comprehensive of large open spaces, parks, transport infrastructure and water courses, which can lower density values. The scale of the Meridian Water development, even if large, is not comparable to the scale of entire neighbourhoods, and therefore it is advisable not to compare figures that are based on different calculations and assumptions.

[10]Ref Aecom Evidence on Housing and Supporting Infrastructure report, table 4-2; 4-4 and 4-6 p.24 + table 4-25 p.44

5.4 Employment

In order to produce a more comprehensive analysis, this scenario testing has also taken into consideration the presence of workers commuting to the site, as well as visitors and customers availing themselves of the retail, Food & Beverage and evening economy offer.

The net additional employment generated by the supporting uses has been tested in 3 different categories:

- Jobs generated by supporting uses and community infrastructure (e.g. staff associated with schools, sports facilities, etc.)
- Jobs generated by on-site retail, serving both residents and employees
- General employment on site

In the spatial impact assessment (Chapter 5) the employment space will be translated into a general floorspace value to integrate the non-residential floorspace required.

In calculating the general employment on site the floor space required to accommodate all different kinds of employment has been averaged into a quantum that will be tested in terms of the spatial impact of the different scenarios. This quantum has been established to be 27 sqm GEA floor space per employee: this value has been calculate applying a ration to the average NIA (net Internal area) job density across four different activity groups, shown in the Evidence for Employment Land, Industries and Jobs, Appendix C - EMPLOYMENT DENSITIES (based on Source: HCA, (2015); Employment Densities Guide). For education uses the numbers of jobs generated by the scenarios has been calculated with Pupil Adult Ratio[11].

Within this footage average value different sector of employment can be considered compatible on site, depending on the land available. It is in fact plausible to suggest that the retention of 100% or 50% of the SIL land will limit the range of typology used for the development, and will force the choice towards a mixed used blocks in order to accommodate all different uses required. This will generate an incompatibility for some job sectors to be provided on site because of the proximity with residential or education uses.

The conclusion from this analysis is that density can change considerably if the presence of workers on site is included in the different scenarios: for example a residential density of 410 people per hectare will increase up to 547 people per hectare if employees on site is included. This value suggest a different kind of density more tied to the presence of people engaged in various activities on site, that could be defined as the "intensity" of the scenario. In fact providing new jobs on site will generate direct and indirect affects both on the demand of retail and employment space. Further work about the employment impact has been carried by Aecom in support of the ELAAP documented in the Evidence for Employment Land, Industries and Jobs report.

[11]Source: SFR 11/2014: 'School Workforce in England: November 2013'

5.5 Supporting uses

In line with the 'maximum case' scenarios considered by Aecom in the ELAAP Evidence on Housing and Supporting Infrastructure report it is understood that existing community uses – i.e. leisure and culture – should be able to absorb some of the demand from the development at Meridian Water. However, due to the considerable presence of infrastructure on and around the perimeter of the site, mobility outwards from the site is limited. In addition to some instances community infrastructure in the surrounding areas and boroughs is already over-subscribed. It is assumed, therefore, that all of the 'required' community infrastructure is to be provided on site and as much of the 'optional' supporting uses should be provided on site as possible.

Required and non-negotiable uses:
- Nurseries
- Primary schools
- Secondary schools
- Open space
- Healthcare

Optional, but desirable, uses:
- Swimming pools
- Sports courts
- Library, arts and culture space

In the Spatial Framework it will be specified if the quantum estimated for the different scenarios can be provided within a plot that integrates residential and other uses.

Sport and Culture facilities:

- Given the estimated incoming new population to the Meridian Water area it is assumed that some sports facilities are highly desirable on site.
- The LBE Infrastructure Delivery Plan Review[12] recommends that an additional swimming pool and an additional library space comprise part of the community infrastructure needed for the effective and integrated regeneration of the area. The nearest leisure centre to Meridian Water in Enfield is Edmonton Leisure centre which is 2.57 kilometres from the location of the new Meridian Water train station.
- The recommended approach is to consider the strategic needs of sport and physical activity at a borough wide level, assessing supply and demand spatially. This work is not part of this scenario testing, and therefore the assumption has been made that Meridian Water will be at minimum self-sufficient with respect to the provision of sports venues.
- A scale comparison study between different leisure centres in London has been done to estimate the approximate footprint and massing for the new centre. Analysis has been done based on the facility provision of leisure centres across different boroughs of the city, including both recently built or refurbished projects as well as older centres.
- The case studies also served as evidence that demonstrates how the integration between uses can effectively occur. Some leisure centres have successfully been combined with residential, as in the case of Moberly Sports Centre or Edmonton Green Leisure Centre. The sports facilities are also compatible with other supporting uses, as demonstrated by the Tottenham Green Pool and Fitness Centre or the Swiss Cottage leisure centre, where a public library has been provided within the same building or a building immediately adjacent. Similar integration can be achieved between culture, health and residential uses, e.g. the Clapham Library project.
- Following the comparison study, 4 different quanta of floor space have been calculated for a sports centre, in direct relation to the number of units provided in the development: 2,500, 3,500, 4,500 and 6,000 sqm.

