NORTH LONDON WASTE AUTHORITY

NORTH LONDON HEAT AND POWER PROJECT

SUSTAINABILITY STATEMENT

The Planning Act 2008 The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2) (q)

AD05.13

Arup

Revision 0

October 2015

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north london waste authority

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Executive Summary

i.i.i This document has been prepared to support the North London Waste Authority's (the Applicant's) application (the Application) for a Development Consent Order (DCO) made pursuant to the Planning Act 2008 (as amended).

i.i.ii The Application is for the North London Heat and Power Project (the Project) comprising the construction, operation and maintenance of an Energy Recovery Facility (ERF) capable of an electrical output of around 70 megawatts (MWe) at the Edmonton EcoPark in north London with associated development, including a Resource Recovery Facility (RRF). The proposed ERF would replace the existing Energy from Waste (EfW) facility at the Edmonton EcoPark.

i.i.iii The proposed ERF would be more efficient and export more energy than the existing Energy from Waste (EfW) facility, helping to provide a solution to the whole of north London's waste volume while avoiding the need for fossil fuels for energy generation. In addition, the design, construction and operations of the proposed ERF promote principles of sustainable buildings, reducing negative impacts on the environment and community, creating jobs and strengthening the local economy.

i.i.iv This Sustainability Statement has been prepared in line with the London Borough (LB) of Enfield (LB Enfield) Development Management Document (DMD), adopted November 2014, Appendix 3: Sustainable Design and Construction Statement and incorporates the London Mayor's Priorities and Best Practice set out in the Sustainable Design and Construction Supplementary Planning Guidance, adopted April 2014. The purpose of this document is to demonstrate how the proposal complies with relevant sustainable design and construction policies.

i.i.v Key sustainability issues addressed within the Sustainability Statement include the Project's design and construction plans relating to:

a. energy demand, efficiency and supply and mitigation and/or offsetting measures to reduce carbon dioxide (CO_2) emissions;
b. water saving measures, including the use of alternative sources of water and installation of water efficiency measures;
c. high-quality, design-led development, including consideration of land use and site context;
d. waste management during construction and operations;
e. use of sustainable materials and green procurement;
f. health and wellbeing of users of the Project and surrounding area, including appropriate mitigation and management of risks of pollution during construction;
g. surface water run-off and flood risk;
h. ecology and green infrastructure;

i. travel and access to the Application Site and surrounding area, including encouragement of alternative transport such as walking, cycling and access to public transport; and

j. pre-assessment of the Project's performance within the Building Research Establishment's (BRE) Environmental Assessment Methodology (BREEAM) rating system.

i.i.vi The Sustainability Statement demonstrates how the Project's design, construction and operational plan complies with relevant local planning policy requirements for sustainable development, and how the Project would contribute to promoting a more sustainable London.

1 Introduction

1.1.1 This Sustainability Statement has been prepared to support North London Waste Authority's (the Applicant's) application (the Application) to the Secretary of State for Energy and Climate Change for a Development Consent Order (DCO) made pursuant to the Planning Act 2008 (as amended).

1.1.2 The Application is for the North London Heat and Power Project (the Project) comprising the construction, operation and maintenance of an Energy Recovery Facility (ERF) capable of an electrical output of around 70 megawatts (MW_e) at the Edmonton EcoPark in north London with associated development, including a Resource Recovery Facility (RRF). The proposed ERF would replace the existing Energy from Waste (EfW) facility at the Edmonton EcoPark.

1.1.3 The Project is a Nationally Significant Infrastructure Project for the purposes of Section 14(1)(a) and section 15 in Part 3 of the Planning Act 2008 (as amended) because it involves the construction of a generating station that would have a capacity of more than 50MW_e.

1.2 Purpose of this Report

1.2.1 The purpose of this Sustainability Statement is to:

a. demonstrate how sustainable strategies have been considered and implemented during the design of the Project; and

b. detail how the proposed design of the Project meets or exceeds sustainability-focused performance requirements of the LB Enfield and the Mayor of London's local planning policies.

1.2.2 The Sustainability Statement provides a direct response to the local and regional sustainability policy requirements set out by LB Enfield and the Mayor of London. A full list of the relevant planning policies is included in Section 3. The Sustainability Statement demonstrates how sustainable strategies have been considered and implemented during design and details how the Project meets or exceeds the sustainability-focused performance requirements of LB Enfield and the Mayor of London's planning policies.

1.2.3 The Environmental Commitments and Mitigation Schedule (AD06.03) sets out the mechanism by which the Applicant will be obliged to comply with design commitments and actions to achieve the environmental effects described in this document. The draft DCO (AD03.01) includes Requirements 5 and 16 to ensure compliance with the identified measures.

1.2.4 This Statement forms part of a suite of documents accompanying the Application submitted in accordance with the requirements set out in section 55 of the Planning Act and Regulations 5, 6 and 7 of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 (APFP Regulations 2009), and should be read alongside those documents (see Project Navigation Document AD01.02).

1.3 Document structure

1.3.1 This Sustainability Statement is structured as follows:

a. Section 1 introduces the Sustainability Statement, outlines the purpose and scope and provides an overview of the existing site and the Project;

b. Section 2 explains the methodology of the sustainability assessment and limitations and assumptions;

c. Section 3 provides a list of the baseline policy review of national, regional and local policy and other sustainability related expectations that informed the sustainability assessment;

d. Section 4 assesses the performance of the Project and provides the results of the sustainability appraisal against planning policy requirements;

e. Appendix A provides a review of policy;

f. Appendix B provides a reference table of the Project compliance with the relevant sustainability-related policies of the Mayor of London and LB Enfield;

g. Appendix C provides the BREEAM pre-assessment results for the Project; and

h. Appendix D provides the Building Energy Assessment.

1.4 The Applicant

1.4.1 Established in 1986, the Applicant is a statutory authority whose principal responsibility is the disposal of waste collected by the seven north London boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest (the Constituent Boroughs).

1.4.2 The Applicant is the UK's second largest waste disposal authority, handling approximately 3 per cent of the total national Local Authority Collected Waste (LACW) stream. Since 1994 the Applicant has managed its waste arisings predominantly through its waste management contract with LondonWaste Limited (LWL) and the use of the EfW facility at the existing Edmonton EcoPark and landfill outside of London.

1.4.3 LWL is a private waste management company wholly owned by the Applicant, and is the freeholder of the Edmonton EcoPark and the operator of the existing EfW facility. LWL has a current contract with the Applicant for management of its waste which expires in December 2025 with flexibility for termination sooner. The contract includes:

a. the reception, treatment and disposal of residual wastes;

b. the operation of Reuse and Recycling Centres (RRC), including the recycling of wastes and the transfer of residual wastes to a disposal point;

c. the reception and treatment of separately collected organic wastes;

d. the reception and transportation of other separately collected wastes for recycling by third parties; and

e. the reception and transportation of other separately collected clinical and offensive wastes for treatment by third parties.

1.5 The Application Site

1.5.1 The Application Site, as shown on the Site Location Plans (A_0001 and A_0002) in the Book of Plans (AD02.01), extends to approximately 22 hectares and is located wholly within the London Borough of Enfield (LB Enfield). The Application Site comprises the existing waste management site known as the Edmonton EcoPark where the permanent facilities would be located, part of Ardra Road, land around the existing water pumping station at Ardra Road, Deephams Farm Road, part of Lee Park Way and land to the west of the River Lee Navigation, and land to the north of Advent Way and east of the River Lee Navigation (part of which would form the Temporary Laydown Area and new Lee Park Way access road). The post code for the Edmonton EcoPark is N18 3AG and the grid reference is TQ 35750 92860.

1.5.2 The Application Site includes all land required to deliver the Project. This includes land that would be required temporarily to facilitate the development.

1.5.3 Both the Application Site and the Edmonton EcoPark (existing and proposed) are shown on Plan A_0003 and A_0004 contained within the Book of Plans (AD02.01). Throughout this report references to the Application Site refer to the proposed extent of the Project works, and Edmonton EcoPark refers to the operational site. Upon completion of the Project the operational site would consist of the Edmonton EcoPark and additional land required to provide new access arrangements and for a water pumping station adjacent to the Deephams Sewage Treatment Works outflow channel.

Edmonton EcoPark

1.5.4 The Edmonton EcoPark is an existing waste management complex of around 16 hectares.

1.5.5 Current use of the Edmonton EcoPark comprises:

a. an EfW facility which treats circa 540,000 tonnes per annum (tpa) of residual waste and generates around 40MW_e (gross) of electricity;

b. an In-Vessel Composting (IVC) facility which processes food, landscaping and other green waste from kerbside collections and Reuse and Recycling Centres (RRCs) as well as local parks departments. The facility currently manages around 30,000tpa, and has a permitted capacity of 45,000tpa;

c. a Bulky Waste Recycling Facility (BWRF) and Fuel Preparation Plant (FPP) which receive bulky waste from RRCs and direct deliveries. These facilities respectively recycle wood, metal, plastic, paper, card and construction waste; and separate oversized items and shred waste

suitable for combustion. These integrated facilities manage over 200,000tpa;

d. an Incinerator Bottom Ash (IBA) Recycling Facility which processes ash from the existing EfW facility;

e. a fleet management and maintenance facility which provides parking and maintenance facilities for the Edmonton EcoPark fleet of operational vehicles;

f. associated offices, car parking and plant required to operate the facility; and

g. a former wharf and single storey building utilised by the Edmonton Sea Cadets under a lease.

1.5.6 In order to construct the proposed ERF, the existing BWRF and FPP activities would be relocated within the Application Site; the IVC facility would be decommissioned and the IBA recycling would take place off-site.

Temporary Laydown Area and eastern access

1.5.7 The proposed Temporary Laydown Area is an area of open scrubland located to the east of the River Lee Navigation and north of Advent Way. There is no public access to this area. The Temporary Laydown Area would be reinstated after construction and would not form part of the ongoing operational site.

1.5.8 In addition to the Temporary Laydown Area the Application Site includes land to the east of the existing Edmonton EcoPark which would be used for the new Lee Park Way entrance and landscaping along the eastern boundary.

Northern access

1.5.9 The Application Site also includes Deephams Farm Road and part of Ardra Road with land currently occupied by the EfW facility water pumping station between the junction of A1005 Meridian Way and Deephams Farm Road.

1.6 Surrounding area

1.6.1 The Application Site is located to the north of the A406 North Circular Road in an area that is predominantly industrial. The Lee Valley Regional Park (LVRP) is located to the east of the Edmonton EcoPark.

1.6.2 Land to the north and west of the Application Site is predominantly industrial in nature. Immediately to the north of the Edmonton EcoPark is an existing Materials Recovery Facility (MRF) which is operated by a commercial waste management company, alongside other industrial buildings. Further north is Deephams Sewage Treatment Works. Beyond the industrial area to the north-west is a residential area with Badma Close being the nearest residential street to the Application Site (approximately 60m from the nearest part of the boundary) and Zambezie Drive the nearest to the Edmonton EcoPark at approximately 125m west.

1.6.3 Eley Industrial Estate located to the west of the Application Site comprises a mixture of retail, industrial and warehouse units.

1.6.4 Advent Way is located to the south of the Application Site adjacent to the A406 North Circular Road. Beyond the A406 North Circular Road are retail and trading estates; this area is identified for future redevelopment to provide a housing-led mixed use development known as Meridian Water.

1.6.5 The LVRP and River Lee Navigation are immediately adjacent to the eastern boundary of the Edmonton EcoPark, and Lee Park Way, a private road which also forms National Cycle Network (NCN) Route 1, runs alongside the River Lee Navigation. To the east of the River Lee Navigation is the William Girling Reservoir along with an area currently occupied by Camden Plant Ltd. which is used for the crushing, screening and stockpiling of waste concrete, soil and other recyclable materials from construction and demolition. The nearest residential areas to the east of the Application Site and LVRP are located at Lower Hall Lane, approximately 550m from the Edmonton EcoPark and 150m from the eastern edge of the Application Site.

1.7 The Project

1.7.1 The Project would replace the existing EfW facility at Edmonton EcoPark, which is expected to cease operations in around 2025, with a new and more efficient ERF which would produce energy from residual waste, and associated development, including temporary works required to facilitate construction, demolition and commissioning. The proposed ERF would surpass the requirement under the Waste Framework Directive (Directive 2008/98/EC) to achieve an efficiency rating in excess of the prescribed level, and would therefore be classified as a waste recovery operation rather than disposal.

1.7.2 The main features of the Project once the proposed ERF and permanent associated works are constructed and the existing EfW facility is demolished comprise:

a. a northern area of the Edmonton EcoPark accommodating the proposed ERF;

b. a southern area of the Edmonton EcoPark accommodating the RRF and a visitor, community and education centre with offices and a base for the Edmonton Sea Cadets (‘EcoPark House’);

c. a central space, where the existing EfW facility is currently located, which would be available for future waste-related development;

d. a new landscape area along the edge with the River Lee Navigation; and

e. new northern and eastern access points to the Edmonton EcoPark.

1.7.3 During construction there is a need to accommodate a Temporary Laydown Area outside of the future operational site because of space constraints. This would be used to provide parking and accommodation for temporary staff (offices, staff welfare facilities), storage and fabrication areas, and associated access and utilities.

1.7.4 There are some aspects of the Project design that require flexibility and have therefore yet to be fixed, for example, the precise location and scale of the buildings associated with the Project. It would not be possible to fix these elements in advance of the detailed design and construction which would be undertaken following appointment of a contractor should the DCO be granted. In order to accommodate this and ensure a robust assessment of the likely significant environmental effects of the Project, the Application is based on the limits of deviation set out in the Book of Plans (AD02.01), which identifies:

a. works zones for each work or group of works (to establish the area in which the development can be located); and

b. maximum building envelopes (to establish the maximum building length, width, height and footprint).

1.7.5 The Book of Plans (AD02.01) is supplemented by Illustrative Plans (included in the Design Code Principles, AD02.02) that set out the indicative form and location of buildings, structures, plant and equipment, in line with the limits of deviation established by the draft DCO (AD03.01).

1.7.6 A separate Environmental Permit would need to be obtained from the Environment Agency (EA) for the operation of the waste facility under the Environmental Permitting (England and Wales) Regulations 2010. The existing EfW facility at the Edmonton EcoPark is subject to an Environmental Permit issued by the EA. The Applicant is currently in discussions with the EA regarding an application for the new Environmental Permit(s) associated with the proposed ERF with a view to submitting an application in parallel with the DCO process.

Principal development (Works No.1a)

1.7.7 The principal development comprises the construction of an ERF located at the Edmonton EcoPark, fuelled by residual waste and capable of an electrical output of around 70MW_e (gross) of electricity. The principal development consists of the following development, located within the limits of deviation shown on Drawing C_0002 and within the building envelopes shown on Drawing C_0003 (in the Book of Plans (AD02.01)):

(i) a main building housing:

(a) a tipping hall;

(b) waste bunker and waste handling equipment;

(c) two process lines (with each line having a capacity of 350,000 tonnes of waste per annum), consisting of a moving grate, furnace, boiler and a flue gas treatment plant;

(d) facilities for the recovery of incinerator bottom ash and air pollution control residue;

(e) steam turbine(s) for electricity generation including equipment for heat off-take; and

(f) control room containing the operational and environmental control and monitoring systems, and offices.

(ii) entry and exit ramps to the ERF;

(iii) a stack containing flues for flue gas exhaust;

(iv) cooling equipment; and

(v) an observation platform enclosure.

Associated development (Works No. 1b – 7)

1.7.8 Associated development within the meaning of section 115(2) of the Planning 2008 Act (as amended) in connection with the Nationally Significant Infrastructure Project referred to in Works No.1a, comprising:

(a) Works No.1b – works required to provide buildings, structures, plant and equipment needed for the operation of the ERF as shown on Drawing C_0002 (AD02.01) comprising:

(i) a wastewater treatment facility;

(ii) a water pre-treatment plant;

(iii) external stores and workshops;

(iv) a fuelling area and fuel storage, vehicle wash, transport offices and staff facilities, toilets, natural gas intake and management compound, and fire control water tank(s); and

(v) electrical substation(s).

(b) Works No.2 – the construction of a resource recovery facility comprising the following building, structures and plant, as shown on Drawing C_0004 and within the building envelope shown on Drawing C_0005 (AD02.01):

(i) a Recycling and Fuel Preparation Facility (RFPF);

(ii) a RRC;

(iii) offices, and staff and visitor welfare facilities;

(iv) odour abatement and dust suppression plant and equipment; and

(v) fire control water tank(s) and pump house and equipment.

(c) Works No.3 – the construction of a building to provide visitor, community and education facilities, office accommodation, and a boat canopy, as shown on Drawing C_0006 and within the building envelope shown on Drawing C_0007 (AD02.01).

(d) Works No.4 – utilities and infrastructure work, landscaping, access, security and lighting, and weighbridges on Drawing C_0008 (AD02.01), comprising:

(i) the diversion, repositioning, creation of new connections to, decommissioning, removal, replacement, modification or upgrade of existing, and the laying or installation of new, pipes, cables, systems and associated apparatus for:

(a) potable water;

(b) wastewater;

(c) surface water;

(d) foul water;

(e) raw water;

(f) electricity;

(g) gas; and

(h) CCTV, telecoms and data.

(ii) the erection of a raw water pumping station;

(iii) stabilisation works to the eastern bank of Salmon's Brook;

(iv) the construction of surface water pumps, pipework and attenuation tanks;

(v) landscaping works;

(vi) the installation of areas of green roof and/or brown roof;

(vii) the widening of the existing entrance into the Edmonton EcoPark from Advent Way, including modification or replacement of the bridge over Enfield Ditch;

(viii) construction within the Edmonton EcoPark of vehicle and cycle parking, vehicle, cycle and pedestrian routes, and weighbridges;

(ix) construction of an access into the Edmonton EcoPark from Lee Park Way, including bridging over Enfield Ditch;

(x) improvements to Lee Park Way including vehicle barriers and the creation of segregated pedestrian and cycle paths;

(xi) improvements to Deephams Farm Road and use of Deephams Farm Road as an access to the Edmonton EcoPark;

(xii) the resurfacing of Ardra Road (if required);

(xiii) security, fencing, and lighting works and equipment;

(xiv) the erection of security facilities and equipment and gatehouses within the operational site at access points from Advent Way, Ardra Road, and Lee Park Way;

(xv) the upgrade and maintenance of the existing bridge over the River Lee Navigation; and

(xvi) the installation of photovoltaic panels at roof level of the ERF and RRF.

(e) Works No.5 – works for the creation of the Temporary Laydown Area and its temporary use, as shown on Drawing C_0009 (AD02.01), as follows:

(i) areas of hardstanding;

(ii) the erection of fencing, hoarding or any other means of enclosure;

(iii) the erection of security facilities and equipment and gatehouses;

(iv) vehicle parking;

(v) office and staff welfare accommodation;

(vi) storage, fabrication, laydown area;

(vii) foul water storage and pumps and surface water attenuation storage and pumps;

(viii) utility works including electricity, water, CCTV, telecoms and data;

(ix) the creation of vehicular, cycle and pedestrian access from Lee Park Way to the Temporary Laydown Area; and

(x) restoration of the Temporary Laydown Area.

(f) Works No.6 – site preparation and demolition works within the area as shown on Drawing C_0010 (AD02.01), comprising:

(i) demolition of existing buildings, structures and plant excluding demolition of the existing EfW facility;

(ii) construction of a temporary ash storage building;

(iii) realignment of the exit ramp from the existing EfW facility; and

(iv) works to prepare the land shown on Drawing C_0008 (AD02.01) for the construction of works numbers 1a, 1b, 2, 3, 4 and 5.

(g) Works No.7 – as shown on Drawing C_0011 (AD02.01), comprising decommissioning and demolition of the existing EfW facility and removal of:

(i) the existing stack;

(ii) demolition of the existing water pumping station on Ardra Road; and

(iii) making good the cleared areas.

1.7.9 The draft DCO also identifies such other works as may be necessary or expedient for the purposes of or in connection with the construction, operation and maintenance of the authorised development which do not give rise to any materially new or materially different environmental effects from those assessed and set out in the Environmental Statement (ES) (AD06.02).