[12]Aecom Evidence on Housing and Supporting Infrastructure report, September 2016, chapter 2.7.2, p 18

Play Space:

Play space should be provided at a range of scales and to suit different age groups in accordance with the London Plan. For simplicity's sake we have divided the provision into doorstep Children's Playspace, which can be provided in private courtyards, and Playing Pitches, which can be provided embedded in the open space. The following standards should be adhered to on site to provide:

1. Doorstep Play (courtyards and cul-de-sacs)
2. LAPs - Local Area for Play minimum 100 sqm
3. LEAPs - Local Equipped Area for Play minimum 400 sqm
4. NEAPs - Neighbourhood Equipped Area for Playing 1,000 sqm
5. MUGAs - Multi use games area - Integrated into schools[13].
6. Regional Park – 400Ha – LVRP
7. Local Parks and Open Spaces – 2Ha (400m Radius)
8. Small Open Spaces -Under 2Ha (< 400m Radius)
9. Pocket Parks -Under 0.4 Ha (< 400m Radius)
10. Linear Open Spaces – along waterways

[13]Or new standards in London Plan 2016 Table 7.2 Public open space categorisation. P315 https://www.london.gov.uk/sites/default/files/the_london_plan_malp_march_2016_-_chapter_7_-_londons_living_spaces_places.pdf

Education:

- School footprints will be calculated on the basis of the Aecom assumptions in table 4-25 and with the dimensions specified at the paragraph 4.8.4, e.g. each primary school will have a 350 sqm GIA area with an additional 4.1 sqm per child. Only the school floor space (and not the outdoor space) has been used to estimate the total floorspace that the development in Meridian Water will need to accommodate the different uses, the open space needed for the schools has not been included in the calculations for the footprint of the building.

- Education floor space requirements are shown in the Aecom Task A report (Table 4-27 p. 46). It was necessary to recalculate the floorspace required for education distinguishing between the floor space of the actual building and the outdoor play. It is uncommon for new urban schools to meet the DoE soft outdoor play standards. As a consequence we have located schools near or adjacent parkland, which we would expect to be able to be used to provide this amenity. The remaining hard outdoor space has been met at 50% of the DoE standards, once again in keeping with the urban location.

- Full planning application[14] has been granted for a new school within the red line boundary for Meridian Water: the Meridian Angel Primary School, in Willoughby Lane, Upper Edmonton. According its planning application provide for a school with capacity for 420 pupils aged between 4 and 11. It was assumed the capacity of the school will be filled by the demand in the surrounding areas and that, therefore, more schools will be needed to be provided in the new development of Meridian Water to meet the demand created by the new residents.

- A useful precedent is Mossbourne Academy in Hackney. It is situated beside Hackney Downs Park and has approximately 1,105 pupils in 5 classes per year and 250 at sixth form on a site of approximately 2.5 Ha. Aecom's report suggests a secondary school would need 0.9 Ha plus 50m^2 x pupil numbers to meet DoE standards. This would equate to 6.4 Ha. It is worth noting that Mossbourne is considered a highly desirable school.

[14]Number 14_04205_FUL, available on LBE planning portal website

5.6 Open Space/Public Amenity

Open Space and Public Amenity are considered together in our analysis as they are interrelated in terms of provision and in terms of assessing the qualities of a place.

The LBE Open Space and Sports Assessment Update (2011) recommend a provision of 2.37 ha/1000 of open space per person. As stated in the ELAAP Evidence on Housing and Supporting Infrastructure report by Aecom: "The Upper Lea Valley Regional Park is located within 0.4km of Meridian Water and therefore fulfils the role of all open space typologies".[15] It should be noted that approximately 80 ha of the Lea Valley Regional Park is within a 3 kilometre distance of the Meridian Water site. An essential requirement for the new development is that large open spaces should be accessible within 10-15 minute walk from the more dense residential areas. The development to the west of the rail line and Zone 8 next to Kenninghall Open Space cannot take advantage of the Upper Lea Valley as it is located on the far northern edge of Meridian Water and, as well, there is considerable transport infrastructure that would need to be traversed. In Scenarios 1 and 2 the Lea Valley open space has been excluded from the calculation because of insufficient accessibility caused by the retention of the SIL land. National policy guidance asks that careful consideration be given to the provision of Open Space in light of current and anticipated local needs and practices. The London Plan does set targets for private amenity of 5m^2 for 1 bed flat and an additional 1m^2 per additional person. Approximately 16.3 ha of space with potential for high quality open space and public amenity have been identified on site, including existing parks like Kenninghall and Lee Valley Park but including new open space along the water's edge, new parks, green squares, etc. A further 7.8 ha of private shared amenity can be created in courtyards and podium decks, which together would provide approximately 24.1 ha on site.

Although this 24.1 Ha yields roughly half of the 'Enfield' requirement the quality of the open space provision and the fact that this will be supplemented by additional amenity such as sports facilities and open space directly adjacent to the site such as the Lee Valley Park would suggest that the site could provide a reasonable level of open space even at the higher number of units, providing all of the SIL land is used.