1.8 Stages of development

1.8.1 The proposed ERF is intended to be operational before the end of 2025, but with the precise timing of the replacement to be determined. In order to do this, the following key steps are required:

a. obtain a DCO for the new facility and associated developments;

b. obtain relevant environmental permit(s) and other licences, consents and permits needed;

c. identify a suitable technology supplier;

d. agree and arrange source(s) of funding;

e. enter into contract(s) for design, build and operation of new facility and associated development;

f. move to operation of new facility; and

g. decommission and demolish the existing EfW facility.

1.8.2 Site preparation and construction would be undertaken over a number of years and it is expected that the earliest construction would commence is 2019/20, although this may be later. Construction would be implemented in stages to ensure that essential waste management operations remain

functioning throughout. This is especially relevant for the existing EfW facility and associated support facilities.

1.8.3 The stages of the Project are as follows:

a. Stage 1a: site preparation and enabling works;

b. Stage 1b: construction of RRF, EcoPark House and commencement of use of Temporary Laydown Area;

c. Stage 1c: operation of RRF, EcoPark House and demolition/clearance of northern area;

d. Stage 1d: construction of ERF;

e. Stage 2: commissioning of ERF alongside operation of EfW facility, i.e. transition period;

f. Stage 3: operation of ERF, RRF and EcoPark House, demolition of EfW facility; and

g. Stage 4: operation of ERF, RRF and EcoPark House, i.e. final operational situation.

Stage 1a

1.8.4 Stage 1a involves a series of site preparation and enabling works required for the Project. The works would include:

a. enabling works along Deephams Farm Road to create the Deephams Farm Road access;

b. demolition of clinical waste building and maintenance workshop building;

c. infill of artificial pond and clearance of landscaped area to form temporary storage and parking area;

d. layout of replacement fleet parking areas and temporary support buildings on the site of the maintenance workshop;

e. establishment of hoarded demolition work sites with safe pedestrian and vehicular access to the existing EfW facility main entrance and staff car parks. Access to the existing EfW facility would continue to be from the existing Edmonton EcoPark access;

f. relocation of Edmonton Sea Cadets to existing EfW facility meeting rooms with safe pedestrian and vehicular access via the existing Edmonton EcoPark access at Advent Way to the main entrance and staff car parks; storage of Edmonton Sea Cadets equipment in a container located at front of the existing EfW facility and relocate their boats to an off-site location provided by the Edmonton Sea Cadets;

g. diversion of utilities and services affected by demolition and clearance works including diversion of the sewer trunk main owned by Thames Water Utilities Limited (TWUL) which runs under the proposed location of the RRF;

h. demolition and clearance of EcoPark House and RRF construction zones;

i. creation of new Lee Park Way access and temporary diversion of footpaths and cycleways; and

j. establishment of the Temporary Laydown Area to the north of Advent Way and east of the River Lee Navigation to provide for site offices; storage of construction materials, plant and machinery; fabrication/sub-assembly; and construction staff/contractor vehicle parking. Temporary diversion of footpaths and cycleways at the Temporary Laydown Area access points.

1.8.5 The existing EfW facility would continue to operate at current capacity. The existing IBA recycling facility would continue to process ash from the existing EfW facility. The existing BWRF, FPP and IVC would continue to operate in this period.

1.8.6 Operational vehicles would continue to access the Edmonton EcoPark via the access at Advent Way. This accounts for approximately 1,063 one way vehicle movements per day.

1.8.7 Traffic associated with the Stage 1a demolition and enabling works would arrive at the Edmonton EcoPark via the existing access on Advent Way.

Stage 1b

1.8.8 During Stage 1b, the RRF and EcoPark House buildings would be constructed in the southern part of the Edmonton EcoPark. It would be necessary to construct these buildings prior to the construction of the proposed ERF and demolition of the operations north of the existing EfW facility. The works required during this stage of construction would include:

a. commencement of use of Temporary Laydown Area;

b. relocation of LWL vehicle fleet to the north of existing EfW facility;

c. construction of EcoPark House;

d. construction of RRF and its weighbridges;

e. erection of temporary ash storage building;

f. layout of staff and visitor parking area immediately adjacent to EcoPark House;

g. commencement of use by staff and visitor vehicles of the new Lee Park Way access;

h. construction of the attenuation tank and associated drainage of the RRF sub-catchment; and

i. existing EfW facility exit ramp arrangements aligned with RRF construction area and required RRF operational vehicles routes.

1.8.9 The existing EfW facility would continue to operate at current capacity. The Edmonton Sea Cadets would continue to occupy space in the existing EfW facility.

1.8.10 The existing BWRF, FPP and IVC would continue to operate in this period, until the RRF is completed (see Stage 1c). The IBA recycling facility would continue to process ash from the existing EfW facility.

1.8.11 Operational vehicles would continue to access the Edmonton EcoPark via the existing Edmonton EcoPark access from Advent Way. The new Lee Park Way access would become available and be used by some staff and Edmonton Sea Cadets traffic.

1.8.12 Traffic associated with the construction of the RRF and EcoPark House would arrive at the Edmonton EcoPark via the existing access on Advent Way. Some traffic may arrive at the Temporary Laydown Area, travelling from the Temporary Laydown Area to the Edmonton EcoPark via Walthamstow Avenue and the existing access. Some light vehicles including construction staff shuttle buses may travel to the Edmonton EcoPark via the new Lee Park Way access.

Stage 1c

1.8.13 During this stage of construction the facilities to the north of the existing EfW facility would be demolished to make way for the proposed ERF. The works required involve:

a. completion of RRF and transfer of FPP/BWRF operations;
b. completion of EcoPark House and occupation by the Edmonton Sea Cadets;
c. relocation of Edmonton EcoPark stores;
d. disconnection of obsolete services and utilities within demolition zones;
e. demolition and clearance of existing FPP area;
f. demolition and clearance of existing BWRF area;
g. demolition and clearance of existing IBA area; and
h. demolition and clearance of existing IVC facility – composting activities to be relocated off-site and bulking facilities provided within the RRF to enable transport to third party treatment sites.

1.8.14 The existing EfW facility would continue to operate at current capacity, with a temporary ash storage building provided to replace the existing IBA area and allow the transfer of ash off-site for recycling.

1.8.15 The Recycling and Fuel Preparation Facility (RFPF) operations would commence within the RRF, with capacity to treat around 390,000 tpa. The RRC element of the RRF building would be open to members of the public and small businesses with access via the new Lee Park Way access. On completion of EcoPark House this would be available for community and education activities, the Edmonton Sea Cadets and for office accommodation associated with operation of the Edmonton EcoPark.

1.8.16 Operational vehicles would continue to access the Edmonton EcoPark via the existing access on Advent Way to serve both the existing EfW facility and proposed RRF. Members of the public and small business vehicles visiting the RRC element of the RRF, users of EcoPark House and staff would access the Edmonton EcoPark via the new Lee Park Way access.

1.8.17 Traffic associated with the northern Application Site clearance would use the new Deephams Farm Road access.

Stage 1d

1.8.18 During Stage 1d, the main build for the proposed ERF would occur within a defined work zone at the northern area of the Edmonton EcoPark. The works involve:

a. construction of ERF including piling and excavation works, civil and structural works, establishment of new utilities connections;

b. construction of the surface water attenuation tank(s) and associated drainage of the ERF sub-catchment;

c. erection of a new pumping station and associated pipework to provide raw water from Deephams Sewage Treatment Works outflow channel; and

d. partial landscaping.

1.8.19 The majority of heavy goods vehicles associated with the construction of the proposed ERF would arrive at the Edmonton EcoPark via the Deephams Farm Road access. Vehicle movements associated with the delivery of concrete would be undertaken directly to the Edmonton EcoPark while approximately 50 per cent of all other construction vehicle movements would be to the Temporary Laydown Area, with onward movement to the Edmonton EcoPark when required. The majority of these vehicles would travel via the A406 North Circular Road and A1055 Meridian Way to the Deephams Farm Road access. However, any abnormal loads may travel between the Temporary Laydown Area and the Edmonton EcoPark via the existing access. This would be undertaken at a time that minimises any conflict with Edmonton EcoPark operational vehicles.

1.8.20 The existing EfW facility would continue to operate at current capacity and the proposed RRF and EcoPark House would be operational.

1.8.21 Operational vehicles would continue to access the Edmonton EcoPark via the existing access on Advent Way to serve both the existing EfW facility and RRF. Members of the public and small businesses visiting the RRC element of the RRF, users of EcoPark House and staff would access the Edmonton EcoPark via the new Lee Park Way access.

Stage 2

1.8.22 This stage marks the completion of the proposed ERF, commissioning of the facility and start of operations. The existing EfW facility would then be ready for decommissioning and demolition. The works required involve:

a. commissioning of proposed ERF;

b. installation of ERF weighbridges;

c. relocation of operations contractors compound from adjacent to the existing EfW facility to adjacent to the southern side of the ERF;

d. relocation of operational stores adjacent to the ERF;

e. relocation of operational fleet depot to adjacent to ERF; and

f. completion of landscaping works that are not linked to or affected by the EfW facility demolition.

1.8.23 The commissioning stage of the proposed ERF is estimated to take between six and twelve months. The commissioning stage is necessary in order to test all of the equipment and processes before the proposed ERF is fully operational. During this stage both the existing EfW facility and the proposed ERF would be operational as waste inputs are gradually transferred from the existing EfW facility to the proposed ERF.

1.8.24 Landscaping and relocation of support facilities would take place during the ERF commissioning stage with use of the Deephams Farm Road access remaining in place for the operations contractor's use, alongside staff shuttle buses from Lee Park Way as required.

1.8.25 The existing EfW facility would continue operation at a reduced capacity as incoming waste is transferred to the proposed ERF to allow its commissioning. The proposed ERF would increase the proportion of the waste that it takes as its commissioning progresses and both treatment lines are brought online.

1.8.26 The proposed RRF and EcoPark House would be operational.

1.8.27 Operational vehicles would continue to access the Edmonton EcoPark via Advent Way as before to serve both the existing EfW facility and proposed ERF and RRF. Some operational vehicles travelling to the ERF would use the Deephams Farm Road access. Members of the public and local businesses visiting the RRC element of the RRF would access the Edmonton EcoPark via the new Lee Park Way access.

Stage 3

1.8.28 Decommissioning, stripping out and demolition of the existing EfW facility would commence after the proposed ERF is fully commissioned and tests including the reliability period have been successfully completed. The works required would involve:

a. hoarding of the demolition work zone;

b. clearance of northern half of existing EfW facility site – once cleared the northern area of the EfW facility site would be used as a laydown for demolition equipment which is required before the demolition of the main EfW facility building can proceed;

c. completion of fleet parking and facilities area;

d. construction of widened southern entrance and new security gatehouse;

e. demolition and decommissioning of water pumping station;

f. demolition of main EfW facility building;

g. excavation of bunker and infilling with suitable material;

h. levelling of site and make good;

i. completion of Edmonton EcoPark landscaping works;

j. completion of staff car parks and surface water attenuation tanks on removal of EfW facility exit ramp; and

k. restoration of the Temporary Laydown Area.

1.8.29 The proposed ERF would operate at the capacity required with each process line capable of 350,000 tonnes per annum with a total capacity of the facility at 700,000 tonnes per annum. The proposed RRF and EcoPark House would also be operational.

1.8.30 Operational vehicles would continue to access the Edmonton EcoPark via the existing access on Advent Way as existing to serve both the ERF and RRF. Members of the public and small businesses visiting the RRC element of the RRF, users of EcoPark House and staff would access the Edmonton EcoPark via the new Lee Park Way access.

1.8.31 Traffic associated with the decommissioning and demolition of the existing EfW facility would travel to and from the Edmonton EcoPark via the existing Edmonton EcoPark access on Advent Way to minimise any conflicts with the operational ERF. Some vehicles associated with the removal of materials may be marshalled at the Temporary Laydown Area, waiting there until required on the Edmonton EcoPark. The new Deephams Farm Road access may also be used, if necessary.

Stage 4

1.8.32 Stage 4 would see the full operation of all new facilities. The proposed ERF would operate at full required capacity with each process line capable of processing 350,000 tonnes per annum with a total capacity of the facility at 700,000 tonnes per annum. The RRF would operate with a capacity of around 390,000tpa.

1.8.33 EcoPark House would be occupied by the site operator and the Edmonton Sea Cadets, and would also be available for other community and education activities.

1.8.34 Operational vehicles would continue to access the Edmonton EcoPark via the existing access on Advent Way to serve both the ERF and RRF while some movements would be undertaken using the Deephams Farm Road access. Members of the public and small businesses visiting the RRC element of the RRF, users of EcoPark House and staff would access the Edmonton EcoPark via the new Lee Park Way access.

2 Methodology

2.1 Sustainability assessment methodology

2.1.1 The LB Enfield Development Management Document[1] (DMD) requires all planning applications to be accompanied by a Sustainable Design and Construction Statement to demonstrate compliance with Development Plan policies as set out in Appendix 3: Sustainable Design and Construction Statement (DMD Policy 49). Although the Project will be determined as a DCO, the DMD policy has been taken into consideration in assessing the sustainability of the Project.

2.1.2 The sustainability assessment was undertaken in three main stages:

a. Stage 1 – a desktop review of relevant national, regional and local policy;

b. Stage 2 – appraisal of the Project's sustainability performance against identified relevant policy; and

c. Stage 3 – preparation of the Sustainability Statement report.

2.2 Assumptions and limitations

2.2.1 The Sustainability Statement has drawn upon a number of other documents that have been submitted with the Application including the Environmental Statement (ES) (AD06.02), Design and Access Statement (AD05.07), Flood Risk Assessment (FRA) (AD05.14), Transport Assessment (AD05.13), and Building Energy Assessment (Appendix D). Where required these documents include assumptions and limitations that are not explained in the Sustainability Statement. Reference documents are noted where applicable.

[1] LB Enfield (2014), Development Management Document, Adopted November 2014.

3 Baseline review

3.1 Sustainability policy expectations

3.1.1 A baseline policy review of national, regional and local policy guidance on sustainable development was undertaken to determine the relevant requirements set out in policy. The policy documents that were taken into consideration in that review are listed below, and a review of all the policies is provided at Appendix A. A reference table of the Project compliance with the relevant sustainability-related policies of the Mayor of London and LB Enfield is provided at Appendix B. The review identified that the principal policies for consideration as a part of this Sustainability Statement are those documents highlighted in bold.

3.1.2 National Policy

a. National Planning Policy Framework[2] (NPPF);

b. Overarching National Policy Statement for Energy (NPS EN-1)[3]; and

c. National Policy Statement for Renewable Energy Infrastructure (NPS EN-3)[4].

3.1.3 Regional Policy

a. Greater London Authority (GLA) – The Mayor of London – The London Plan consolidated with alterations since 2011[5] and associated documents:

- **Mayor's Sustainable Design and Construction, Supplementary Planning Guidance[6] (SPG);**
- Mayor's Cultural Strategy[7] ;
- Mayor's Climate Change Adaptation Strategy, Managing Risks and Increasing Resilience[8];
- Mayor's Climate Change Mitigation and Energy Strategy, Delivering London's Energy Future[9] ;

[2] Department for Communities and Local Government (2012) National Planning Policy Framework, March 2012
[3] Department of Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1), July 2011.
[4] Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy Infrastructure (EN-3), July 2011.
[5] Greater London Authority (GLA) (2015) The London Plan, the Spatial Development Strategy for London Consolidated with Alterations since 2015, March 2015.
[6] Mayor of London (2014) Mayor's Sustainable Design and Construction, Supplementary Planning Guidance.
[7] Mayor of London (2012) Mayor's Cultural Strategy – 2012 and Beyond
[8] Mayor of London (2011) Managing Risks and Increasing Resilience Mayor's Climate Change Adaptation Strategy, Managing Risks and Increasing Resilience.
[9] Mayor of London (2011) Delivering London's Energy Future: The Mayor's Climate Change Mitigation and Energy Strategy, October 2011.

- Mayor's Water Strategy, London's Water Future[10] ;
- Mayor's Business Waste Strategy, Making Business Sense of Waste[11];
- Mayor's Transport Strategy[12];
- Mayor's Economic Development Strategy[13];
- Mayor's Air Quality Strategy, Clearing the Air[14]
- Mayor's Noise Strategy, A Sounder City[15]; and
- Mayor's Biodiversity Strategy, Connecting with London's Nature[16].

3.1.4 Local Policy

a. LB Enfield Core Strategy 2010-2025[17];
b. **LB Enfield Development Management Document[1];**
c. Proposed Submission Central Leeside Area Action Plan[18]; and
d. Edmonton EcoPark Planning Brief (supplementary planning document to the Local Plan)[19].

[10] Mayor of London (2011) The Mayor's Water Strategy Securing London's Water Future October 2011.
[11] Mayor of London (2011) The Mayors Business Waste Strategy for London Making Business Sense of Waste, November 2011
[12] Mayor of London (2010) The Mayor's Transport Strategy May for London 2010
[13] Mayor of London (2010) The Mayor's Economic Development Strategy for London May 2010
[14] Mayor of London (2010) The Mayor's Air Quality Strategy Clearing London's Air
[15] Mayor of London (2004) The Mayor's Ambient Noise Strategy Sounder City March 2004
[16] Mayor of London (2002) The Mayor's Biodiversity Strategy Connecting with London's Nature July 2002
[17] LB Enfield (2010) The Enfield Plan Core Strategy 2010 – 2025, Adopted November 2010.
[18] LB Enfield (2014) Central Leeside Proposed Submission Area Action Plan, November 2014.
[19] LB Enfield (2013) Edmonton EcoPark Planning Brief Supplementary Planning Document to the Local Plan, May 2013.

4 Sustainability assessment

4.1.1 The Sustainability Statement describes the extent to which the Project meets or exceeds the sustainability requirements for development, as set out in:

a. LB Enfield Development Management Document (DMD) (2014) Appendix 3: Sustainable Design and Construction, and

b. the Mayor's Priorities and Best Practice as outlined in the London Plan (2015) Sustainable Design and Construction SPG (2014).

4.1.2 The structure of the assessment narrative follows the guidance for development proposals set out in DMD Appendix 3:

a. Energy Statement;

b. Water Efficiency;

c. Design;

d. Waste Management and Construction;

e. Materials and Green Procurement;

f. Health and Wellbeing;

g. Surface Water Run-off and Flood Risk;

h. Ecology and Green Infrastructure;

i. Travel; and

j. Pre-Assessments.

4.1.3 For each section a summary of relevant policy is provided followed by a table with the Project response.

4.1.4 The Project does not retain any existing buildings within the proposed development scheme.

4.1.5 The Project does not include any circumstances that would result in non-conformity (through either technical feasibility or economic viability) with the Sustainable Design and Construction Policy set out in the DMD.

4.1.6 The DMD requires that all new development must achieve the highest sustainable design and construction standards having regard to technical feasibility and economic viability. This includes a focus on strategies to enable the development to mitigate CO_2 emissions and adapt to future climate change (DMD Policy 49).

4.2 Energy statement

4.2.1 The Mayor's Sustainable Design and Construction SPG encourages the minimisation of the overall CO_2 emissions from a development through the implementation of the energy hierarchy. The development should (Mayor's Sustainable Design and Construction SPG Section 2.4):

a. contribute to a resilient and low carbon energy infrastructure;

b. be accompanied by an energy demand assessment;

c. prioritise passive measures in design; and

d. assess the potential to connect to or expand an existing district heating or cooling network; or establish a new network.

4.2.2 The SPG encourages major developments to incorporate renewable energy technologies to minimise overall CO_2 emissions where feasible. Where developments do not achieve the Mayor's CO_2 reduction targets set out in the London Plan, the development should make a contribution to the local borough's CO_2 off-setting fund (Mayor's Sustainable Design and Construction SPG Section 2.5).

4.2.3 Developments are encouraged to promote sustainable energy use and address the causes and impacts of climate change by: minimising energy use; supplying energy efficiently; and using energy generated from renewable sources in line with London Plan and national policy (LB Enfield Core Strategy Core Policy 20).

4.2.4 The LB Enfield DMD requires all planning applications to be accompanied by an Energy Statement that demonstrates how the development has minimised on-site CO_2 emissions in accordance with the principles of the energy hierarchy. In addition, LB Enfield seeks to ensure Enfield's future energy infrastructure is in place to accommodate the levels of growth anticipated within the Borough in line with the LB Enfield Core Strategy Core Policy 20 (DMD Appendix 3).