If a significant amount of SIL were to be retained this would have a detrimental effect on open space provision:

- Much of the open space envisaged is located in the eastern half of the site where the SIL land is.
- To create reasonable access to Lee Valley Park would require at least half of the SIL area to be redeveloped.
- If the developable site is greatly reduced and a large number of homes is maintained then the proportion of amenity either in courtyards or parks and riverside would greatly reduce.

Table 13: Open space provision

			Core Strategy Mix		SHMA Mix		Developer Partner Mix	
Main Scenario	Dwellings	Open space available (ha.)	space prov per 1000 residents		space prov per 1000 residents		space prov per 1000 residents	
1.1	5000	8.9	0.67	ha.	0.78	ha.	0.79	ha.
1.2	8000	8.9	0.42	ha.	0.49	ha.	0.49	ha.
1.3	10000	8.9	0.34	ha.	0.39	ha.	0.39	ha.
1.4	12000	8.9	0.28	ha.	0.33	ha.	0.33	ha.
2.1	5000	8.9	0.67	ha.	0.78	ha.	0.79	ha.
2.2	8000	8.9	0.42	ha.	0.49	ha.	0.49	ha.
2.3	10000	8.9	0.34	ha.	0.39	ha.	0.39	ha.
2.4	12000	8.9	0.28	ha.	0.33	ha.	0.33	ha.
3.1	5000	24.1	1.83	ha.	1.29	ha.	2.13	ha.
3.2	8000	24.1	1.14	ha.	0.81	ha.	1.33	ha.
3.3	10000	24.1	0.91	ha.	0.64	ha.	1.07	ha.
3.4	12000	24.1	0.76	ha.	0.54	ha.	0.89	ha.
4.1	5000	24.1	1.83	ha.	1.29	ha.	2.13	ha.
4.2	8000	24.1	1.14	ha.	0.81	ha.	1.33	ha.
4.3	10000	24.1	0.91	ha.	0.64	ha.	1.07	ha.
4.4	12000	24.1	0.76	ha.	0.54	ha.	0.89	ha.

*within the redline boundary

[15]Central Leeside Area Action Plan Task A, draft August 2016, AECOM, ref. 2.5.3 and Table 2-10 p. 15

5.7 Retail Space

Retail space is necessary to support the demand generated by the new development.
This chapter will compare the outcome of two studies: one from the ELAAP Evidence on Housing and Supporting Infrastructure report, and one commissioned by us by Peter Brett Associates (September 2016). The two studies differ in their baseline assumptions with respect to leakage rates and expenditure assumed. Moreover the PBA study focus as just on the Retail impact assessment of one scenario with 10,000 homes and 6,000 jobs. The comparison between the spatial impacts across the two provides a more comprehensive and complete evidence base, testing if the capacity on site can be flexible enough to accommodate different kinds of retail space.

The estimate of the additional retail space both effects and is affected by the employment scenarios:

- the jobs created by the provision of retail space are considered part of the final target to be achieved (scenarios of 3,000 jobs, 6,000 jobs)
- some employment uses on site will create additional demand for retail space not necessarily accounted for.

In order to simplify the calculations and reduce the number of variables, the floor space forecasted by Aecom and PBA will be based just on the expenditure of the residents.

It is assumed that most of the retail space will be located on the ground floor in mixed use plots. In the ELAAP Housing and Supporting Infrastructure report [16] Aecom indicates retail area per dwelling provision scenarios: it is understood the areas are expressed as net in terms of floor space, and then need to be converted into GEA for land use. As in the PBA report, the net sales floor space will be converted into gross floor space by applying a ratio of 75%.

Table 14: Retail gross area

Core Strategy Mix	
Dwellings	Gross Retail Floor Space 75%
5000	3091 sq m
8000	4945 sq m
10000	6181 sq m
12000	7418 sq m

SHMA	
Dwellings	Gross Retail Floor Space 75%
5000	2960 sq m
8000	4736 sq m
10000	5920 sq m
12000	7103 sq m

Developer Mix	
Dwellings	Gross Retail Floor Space 75%
5000	2646 sq m
8000	4233 sq m
10000	5291 sq m
12000	6349 sq m

Conclusions:

- the demand for retail space is related to the population yield, therefore a developer mix with lower population creates a lower demand
- certain type of retail together with other functions on site may act as attractions enabling higher and further square footage of retail to be activated.