4.2.5 Developments are required to minimise energy-related CO_2 emissions through (DMD Policy 51, DMD Policy 52, DMD Policy 53, DMD Policy 55, DMD Policy 56):

a. adopting energy-efficiency and passive design measures;

b. enabling the use of decentralised energy; and

c. adopting mitigation and/or offsetting measures to achieve the government's zero carbon targets for buildings.

4.2.6 Major non-residential development involving the replacement of new non-residential floorspace must move towards zero CO_2 emissions from operations from 2019.

4.2.7 Table 4.1 below sets out how the Project adheres to these policies. A Building Energy Assessment is provided at Appendix B.

Table 4.1: Project response to energy policies

Project Response	Policy Ref.
The Project is for the construction, operation and maintenance of an ERF of around 70 MW_e at the Edmonton EcoPark in north London, contributing to the energy supply of the area. The entire site electricity demands can be met by the on-site connection from the ERF.	**Mayor's Sustainable Design and Construction SPG Section:** 2.4, 2.5
An Building Energy Assessment (Appendix D) has been provided to accompany the Application, which confirms compliance with the Mayor's Sustainable Design and Construction SPG 2.4 and LB Enfield Core Strategy Policy 20 through the following:	**LB Enfield DMD:** DMD 51, DMD 52, DMD 53, DMD 55, DMD 56, DMD Appendix 3

Project Response	Policy Ref.
• energy demand assessment; • the application of the energy hierarchy principles; • the pursuit of energy efficient design measures; and • the implementation of the energy hierarchy (lean>clean>green) to reduce carbon emissions. After demand reductions measures were considered, the emissions savings were calculated at 12%. The Building Energy Assessment for the Application Site meets the 35% reduction target from Part L under the second stage of the energy hierarchy. A site-wide heat network is assessed but its installation would be subject to a feasibility and cost benefit analysis. Applying a site-wide heat network and on-site electricity network to the energy performance of the Project, the energy model demonstrates a 51% saving on regulated emissions, reducing the annual emissions to 78 tonnes. The Project includes provision for renewable technology in the form of solar photovoltaic (PV) panels on the available roof area of the ERF and RRF, subject to a cost benefit analysis. As the Building Energy Assessment in Appendix D documents, 2,220m^2 of roof area would be required to completely offset regulated CO_2 emissions. PV panels over this roof area could achieve a peak output of approximately 160kW_e and output of 146,000kWh/annum. By installing the PV panels suggested, the site buildings would achieve zero carbon on regulated emissions. The BREEAM strategy for the proposed development is described in further detail in the BREEAM Pre-Assessment included with the Application. Further details on the energy and carbon strategy, including a detailed list of passive energy design interventions, energy efficient building systems, and a feasibility study of carbon emissions savings and low and zero carbon (LZC) energy technologies for the proposed development, are described in the Building Energy Assessment in Appendix B of this Statement.	**LB Enfield Core Strategy:** Core Policy 20

4.3 Water efficiency

4.3.1 The Mayor's Sustainable Design and Construction SPG requires all developments to maximise the opportunities for water saving measures and appliances, including the use of alternative sources of water, installation of water efficiency measures and the incorporation of rainwater harvesting (Mayor's Sustainable Design and Construction SPG Section 2.6).

4.3.2 The LB Enfield DMD further encourages the inclusion of greywater recycling, and all new major developments should undertake a rainwater and greywater feasibility study, incorporating the technology into designs as appropriate (DMD Policy 58).

4.3.3 New non-residential developments, including refurbishments, should aim to achieve the maximum number of water credits in a BREEAM assessment or the 'best practice' level of the AECB (Association of Environment Conscious Building) water standards (Mayor's Sustainable Design and

Construction SPG Section 2.6) and demonstrate at least a 12.5 per cent improvement in water efficiency over notional baseline (DMD Policy 58).

4.3.4 To ensure that Enfield's future water resource needs and wastewater treatment infrastructure are managed effectively, all new development proposals must demonstrate that there is sufficient water supply infrastructure capacity both on- and off-site to serve the development or that any necessary upgrades will be delivered ahead of the occupation of development (DMD Policy 60).

4.3.5 Table 4.2 below sets out how the Project adheres to these policies.

Table 4.2: Project response to water policies

Project Response	Policy Ref.
In line with BREEAM targets and requirements set out in the Mayor's Sustainable Design and Construction SPG Section 2.6, the Project aims to achieve water efficiency through a number of measures including water efficient components, water monitoring and a leak detection system. Subject to feasibility in detailed design, a proposed rainwater harvesting system will also contribute to the BREEAM score if the harvested rainwater is used for WC flushing. The Project aims achieve the maximum number of water credits in a BREEAM assessment as feasible, or the 'best practice' level of the AECB water standards. If feasible, rainwater harvesting (often treated first) would be implemented to supplement water for fire and dust suppression systems, non-potable water uses, and washing operations to reduce pressure on potable water supply. Water demand at the Edmonton EcoPark would be managed by incorporating, as a minimum water efficient appliances (such as taps, toilets, urinals, etc.) to limit water consumption to between 4.5 and 5.5m3/person/year and a water meter with a pulsed output for each building unit at the Application Site.	**Mayor's Sustainable Design and Construction SPG Section:** 2.6 **LB Enfield DMD**: DMD 58, DMD 60

4.3.6 Drainage infrastructure, surface water runoff and flood risk management are addressed within sections 4.8.1 through 4.8.5 in response to LB Enfield DMD Policy 59, DMD Policy 60, DMD Policy 61, DMD Policy 62 and DMD Policy 63.

4.4 Design

4.4.1 The Mayor's Sustainable Design and Construction SPG states that buildings and their surroundings should be designed and built to optimise the use of land, including through optimising density and design, considering appropriate design of basements and lightwells, and considering the accessibility of the site and its local context (Mayor's Sustainable Design and Construction SPG Section 2.2).

4.4.2 The development should also carefully consider the design of the site, building layout, footprint, scale and height of buildings, as well as the location of land uses in the context of the following aspects (Mayor's Sustainable Design and Construction SPG Section 2.3):

a. reuse of existing building: any existing buildings that can be practically refurbished, retrofitted, or extended should be retained and reused;

b. landform: the design of new developments should take advantage of any opportunities the existing landform offers to enhance the sustainability of the development;

c. mixed land use: where appropriate, development should include a mix of land uses to reduce the need for local residents and visitors to travel;

f. site layout: the development should ensure the layout of the site and buildings maximise the opportunities provided by natural systems, such as light and wind and the potential for sustainable drainage systems; and

d. micro-climate: the effects of the development on micro-climate should be considered, such as overshadowing, contributing to urban heat island effect, and the comfort of the street environment.

4.4.3 In addition, the LB Enfield DMD includes a number of policies on the subject of sustainable design and construction which are of relevance to the proposed development:

a. high quality and design-led development: development should create safe and secure places in accordance with the principles of Secured by Design, and capitalise on opportunities for improving an area through character, continuity and enclosure, quality of the public realm, ease of movement, legibility, adaptability and durability, and diversity (DMD Policy 37);

b. mitigation of CO_2 emissions and adaptation to future climate change: reduce energy-related CO_2 emissions through energy efficiency, passive solar design, adequate daylighting, reduced reliance on mechanical heating and cooling, and promotion of low and zero carbon technology, and enhance robustness to the potential impacts of future climate change (DMD Policy 49); and

c. avoiding and reducing flood risk: development should be appropriately located to avoid flood risk areas, preserve overland flood and flow routes, preserve and/or enhance flood storage on site, manage surface water runoff and prevent the loss of permeable surfaces/areas on site.

4.4.4 Table 4.3 sets out how the Project adheres to these policies.

Table 4.3: Project response to design policies

Project Response	**Policy Ref.**
The purpose of the Project is to secure consent to allow the NLWA to continue to deliver its waste management duties and to provide a site that can efficiently create energy – heat and power - that can contribute to meeting the demand for sustainable energy generation. As described in Section 5 of the Design and Access Statement (AD05.07) that accompanies the Application, the following objectives have guided the Project design:	**Mayor's Sustainable Design and Construction SPG Section:** 2.2, 2.3 **LB Enfield DMD**: DMD 37, DMD 49,

Project Response	Policy Ref.
• function effectively and be fit for purpose, responding to technical and operational requirements; • promote effective access and circulation; • be sustainable, that is to consider the environmental performance and impact of the components of the Project, their longevity and adaptability to climate change, flexibility and efficiency; • have a considered response to the environmental and ecological constraints both within and in close proximity to the Application Site; • be based on a thorough understanding of the Application Site's context, including an appreciation of the surrounding land uses, its ecological and historical contexts; • enable the continuation and enhancement of community engagement and education activities including organised tours of the proposed ERF and other waste management facilities; • respond to the surrounding context, particularly the Lee Valley Regional Park (LVRP), and include a strong landscape and ecological rationale; and • all buildings, structures and spaces in the Edmonton EcoPark should be of a high design quality which responds to the sensitive wider context as well as its operational function. The Project should also respond to planned improvements in the visual and environmental quality of the industrial estates in the Central Leeside area. In respect of sustainability the design objectives further state: • sustainable construction: the design should achieve a high standard of sustainable design and construction; • apply the energy hierarchy: the Project should apply the energy hierarchy of lean, clean and green to reduce carbon emissions and prioritise energy efficient design measures; • provide heat and electricity: the proposed ERF should be designed to provide electricity to the grid and have the potential to deliver heat to a heat network; • apply the waste hierarchy: the design should encourage re-use and recycling of materials, and reducing construction, demolition and excavation waste. It should prioritise materials that have a low embodied energy, are durable, and can be sustainably sourced; and • appropriate environmental performance: in developing the components of the Project, environmental performance including longevity, adaptability to climate, flexibility and efficiency should be considered.	

4.4.5 Energy demand reduction and mitigation of CO_2 emissions are addressed within Sections 4.2.1 through 4.2.7 in response to LB Enfield DMD Policy 51, DMD Policy 53, DMD Policy 55 and DMD Policy 56.

4.4.6 Drainage infrastructure, surface water runoff and flood risk management are addressed within Sections 4.8.1 through 4.8.5 response to LB Enfield DMD Policy 59, DMD Policy 61 and DMD Policy 62.

4.5 Waste management and construction

4.5.1 The Mayor's Sustainable Design and Construction SPG encourages developers to maximise the use of existing resources and materials and minimise waste generated during the demolition and construction process through the implementation of the waste hierarchy, including provision of sufficient internal storage capacity for recyclable and compostable materials (Mayor's Sustainable Design and Construction SPG Section 2.7).

4.5.2 LB Enfield emphasises sustainable waste management for all new developments through encouraging inclusion of re-used and recycled material; on-site reuse and recycling of construction, demolition and excavation waste; and provision for on-site waste treatment, storage and collection throughout the lifetime of the development (DMD Policy 57).

4.5.3 Specifically, waste and recycling storage is required for all applications in accordance with LB Enfield's Waste and Recycling Planning Storage Guidance ENV 08/162 and that developments must demonstrate compliance with requirements of WST 03 within the BREEAM rating system, or equivalent (DMD Policy 57, DMD Appendix 3).

4.5.4 To guide sustainable demolition and construction activities, LB Enfield requires a Site Waste Management Plan (SWMP) to be prepared for all major developments in accordance with the requirements of Policy 5.18 of the London Plan. The SWMP must demonstrate adherence with the principles of the waste hierarchy to reduce, reuse, recycle and recover materials. In addition, the SWMP must demonstrate compliance with the requirements of MAN 03 within the BREEAM rating and (DMD 57, DMD Appendix 3):

a. divert at least 85 per cent of non-hazardous waste by weight or volume from landfill;

b. set a strategic objective to divert a minimum of 95 per cent of waste by weight or volume by 2020.

4.5.5 Table 4.4 sets out how the Project adheres to these policies:

Table 4.4: Project response to waste management and construction policies

Project Response	**Policy Ref.**
The Code of Construction Practice (AD05.12) (CoCP) contains control measures and the standards to be implemented throughout construction of the Project. As set out in the CoCP (AD05.12), the Applicant will require the Contractor to comply as a minimum with applicable environmental legislation, code of practices, good industry	**Mayor's Sustainable Design and Construction SPG Section**: 2.7

Project Response	Policy Ref.
practice, standards and guidance e.g. British Standards relevant to the various construction activities in which they are engaged at the time of construction. Measures included in the CoCP (AD05.12) require the Contractor to sign up to and adhere to the Considerate Constructors Scheme (CCS) (www.ccscheme.org.uk) and to aim to attain a Certificate of Performance Beyond Compliance. The CoCP (AD05.12) further requires the Contractor to develop and implement an Environmental Management System (EMS) that follows the principles of BS EN ISO 14001 and will include the Contractor's environmental policy, operational, monitoring and auditing procedures. In addition, the CoCP (AD05.12) sets out requirements for the Contractor to prepare and implement a SWMP to promote minimisation of construction waste and responsible management of any waste arisings. The SWMP will include information regarding the classification and type of waste to be produced, targets for diversion of non-hazardous site construction waste from landfill, measures for reducing waste generation and for recycling and / or re-use, any permitting arrangements and waste carrier and off-site treatment and disposal sites to be used. The SWMP will include measures that aim to divert, at minimum, 85% of non-hazardous waste by weight or volume from landfill, with a strategic objective to divert a minimum of 95% of non-hazardous waste by weight or volume. As documented in the BREEAM pre-assessment (AD05.13 Appendix C, the design is tracking to meet the requirements of BREEAM credit WST 03 Operational Waste, which requires a central collection area to be provided where operational waste from the building can be collected and sorted. As documented in the BREEAM pre-assessment (AD05.13 Appendix C), the design is on track to meet the requirements of BREEAM credit Man 03 Responsible Construction Practices.	**LB Enfield DMD**: DMD 57, DMD Appendix 3

4.5.6 Measures to reduce risk of pollution and/or mitigate impacts through design and construction plans are addressed within section 4.7 in relation to Health and Wellbeing.

4.6 Materials and green procurement

4.6.1 The Mayor's Sustainable Design and Construction SPG encourages the careful choice and use of building materials to reduce the generation of waste and ensure high quality external environment and a healthy internal environment. The development design should (Mayor's Sustainable Design and Construction SPG Section 2.7):

a. prioritise materials that have a low embodied energy, can be sustainably sourced, are durable, and will not release toxins into the internal and external environment; and

b. maximise the potential to use pre-fabrication elements.

4.6.2 In addition to these considerations, LB Enfield requires (DMD Policy 57):

a. non-residential schemes assessed under the BREEAM rating system to achieve a minimum of 3 out of 6 credits under MAT 01; and, a minimum of 2 out of 3 credits under MAT 03[20];

b. 100 per cent of timber used on the project to be sourced in accordance with the UK Government's Timber Procurement Policy; and

c. all major developments to include a Green Procurement and Construction Plan detailing the developments' efforts to minimise the environmental impact of the scheme through responsible sourcing of materials, minimising construction site impacts, local procurement and employment strategies and the minimisation of construction and demolition waste.

4.6.3 Table 4.5 sets out how the Project adheres to these policies:

Table 4.5: Project response to materials and green procurement policies

Project Response	**Policy Ref.**
As set out in the CoCP (AD05.12), the Contractor will be required to prepare and implement a Green Procurement and Construction Plan taking account of the Mayor of London's responsible procurement themes and also guidelines on sustainable procurement within BS8903 principles and framework for procuring sustainability. The Project buildings will be assessed using BREEAM New Construction 2014 scheme for commercial buildings where the scoring for credits MAT 01 and MAT 03 do not align with those stated in the requirements. The following are the specific measures expected to be implemented in relation to the environmental impact and responsible sourcing of materials: Development of a Resource Management Plan for the selection, procurement and disposal of materials; Reference to the BRE's "Green Guide to Specification" in the selection of materials; Responsible sourcing of key materials verified by third party certification schemes including FSC/PEFC for timber, BES6001 for concrete and plasterboard and the eco-reinforcement scheme for reinforcing steel. The final selection of targeted BREEAM credits will be refined in later project stages. Further details on the materials selection and procurement are included within the Design and Access Statement and CoCP (AD05.12) submitted with the Application.	**Mayor's Sustainable Design and Construction SPG Section**: 2.7 **LB Enfield DMD**: DMD 57

[20] We believe that LB Enfield DMD 57 policy requirement relating to BREEAM MAT 01 and MAT 03 relates to the 2011 version of BREEAM for public buildings. The Project buildings will be assessed using BREEAM New Construction 2014 scheme for commercial buildings.

4.7 Health and wellbeing

4.7.1 The LB Enfield DMD requires development to provide a sensitive design that is sympathetic to the needs of its users and the surrounding area, and follow the principles of flexible use and good design to promote accommodation of future needs (DMD Policy 37).

4.7.2 LB Enfield also requires, where appropriate, development to undertake a Health Impact Assessment (AD05.09) (HIA) consistent with Policy 3.2 of the London Plan (DMD Appendix 3).

4.7.3 Table 4.6 sets out how the Project adheres to these policies:

Table 4.6: Project response to health and wellbeing policies

Project Response	Policy Ref.
As described in Section 4.4.4, the design of the Project promotes high-quality and design-led development that is flexible to respond to social, technological and economic change. Strategies include ensuring on-going operations during the development works, accommodating future capacity needs, site-sensitive design that responds to the local environment and community mobility needs. A HIA (AD05.09) has been undertaken for the Project. Key health issues addressed in the HIA (AD05.09) include: • potential emissions from the Project; • the effect on the health of the local population as a result of the Project; • accessibility in and around the Application Site through walking and cycling; and • the effect of the Project on the local transport network, including public transport and the prevalence of commercial vehicles. The HIA (AD05.09) concludes that overall, the Project is likely to have beneficial health effects at regional and local levels. Further details on the health and wellbeing impacts of the Project are included within HIA (AD05.09) submitted with the Application.	**LB Enfield DMD**: DMD 37, DMD Appendix 3

4.7.4 In line with LB Enfield DMD Policy 57, the Project is also committed to ensure appropriate pollution mitigation and management measures are incorporated with regard to adverse impacts on land contamination, air, noise and vibration, light and water pollutants during all phases of development, including construction, operations and maintenance.

4.7.5 The following sub-headings illustrate how the development adheres to the key items set out in the Mayor's Sustainable Design and Construction SPG.

Land contamination

4.7.6 The Mayor's Sustainable Design and Construction SPG states that where a site is affected by contamination, mitigation measures should be

employed at an early stage to ensure the site is developed safely (Mayor's Sustainable Design and Construction SPG Section 4.2).

4.7.7 Table 4.7 sets out how the Project adheres to these policies:

Table 4.7: Project response to land contamination policies

Project Response	Policy Ref.
Measures have been set out in the CoCP (AD05.012) to require the Contractor to adopt appropriate measures to protect, assess, mitigate and remediate land where appropriate. Measures will be implemented to assess and control risks to humans (construction workers, site visitors and nearby residents) including risks from encountering contaminated dust, soils and groundwater and where the presence of ground gas and/or vapours. As the Project progresses, the necessary measures will be consulted on with the Environment Agency (EA) and LB Enfield as part of the construction planning process. With the implementation of the above measures, there would be no significant negative effects relating to contaminated land. The HIA documents that there is not likely to be any significant residual impacts associated with contaminated land resulting from the Project.	**Mayor's sustainable Design and Construction SPG Section:** 4.2

Air pollution

4.7.8 The Mayor's Sustainable Design and Construction SPG requires developments to be designed so that they are at least 'air quality neutral'. The design should also minimise the generation of air pollution and mitigate against increased exposure to poor air quality Mayor's Sustainable Design and Construction SPG Section 4.3).