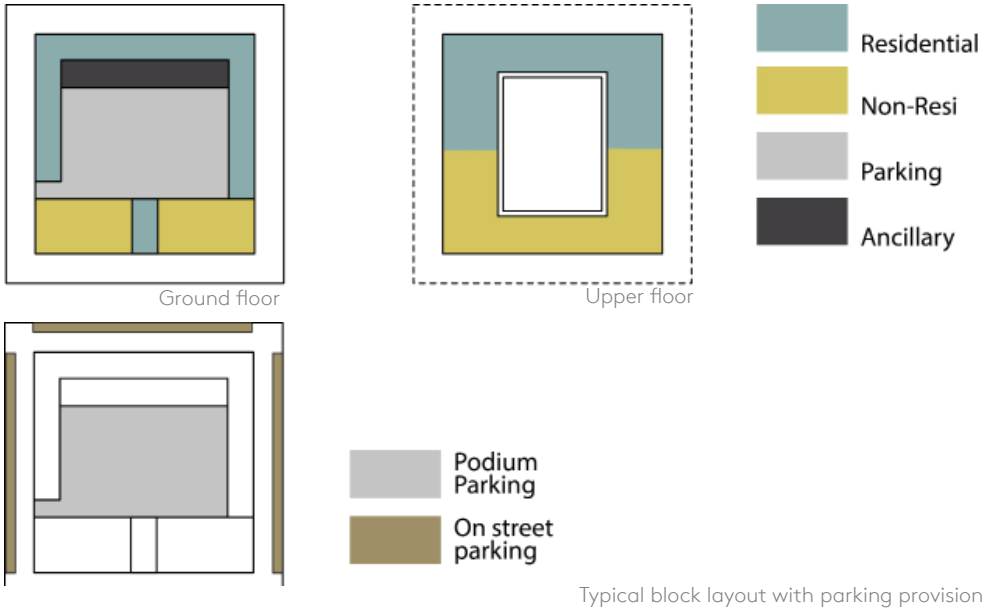
[16] Aecom task A report - table 4-14

5.8 Parking

The provision of parking spaces is an issue that has an impact on both the public realm and the housing typologies. The current work does not aim to justify the use of a particular solution for the parking provision in terms of design, but to show the potential spatial impact on site of the presence of parked cars.

There are different factors that can influence the use of cars in an urban area, including the provision and extent of public transport, cycle safety and the accessibility of daily destinations. The entire development in Meridian Water will take a considerable span of time to be completed, and so it is reasonable to assume that over the next 20 years the requirements for vehicle car parking will decrease as more sustainable modes of transport are promoted and adopted.

Due to the complexity and the number of variables on which parking ratios can depend, figures are based on the maximum provision possible in the different scenarios. They are calculated assuming a typical courtyard block. Podium parking is assumed to occupy the centre of the block, while on street parking is provided on 3 sides of the block.



Typical block layout with parking provision

The reason why the typology is allowing street parking on just 3 sides is that the 4th side can be integrated with the public realm and absorb some inefficiency of block on site.
The parking provision is calculated for residential and commercial use. The values in Table 15 illustrate one average ratio across the site, while in reality different ratios would be applied to different parts of the site depending on the distance from public transport.

Table 15: Parking Ratio Scenarios

Main Scenario	Dwellings	Land available ha.	No. Plots	Parking spaces provided	Car parking Ratio
1.1	5000	33.74	32.21	2875	58%
1.2	8000	33.74	32.21	2875	36%
1.3	10000	33.74	32.21	2875	29%
1.4	12000	33.74	32.21	2875	24%
2.1	5000	38.42	37.91	3385	68%
2.2	8000	38.42	37.91	3385	42%
2.3	10000	38.42	37.91	3385	34%
2.4	12000	38.42	37.91	3385	28%
3.1	5000	44.05	44.78	3998	80%
3.2	8000	44.05	44.78	3998	50%
3.3	10000	44.05	44.78	3998	40%
3.4	12000	44.05	44.78	3998	33%
4.1	5000	52.05	54.54	4869	97%
4.2	8000	52.05	54.54	4869	61%
4.3	10000	52.05	54.54	4869	49%
4.4	12000	52.05	54.54	4869	41%

The Transport Review analyses transport implications of the scenarios and, based on the PTAL range calculates the residential parking requirement to be 49%. At 10,000 homes The Spatial Framework achieves that requirement, with a provision based on 75-80% under podium and 20-25% on street parking. We have rejected scenarios which significantly over or under provide parking (<40% or >80%) for reasons of sustainability in the latter and significant under provision in the former.

From Table 15 it is evident that the resultant ratio for 12,000 dwellings may be too low in every scenario proposed. This would, therefore, entail negotiations with the planning authority and TfL. Scenarios 2 and 3 are achieving parking numbers high enough to offer an acceptable provision of residential parking spaces for 5,000, 8,000 and 10,000 dwellings.

The supporting Transport Review also makes assumptions for non-residential parking based on the anticipated number, mix and distribution of uses, in the various scenarios. A rate of 15 cars per 1000 FTE's (Full Time Employees) is proposed. The Spatial Framework can accommodate 548 non-residential parking spaces in addition to re-housing Ikea and Tesco parking at about 80%. Most of these are in multi storey car parks to minimise visual impact and development potential. This approach would enable all scenarios to easily meet the parking standard with sufficient excess for Blue badge holders, visitors and potentially retail customer surplus.

Supporting Uses

After the calculation of all supporting uses necessary to the new development, the cumulative resut have been summarized in the following table. The different scenarios depend on the dwelling mix and the number of dwellings. These figures includes community infrastructure, employment, retail, and all non residential uses except parking.