4.7.9 Table 4.8 sets out how the Project adheres to these policies:

Table 4.8: Project response to air pollution policies

Project Response	Policy Ref.
The ES (AD06.02) documents that demolition and construction-related activities have the potential to generate dust emissions. However, conditions set out in the CoCP (AD05.12) require the Contractor to adopt appropriate measures to manage dust, air pollution and exhaust emission during the construction works in accordance with best practicable means , the result of which would be to reduce the effect of the emissions to negligible levels, rendering remaining effects not significant. With the application of the appropriate mitigation measures, potential air quality impacts from road traffic associated with all stages of the construction and operations of Project are predicted to be negligible and not significant.	**Mayor's Sustainable Design and Construction SPG Section:** 4.3

Project Response	Policy Ref.
The operation of the proposed ERF has been assessed in terms of emissions from the chimney stack and odour from the facility. Design measures would be applied to ensure that effects from emissions from the chimney stack and odour would be not significant. A human health risk assessment of the replacement facility is also being undertaken, preliminary findings from which also conclude no significant effects. During operation of the Project a similar number of Heavy Good Vehicles (HGVs) would bring in waste as currently. The potential adverse health effects of the air pollution generated by the Project, other on-site equipment and associated HGV and motor vehicle traffic is likely to be small. Further details on the potential impacts of the Project on air pollution and mitigation measures are included within the ES (AD06.02) submitted with the Application.	

Noise pollution

4.7.10 The Mayor's Sustainable Design and Construction SPG encourages that noise should be reduced at the source and then designed out of the scheme to reduce the need for mitigation measures (Mayor's Sustainable Design and Construction SPG Section 4.4).

4.7.11 Table 4.9 sets out how the Project adheres to these policies:

Table 4.9: Project response to noise pollution policies

Project Response	Policy Ref.
The ES (AD06.02) documents that demolition and construction-related activities associated with the Project have been considered in terms of their potential to result in construction noise effects at nearby sensitive (residential) receivers. The ES (AD06.02) concluded that due to the distance of properties potentially sensitive to noise from demolition and construction activities, noise levels would be within specified noise criteria. Noise from traffic associated with all phases of construction and operation of the Project would not be perceptible and therefore not significant. The proposed ERF is being designed to comply with noise limits set out in national standards. The effects of noise from the operation of the industrial plant would therefore be controlled through the design so it would be not significant. Conditions set out in the CoCP (AD05.12) require the Contractor to adopt appropriate measures to assess, consider and implement best practicable means at all times to control noise from the construction works With the implementation of the above measures, there would be no significant negative effects relating to noise pollution. Further details on the potential impacts of the Project on noise pollution and mitigation measures are included within the ES (AD06.02) submitted with the Application.	**Mayor's Sustainable Design and Construction SPG Section:** 4.4

Light pollution

4.7.12 The Mayor's Sustainable Design and Construction SPG states that developments should be designed to minimise light pollution, including glare, light trespass and sky glow (Mayor's Sustainable Design and Construction SPG Section 4.5).

4.7.13 Table 4.10 sets out how the Project adheres to these policies:

Table 4.10: Project response to light pollution policies

Project Response	Policy Ref.
The ES (AD06.02) documents that during operation of the Project, lighting has the potential to affect habitats close to the Application Site. However, the lighting strategy in Section 6 of the Design and Access Statement (AD05.07) would generally avoid and minimise light pollution of protected habitats so effects would be not significant. The Design and Access Statement (AD05.07) documents that provision will be made for aviation warning lighting to be fitted to the stack following consultation with the Civil Aviation Authority. Any additional lighting requirements or safety markings will be developed during detailed design stages. Conditions set out in the CoCP (AD05.12) require the Contractor to adopt appropriate measures to provide appropriate site lighting and to manage light trespass and energy demand in compliance with the Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light GN01:2011. The CoCP (AD05.12) further details conditions to require the Contractor to implement measures to minimise disturbance to designated sites of ecological value in accordance with guidelines set out by the Bat Conservation Trust (BCT). With the implementation of the above measures, there would be no significant negative effects relating to noise pollution caused by the Project.	**Mayor's Sustainable Design and Construction SPG Section:** 4.5

Water pollution

4.7.14 The Mayor's Sustainable Design and Construction SPG encourages developments to incorporate Sustainable Drainage Systems (SuDS), which can help to minimise pollution in urban runoff and improve water quality. During construction, developments should incorporate pollution control measures to prevent groundwater and surface water contamination (Mayor's Sustainable Design and Construction SPG Section 4.6).

4.7.15 Table 4.11 sets out how the Project adheres to these policies:

Table 4.11: Project response to water pollution policies

Project Response	Policy Ref.
The Application Site is located within a designated groundwater Source Protection Zone (SPZ) (Zones 1 and 2). Ground works are required to protect the aquifers.	**Mayor's Sustainable Design**

Project Response	Policy Ref.
An assessment has been undertaken of the effects on ground conditions of the potential for contamination at the Application Site. In particular the potential for the Project to affect the water quality of groundwater beneath the site and in the adjacent Salmon's Brook and Enfield Ditch have been assessed. Measures have been set out in the CoCP (AD05.12) to ensure that groundwater would not be affected and that building works such as deep foundations do not create routes through the ground which may lead to pollution of groundwater. For this reason, the bunker has been carefully positioned to avoid this risk by placing it in the area with the greatest thickness of London Clay, which acts as a barrier protecting the groundwater. The CoCP (AD05.12) further requires the Contractor to apply for the necessary consents and approvals from the relevant authorities to enable discharge of dewatering, surface water run-off and waste water from the construction site to soakaway or filtration systems, watercourses, foul sewers or disposal off-site. As the Project progresses, the detail of the design and control measures will continue to be discussed with the EA to ensure that the measures remain suitable and appropriate. With the implementation of the above measures, there would be no significant negative effects relating to ground conditions and contamination caused by the Project.	**and Construction SPG Section:** 4.6

4.8 Surface water run-off and flood risk

4.8.1 The Mayor's Sustainable Design and Construction SPG emphasises the importance for all developments to incorporate mitigation measures in design to reduce their potential impact on increased surface water flooding due to anticipated increased intensity in rainfall events. Developments should (Mayor's Sustainable Design and Construction SPG Section 3.4, DMD Policy 61):

a. maximise all opportunities to achieve greenfield runoff rates in their developments;

b. follow the drainage hierarchy set out in the London Plan; and

c. design SuDS into their schemes that incorporate attenuation for surface water runoff as well as habitat, water quality and amenity benefits.

4.8.2 Developments should be designed to incorporate adaptation measures to improve their resistance and resilience against all types of flooding and the potential increase in flood risk as a result of climate change, through (Mayor's Sustainable Design and Construction SPG Section 3.4, DMD Policy 59, DMD Policy 60, DMD Policy 62, DMD Policy 63):

a. incorporating the recommendation of the TE2100 plan for the future tidal flood risk management in the Thames estuary;

b. where development is permitted in a flood risk zone, incorporate appropriate residual risk management measures into the design; and

c. considered all sources of flooding when designing and constructing developments.

4.8.3 Developments should also be designed to maximise opportunities to protect fluvial and tidal watercourses, flood defences and culverts (DMD Policy 63).

4.8.4 Developers must demonstrate that there is sufficient wastewater infrastructure both on and off site to serve the development. Development should be properly connected and post- construction checks should be made by developers to ensure that mis-connections do not occur (Mayor's Sustainable Design and Construction SPG 4.6).

4.8.5 Table 4.12 sets out how the Project adheres to these policies:

Table 4.12: Project response to surface water run-off and flood risk policies

Project Response	**Policy Ref.**
The ES documents good environmental design measures that would be implemented for operation of the Project that are relevant to water resources and flood risk. An Operational Management Plan would be prepared and expected to contain the following measures, at minimum: • suitable consents and approvals from the relevant authorities would be gained for waters discharged to Deephams STW via Chingford Sewer; • surface water drainage arrangements including interceptors and attenuation tanks before being discharged to Enfield Ditch; and • run off would be limited to the greenfield rate, in line with LB Enfield requirements and meets EA and London Plan requirements, accounting for climate change over the development lifetime. The Flood Risk Assessment (FRA) documents that current EA flood risk mapping shows that parts of the site are within Flood Zone 2 and are at risk from flooding from the 0.1% Annual Exceedance Probability fluvial event. The FRA concludes that the proposed development is appropriate for Flood Zone 2, since waste treatment and the other land uses proposed are classed as Less Vulnerable to flood risk in the NPPF. The FRA has concluded that groundwater is not a flood risk at the site. The Project will include a new surface water drainage scheme, and no surface water will drain to the foul sewer. The CoCP requires that the Contractor will ensure connection to the local foul sewer system as agreed with the relevant authorities or containment by temporary foul drainage facilities and disposal off-site by a licensed contractor. Appropriate post construction checks will be implemented to ensure mis-connections have not occurred.	**Mayor's Sustainable Design and Construction SPG Section**: 3.4, 4.6 **LB Enfield DMD**: DMD 59, DMD 61, DMD 60, DMD 62, DMD 63

Project Response	Policy Ref.
The FRA presents a drainage solution with run off limited to three times the greenfield rate, in line with EA and London Plan requirements, accounting for climate change over the lifetime of the Project. The risk of flooding from surface water run-off will be addressed through a SuDS strategy at the Application Site, in line with the requirements of the NPPF, EA, London Plan and LB Enfield. The hierarchy of preferred SuDS techniques has been considered in the design of the SuDS strategy. The majority of the surface water attenuation and water quality treatment (that are not provided by rainwater harvesting, green roofs and permeable paving) will be provided by a system which will depend on space available in the final layout of the design. Further detail on the surface water run-off and flood risk management strategy is provided in the FRA submitted with the Application.	

4.9 Ecology and green infrastructure

4.9.1 The Mayor's Sustainable Design and Construction SPG promotes urban greening and protection and planting of trees as a measure to help adapt the city to future climates. Developments are encouraged to integrate green infrastructure into scheme design, including creating links with wider green infrastructure networks (Mayor's Sustainable Design and Construction SPG Section 3.3).

4.9.2 The LB Enfield DMD encourages developments to contribute to the priorities of the Biodiversity Action Plan for Enfield, promoting the protection, enhancement or restoration of the ecological value of the site and, if appropriate the surrounding area, including the provision of living roofs and landscaping/design features as well as contributing to the formation and enhancement of waterways, wildlife corridors, green chains, and important ecological assets (DMD Policy 75, DMD Policy 76, DMD 77 Policy, DMD 78 Policy, DMD 79 Policy, DMD 80 Policy, DMD 81 Policy).