Table 16: Supporting uses gross area

		Core Strategy Mix		SHMA Mix		Developer Partner Mix	
Main Scenario	Dwellings	Non residential Uses		Non residential Uses		Non residential Uses	
1.1a	5000	94,118	sqm	97,515	sqm	94,510	sqm
1.1b		175,849	sqm	179,246	sqm	176,240	sqm
1.2a	8000	100,414	sqm	105,847	sqm	101,037	sqm
1.2b		182,144	sqm	187,578	sqm	182,768	sqm
1.3a	10000	104,806	sqm	111,600	sqm	105,589	sqm
1.3b		186,537	sqm	193,331	sqm	187,320	sqm
1.4a	12000	109,501	sqm	117,653	sqm	110,444	sqm
1.4b		191,232	sqm	199,383	sqm	192,175	sqm
2.1a	5000	94,118	sqm	97,515	sqm	94,510	sqm
2.1b		175,849	sqm	179,246	sqm	176,240	sqm
2.2a	8000	100,414	sqm	105,847	sqm	101,037	sqm
2.2b		182,144	sqm	187,578	sqm	182,768	sqm
2.3a	10000	104,806	sqm	111,600	sqm	105,589	sqm
2.3b		186,537	sqm	193,331	sqm	187,320	sqm
2.4a	12000	109,501	sqm	117,653	sqm	110,444	sqm
2.4b		191,232	sqm	199,383	sqm	192,175	sqm
3.1a	5000	94,118	sqm	97,515	sqm	94,510	sqm
3.1b		175,849	sqm	179,246	sqm	176,240	sqm
3.2a	8000	100,414	sqm	105,847	sqm	101,037	sqm
3.2b		182,144	sqm	187,578	sqm	182,768	sqm
3.3a	10000	104,806	sqm	111,600	sqm	105,589	sqm
3.3b		186,537	sqm	193,331	sqm	187,320	sqm
3.4a	12000	109,501	sqm	117,653	sqm	110,444	sqm
3.4b		191,232	sqm	199,383	sqm	192,175	sqm
4.1a	5000	94,118	sqm	97,515	sqm	94,510	sqm
4.1b		175,849	sqm	179,246	sqm	176,240	sqm
4.2a	8000	100,414	sqm	105,847	sqm	101,037	sqm
4.2b		182,144	sqm	187,578	sqm	182,768	sqm
4.3a	10000	104,806	sqm	111,600	sqm	105,589	sqm
4.3b		186,537	sqm	193,331	sqm	187,320	sqm
4.4a	12000	109,501	sqm	117,653	sqm	110,444	sqm
4.4b		191,232	sqm	199,383	sqm	192,175	sqm

The following conclusions can be drawn:

- even is the dwelling size mix affects the population yield that won't affect much the overall non-residential floorspace required. The residential use is much more affected by the mix.
- all solutions will require the integration of more uses within the perimeter block
- the vast majority of the community infrastructure use results incompatible with a location higher than the ground floor or first floor, for problems related to public access (schools) or due to the nature of the spaces required (leisure centre)
- the capacity on site at ground floor is directly related to the quantity of land that is considered developable, the SIL designation of the land is a key faction in limiting the space available for supporting uses
- some uses will require to be accommodated into standalone buildings

5.9 Spatial Impact

In the previous paragraphs the 32 iterations proposed by Aecom have been tested numerically, and comparative tables have been extracted to highlight the different requirements that different scenarios will generate.

The ultimate objective of the scenario testing is to investigate and demonstrate the spatial implication of each case, in relation to the different quantities of housing provision, numbers of jobs and amount of SIL release. In this chapter the density and the typical residential typology will be applied in order to evaluate how the floor space for the various uses will be accommodated in the new development. The following features will be considered:

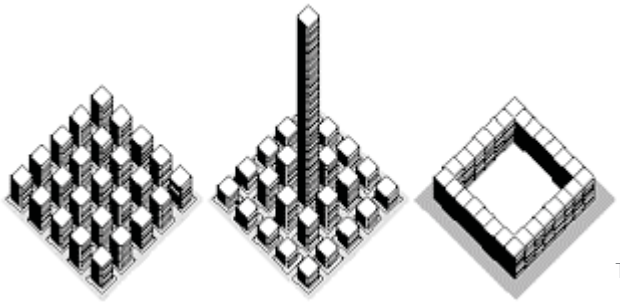
- Density and typologies
- Buildings heights

The 2D and 3D spatial tests are based solely on land take. In reality a masterplan would be based upon a set of best practice urban design principles. For example it may be assumed that a certain quantum of supporting uses may be provided on the ground floor or adjacent to open spaces in order to guarantee a minimum level of quality and accessibility. These would inevitably add further constraints or inform how residential density should be dispersed.

A more detailed analysis of the assessment and implication of the scenario tests is given in the following pages. This demonstrates a satisfactory framework for development and gives high level guidance on how to achieve the quality required to justify the scale of development and it might be properly integrated into the surrounding area. In particular, paragraph 5.12 outlines the conclusions drawn informed by a 3D modelling exercise of the preferred scenario (for more detailed spatial guidance please refer to the Spatial Framework document). This detailed capacity test also provided the opportunity to validate the methodology used in the scenario testing, verifying if the values obtained by numerical calculation match the figures resulting from the 3D modelling.

5.10 Building typologies

The calculation of built form across the different uses and scenarios indicate purely how much floor area is required not necessarily its massing or modulation. As Lionel March's[17] famous diagram demonstrates, the same built volume can be arranged in radically different forms, while still maintaining the same density (and, obviously, creating very different urban environments).

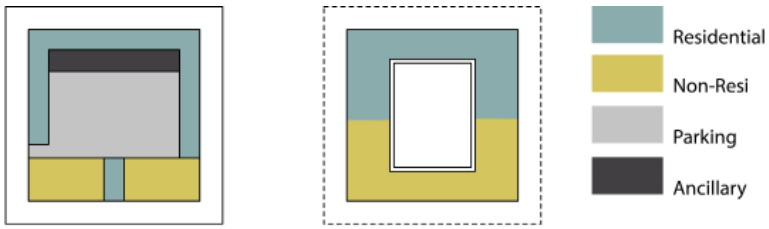


Typical block Lionel March diagrams shows three alternative built form with same value of density

A variety of typologies, densities and building heights across the site is considered preferable and a part of creating flexible and balanced neighbourhoods, where a successful place making strategy will respond to different accessibility contexts (PTAL). Definition of the character of different areas of the development can also be informed by the presence of particular housing typologies and, of course, how they define the public realm.

In order to simplify our testing it is assumed that the density will be distributed evenly across the whole site, and all the floor space required for residential and non-residential uses will be distributed across a single building typology: namely, a courtyard block.

The typical size of the block measures 65 m x 65 m, with a ground floor divided between residential space, under croft parking spaces, plant/ancillary spaces, and non-residential (retail/employment/healthcare/education, etc.). The floor area is organised around a central courtyard. Upper floors adopt a typical depth of 13 m when oriented north –south and 16m when oriented east-west. The distance between buildings is assumed to be 17 meters on all sides.



Typical block Layout chosen for the scenario testing

Movement, access, transport

All spatial scenario tests assume a fairly regular grid of streets, augmented by pathways, along waterways and parkland, and supported by additional junctions onto Meridian Way. The success of this approach will require significant improvements to the lane management, enclosure, and surface treatment of junctions and cycle ways on Meridian Way and the new Causeway. In addition connections and upgrades to the wider network of road, rail, bus, cycle and pedestrian routes as will be necessary.

[17]SUPERDENSITY THE SEQUEL, HTA, Levitt Bernstein, Pollard Thomas Edwards, 2015, p.17

5.11 Building Heights

After distributing the built form for each scenario we then are able to calculate the average height across the site. Not all the land on site is suitable for every use. In order to advance a spatial scenario without dictating, or adhering to, any design guidelines, a spatial capacity of the site has been calculated based on the following and set out on the following tables for each mix type:

- The developable land will be considered suitable to accommodate building plots for 80 % of its extent: this is due to the geometry of the site which will not allow a perfect orthogonal grid to be put in place
- The remaining 20% of the land will be added to the open spaces available (Kenninghall Open Space 1.8 Ha of land to the northwest and the LVRP green belt park 6.4 Ha at the eastern end of the site) in order to measure a comprehensive figure for open space provision.
- A Parking space allowance partly on tertiary roads and mainly on typical plot in under podium parking (25 sqm per parking space has been allowed to include manoeuvre space).

Table 18 average building heights:

			Core Strategy Mix	SHMA Mix	Developer Partner Mix
Scenario	Dwellings	no. Jobs	Average No. Storeys	Average No. Storeys	Average No. Storeys
1.1	5,000	3,000	7.7	7.4	6.7
		6,000	8.5	8.3	7.6
1.2	8,000	3,000	11.6	11.3	10.1
		6,000	12.4	12.1	11.0
1.3	10,000	3,000	14.2	13.8	12.3
		6,000	15.1	14.6	13.3
1.4	12,000	3,000	16.8	16.3	14.6
		6,000	17.7	17.2	15.5
2.1	5,000	3,000	6.6	6.4	5.8
		6,000	7.3	7.1	6.5
2.2	8,000	3,000	9.9	9.6	8.6
		6,000	10.6	10.3	9.4
2.3	10,000	3,000	12.1	11.8	10.5
		6,000	12.8	12.5	11.3
2.4	12,000	3,000	14.3	13.9	12.4
		6,000	15.1	14.6	13.2
3.1	5,000	3,000	5.6	5.5	4.9
		6,000	6.2	6.1	5.6
3.2	8,000	3,000	8.4	8.2	7.3
		6,000	9.0	8.8	8.0
3.3	10,000	3,000	10.3	10.0	8.9
		6,000	10.9	10.6	9.6
3.4	12,000	3,000	12.2	11.8	10.5
		6,000	12.8	12.4	11.2
4.1	5,000	3,000	4.6	4.5	4.1
		6,000	5.1	5.0	4.6
4.2	8,000	3,000	7.0	6.8	6.1
		6,000	7.5	7.3	6.6
4.3	10,000	3,000	8.5	8.3	7.4
		6,000	9.0	8.8	7.9
4.4	12,000	3,000	10.1	9.8	8.7
		6,000	10.6	10.3	9.3

Average building heights

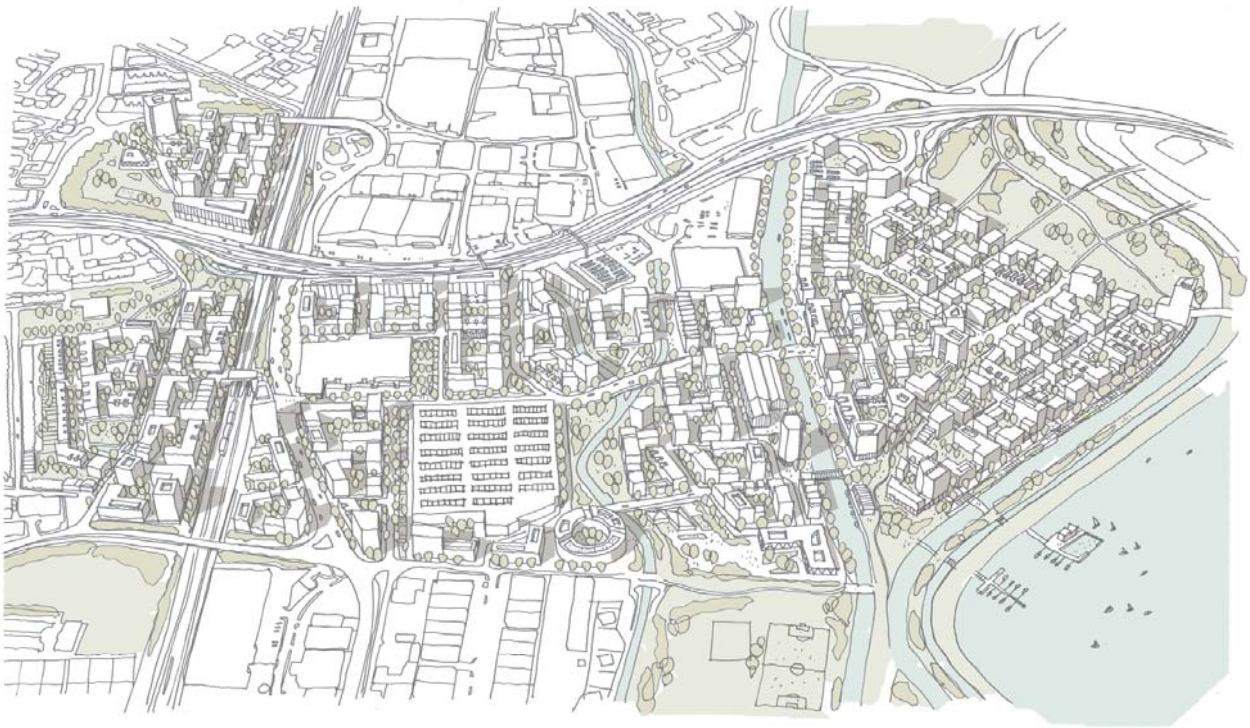
Scenarios where building heights exceed 8 storeys are not considered acceptable as the distances between plots are not likely to give sufficient levels of daylight and air circulation. The scenarios with 9 or more average number of storeys, therefore, have been considered to fail in this respect. The dwelling size mix and related population will greatly affect the associated supporting infrastructure demand and have very different impacts on the total floor space, and consequently, on the average heights of buildings.

At 10,000 homes the developer mix would result in an average residential storey height of around 8 storeys. Non-residential uses either at ground floor in residential blocks or in dedicated buildings at a wide range of storey heights depending on the typology (e.g. 3 storey for schools but much taller for offices).

In practice storey heights will vary in response to context, the adjacent road widths and proximity to the station, where density is likely to be higher. As a result one can envisage taller elements within blocks adjacent to parks, larger roads, water courses and the railway. Lower storeys may consequently be possible in narrower roads and mews in line with an anticipated general street width to building aspect ratio of 1:1. Further design moves such as upper storey set-backs, accent towers and breaks in blocks as well as raised podium courtyards can be used to improve aspect, light etc.

At this 8 storey scale however it is expected that full compliance with national daylight or amenity light standards may not be entirely possible in all instances. (For example, in the area west of the rail line some 10-15% of the Phase 1 Outline Application failed compliance.)

Increasing the built area through more Residential units, higher Employment numbers, Enforcing an LBE unit mix or by Retention of SIL would all result in taller average heights and consequentially poorer spatial and design performance, particularly in terms of light and the quality of the public realm.



5.12 The Spatial Framework

The 3D modelling carried out by KCA explored the spatial impact of the particular conditions of scenario 4.3.b, with 10,000 units, 6,000 jobs and the developer partner dwelling size mix. From this exercise the following conclusions have been drawn:

- The provision of 10,000 homes can be achieved in conjunction with Tesco and Ikea remaining in their current location.
- The massing allows for a density variation, with higher densities around the station.
- A general datum of 6 storeys can be set across most of the residential buildings with taken datum along the causeway and the waterways. The average height of 8 storeys is reached with the presence of taller buildings across the site.
- The presence of tall buildings and articulated blocks is necessary to increase the site capacity, but also to create a successful townscape: the spatial framework presents 14 tall buildings exceeding 14 storeys in height and only 3 buildings reaching a maximum height of 20 storeys.
- The presence of the warehouses 5 and 6 - being repurposed as Meridian Works - on site have been retained in their current location, reinforcing the aspiration that a new bespoke work/making spaces could eventually be provided elsewhere on site, enriching the mixed uses across the development.
- Supporting uses can all be accommodated successfully on site, including sports facilities, arts and culture, and education.
- Retail floor space can be provided on site with a good level of flexibility.
- The majority of the blocks need to be mixed used in order to accommodate all non-residential uses and create active streets and watersides. The density generated by the development combined with the mix of uses serve to facilitate the creation of active and healthy neighbourhoods.
- From a preliminary test of access to Daylight and Sunlight the scheme results in the main in acceptable levels.
- Different typologies of play space can be accommodated on site in line with planning requirements. Doorstep play space will be predominantly provided in private courtyards: therefore extra care should be taken in designing internal courtyards in order to guarantee high quality, easily surveilled spaces.
- The average building height demonstrated by the 3D modelling achieved the value of 7.9 storeys, confirming the calculation resulting from the scenario testing with a minimum variation.
- The Building modelling allows for variation in streets width and for open spaces integrated in the public realm.
- The open space provided on site corresponds to 30% of the Open space required by the LBE Open Space and Sports Assessment Update (2.37 ha/1000 residents). This quantum has been considered acceptable considering the proximity of the Lea Valley Regional Park and the new accessibility to it created by the development. This is supplemented by nearly 8 Ha of Private Shared Amenity Courtyards and Roof Terraces not included in areas given by balconies, roofs and terraces.
- The provision of floor space for employment is a great opportunity to locate non-residential buildings along the North Circular, with the function of screening the residential units from noise and pollution caused by traffic.

GLOSSARY

6

Glossary

- Gross External Area (GEA) is the area of a building measured externally at each floor level. This measurement includes external and internal walls, plant rooms and outbuildings, but excludes external space such as balconies and terraces. It includes lift shafts, communal corridors and lobbies.

- Gross Internal Area (GIA) – this refers to the entire area inside the external walls of a building and includes corridors, lifts, plant rooms, service accommodation (e.g. toilets).

- Net Internal Area (NIA) – this is commonly referred to as the net let-able or 'usable' area of houses, offices and retail units. It includes entrance halls, kitchens and cleaners' cupboards, but excludes corridors, internal walls, stairwells, lifts, WCs and other communal areas.

Note: The spatial impact of the present scenario testing has been based on and expressed in Gross External Areas (GEA) only. Values given in other units (NIA or GIA) by planning policies or other guidelines have been converted using a ratio. Where relevant conversion rates or calculations have been shown for the sake of clarity.

Density settings: from the London Plan 2016: Appropriate density ranges are related to setting in terms of location, existing building form and massing, and the index of public transport accessibility (PTAL).
Density types:

- Gross density - any density figure for a given area of land that includes uses not necessarily directly relevant to the figure (usually roads, parks, large open spaces and other transport infrastructure).

- Net density - any density figure for a given area of land that include only the land on which the development can be built, i.e. developable area, excluding major roads and infrastructure and main parks and open spaces .

The setting for different densitites can be defined as:

- Central – areas with very dense development, a mix of different uses, large building footprints and typically buildings of four to six storeys, located within 800 metres walking distance of an International, Metropolitan or Major town centre.

- Urban – areas with predominantly dense development such as, for example, terraced houses, mansion blocks, a mix of different uses, medium building footprints and typically buildings of two to four storeys, located within 800 metres walking distance of a District centre or, along main arterial routes.

- Suburban – areas with predominantly lower density development such as, for example, detached and semi-detached houses, predominantly residential, small building footprints and typically buildings of two to three storeys.

Reference

LBE Documents

This Spatial Appraisal of the Scenario testing is part of the following suite of documents which support the ELAAP 2016.

Edmonton Leeside Area Action Plan (ELAAP) 2016 and following appendices

ELAAP - Housing, Mix and Social Infrastructure

ELAAP - Employment Land, Industries and Jobs

ELAAP - Spatial appraisal of Scenario Tests A & B – exclude this from Reference

ELAAP - Transport appraisal of Scenario Tests A & B

ELAAP - Spatial Framework - and vision for Meridian Water

Note: Verification of assumptions in the first 2 reports above of supporting evidence are not repeated in this document unless particularly note worthy

Other references

The following research and Policy documents have been referenced:

- "Superdensity - the Sequel: Designing high density housing and sustainable places", Pollard Thomas Edwards, PRP architects, HTA, Levitt Bernstein, 2015
- Density and Urban Neighbourhoods in London, Final Report, Minerva LSE Research Group, 2004
- Annex B: Building Bulletin 103: of Area guidelines for mainstream schools 2014
- SFR 11/2014: 'School Workforce in England: November 2013'
- "Land Area and population Density, Ward and Borough" published by the GLA, source http://data.london.gov.uk/2015 data
- SUPER DENSITY THE SEQUEL, HTA, Levitt Bernstein, Pollard Thomas Edwads, 2015
- Employment Densities Guide 2nd Edition 2010 - HCA (Drivers Jonnas Deloitte)

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