4.9.3 Table 4.13 sets out how the Project adheres to these policies:

Table 4.13: Project response to ecology and green infrastructure policies

Project Response	Policy Ref.
The River Lee Navigation lies immediately east of the Edmonton EcoPark and flows through the LVRP. The LVRP comprises waterways, reservoirs and green space and is designated as Green Belt. Part of the LVRP is also designated as a Site of Metropolitan Importance for Nature Conservation (SMINC), the boundary of which extends within the Application Site (along the eastern boundary). The ES (AD06.02) documents that ecology enhancement measures are considered to provide a net gain in biodiversity. The Design and Access Statement (AD05.07) documents landscape treatments that would be undertaken that would	**Mayor's Sustainable Design and Construction SPG Section**: 3.3 **LB Enfield DMD**: DMD 75, DMD 76, DMD 77, DMD 78, DMD 79, DMD 80, DMD 81

Project Response	Policy Ref.
enhance the Application Site landscape and ecology and adjacent waterways and links to wildlife corridors and green chains. Measures include: • removal of invasive species and scrub along Enfield Ditch in order to open up the currently shaded area so more light can penetrate and improve floral diversity; • new native tree and shrub planting on the slope to facilitate screening of views and provide ecological enhancement; • selective clearance and new native tree and shrub planting along Lee Park Way; • native marginal planting along Enfield Ditch; • introduction of green and brown roofs to provide new habitats; • formal tree planting along the roads on the east of the Application Site including Lee Park Way; • soft landscaping designed to promote biodiversity and to utilise locally appropriate native species to enhance existing and replacement habitat; • lights proposed within Lee Valley SMINC would be designed to maintain these dark areas for wildlife, particularly foraging and commuting bats; and • integration with the LVRP and Green Belt to the east of the Application Site (providing ecological benefits). The CoCP (AD05.12) contains detailed measures designed to ensure compliance with legislation and avoid potential adverse effects during the construction of the Project. These measures are to be implemented to protect biodiversity and limit losses to areas of conservation interest and any potentially negative impacts to legally-protected and notable species.	

4.10 Travel

4.10.1 The Mayor's Sustainable Design and Construction SPG has no specific section on transport; however it encourages developments to include a mix of uses where suitable, to provide a range of services commensurate to the public transport accessibility (Mayor's Sustainable Design and Construction SPG Section 2.3).

4.10.2 The Sustainable Design and Construction SPG also states that developments should be designed to encourage and facilitate walking and cycling and the use of public transport. This will enable air pollutants deriving from a particular development to be minimised. To further support this policy, developments should ensure that the local car parking standard is not exceeded (Mayor's Sustainable Design and Construction SPG Section 4.3).

4.10.3 The LB Enfield DMD requires all major development proposals to be accompanied by a Transport Assessment. Proposals must demonstrate how the development has sought to minimise traffic generation and the

need to travel by car/private motor vehicle. Development proposals must also ensure that appropriate space for servicing is provided and that there are no impacts on the safety of pedestrians, cyclists and other road users (DMD Policy 47).

4.10.4 In addition, the development must provide the number and type of electric charging points in accordance with Policy 6.13 of the London Plan (DMD Appendix 3).

4.10.5 Table 4.14 sets out how the Project adheres to these policies:

Table 4.14: Project Response to Travel Policies

Project Response	**Policy Ref.**
A Transport Assessment (AD05.11) has been prepared for the Project and is submitted as part of the Application. The Transport Assessment (AD05.11) documents key transport issues including: the number of trips generated by the Project at all stages during construction and operation; the proposed car and cycle parking; site accessibility by all modes of transport; the effect of the Project on the local transport networks, including public transport. The Transport Assessment (AD05.11) shows that for all phases, the trips generated by the Project can be accommodated within the local transport network with no significant adverse effects as a result. The Project would provide approximately 270 parking spaces for vehicles during the peak of construction, with parking for construction employees provided on the Temporary Laydown Area. The completed Project would provide 128 car/van parking spaces. This would reduce parking capacity from the current 211 car/van parking spaces. Service trips will be managed such that the times of deliveries do not coincide with the peak times for site operations. A study into the feasibility of moving waste by water has been undertaken (Appendix I of AD05.11) and concluded that while the transport IBA and Municipal Solid Waste (MSW) by water would have environmental benefits, the overall cost of transporting IBA and/or MSW via the waterways would be substantially more expensive than the equivalent road transport scenario and without significant investment in the waterways, it would not be feasible. Framework Operational and Construction Travel Plans (Appendix J and Appendix K of AD05.11) have been prepared in accordance with Transport for London's (TfL) guidance (November 2013) and will be submitted as part of the Application. Both Travel Plans aim to promote the use of sustainable modes of transport through a range of soft measures including the provision of public transport shuttle services (for construction), the provision of cycle parking and the promotion of car sharing.	**Mayor's Sustainable Design and Construction SPG Section**: 2.3, 4.3 **LB Enfield DMD**: DMD 47, Appendix 3

4.11 Pre-assessments

4.11.1 A BREEAM pre-assessment has been undertaken of the proposed development. The BREEAM pre-assessment findings are included at Appendix C.

4.11.2 The LB Enfield DMD requires major non-residential new developments to demonstrate a “very good” BREEAM rating under the BREEAM 2011 scheme, or equivalent rating/scheme is this is replaced or updated (DMD Policy 50).

4.11.3 Table 4.15 sets out how the Project adheres to these policies:

Table 4.15: Project response to pre-assessment policies

Project Response	Policy Ref.
The project team undertook a pre-assessment of the design of the proposed development in line with the assessment methodology set out in version 3.0 of BREEAM New Construction 2014. The proposed ERF, RRF and EcoPark House buildings have been registered with the BRE against version 3.0 of BREEAM NC 2014. The pre-assessment demonstrates a strategy for how the Project could result in a BREEAM score of 60.27% which exceeds the 55% threshold for a Very Good rating with a small margin to allow flexibility during design development. All of the mandatory credits for a Very Good rating are targeted and are considered to be achievable. Requirements within Schedule 2 of the DCO requires the Project to achieve a BREEAM rating of no less than “very good”. Further details on the BREEAM pre-assessment can be found in the BREEAM pre-assessment report, included as Appendix C.	**LB Enfield DMD**: DMD Policy 50

4.12 Conclusion

4.12.1 This Sustainability Statement identifies how the Project performs against and meets the sustainability policies set out by LB Enfield (Enfield DMD, 2014) and the Major’s Sustainable Design and Construction SPG (2014).

4.12.2 This Sustainability Statement documents how the Project complies with relevant local and regional policy planning requirements for sustainable development and where appropriate, references intentions in further project stages.

4.12.3 Delivery of the Project approach outlined in this Statement demonstrate how the Project would contribute to supporting local and regional policy and therefore promote a more sustainable London.

Appendix A: Policy context

A1 Introduction

A1.1.1 The policies included within this Appendix set out the overall sustainability context for development within the London Borough of Enfield, and inform the understanding of relevant sustainability issues, opportunities and challenges for the Project.

A1.1.2 Within this sustainability context, the specific policies set out in Section 4 set the framework for the sustainability assessment of the Project against relevant policy requirements.

A2 National policy statements

A2.1 Introduction

A2.1.1 This Appendix summarises relevant national policy guidance on sustainable development.

A2.1.2 For a full summary of relevant planning policy, refer to the Planning Statement submitted with the planning application.

A2.2 The National Planning Policy Framework (March 2012)

A2.2.1 The NPPF[2] sets out the Government's planning policies for England and forms part of other relevant matters considered for determining DCO applications.

A2.2.2 The NPPF does not specifically contain any waste management policies however, it states that decisions on waste applications should have regard to policies in this Framework as far as these are relevant.

A2.2.3 The NPPF sets out the Government's view of three crucial roles that sustainable development can play in the planning system in England:

a. an economic role, contributing to a strong, responsive, competitive economy;

b. a social role, supporting vibrant and healthy communities; and

c. an environmental role, protecting and enhancing our natural, built and historic environment.

A2.2.4 The NPPF constitutes guidance for local planning authorities and decision-takers both in drawing up plans and as a material consideration in determining applications.

A2.2.5 The key principle applied as part of the NPPF is a presumption in favour of sustainable development. This is to be incorporated into both plan making and decision making at the local level.

A2.3 Overarching National Policy Statement for Energy (NPS EN-1) (July 2011)

A2.3.1 NPS EN-1[3] sets out how the energy sector can help to deliver the Government's climate change objectives and contribute to a diverse and affordable energy supply for the UK. It covers Government policy on energy and energy infrastructure development, the assessment principles for deciding applications and how impacts from new energy infrastructure should be considered in applications.

A2.3.2 An urgent 'need' for energy infrastructure development is outlined in NPS EN-1 'General points' (paragraph 4.1.2), which also reinforces the requirement for the Secretary of State (SoS) to make a presumption in favour of granting development consent for energy NSIPs.

A2.3.3 Important considerations for the SoS to taken into account when making decisions about development consent applications for energy NSIPs are set out in Paragraph 4.1.3. The SoS should consider:

a. the potential benefits including the contribution to meeting the need for energy infrastructure, job creation and any long-term or wider benefits; and

b. the potential adverse impacts, including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

A2.4 National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (July 2011)

A2.4.1 NPS EN-3[4] sets out the 'Technology Specific Considerations' to be taken into account in the preparation and assessment of applications for renewable energy infrastructure, including impacts and matters including EfW.

A2.4.2 Taken together with NPS EN-1, this provides "*the primary basis for decisions by the Infrastructure Planning Commission (IPC) on applications it receives for nationally significant renewable energy infrastructure*[21]." The policies set out in this NPS are additional to those on generic impacts set out in NPS EN-1 and do not replace them.

[21] The IPC was abolished by the Localism Act 2011, applications are now examined by the Planning Inspectorate, and final decisions taken by the Secretary of State for Energy and Climate Change.

A2.4.3 The policy states that "*The IPC is expected to adhere to locational considerations when deciding on renewable energy infrastructure projects, and should prioritise sites for development where the resource exists and where it is economically feasible to allow such development*."

A2.4.4 NPS EN-3 recognises that EfW will play an increasingly important role in meeting UK's energy needs. It can also contribute to meeting UK's renewable energy targets where the waste burned is deemed renewable.

A3 Regional policy

A3.1 Introduction

A3.1.1 This Appendix summarises relevant regional policy guidance on sustainable development.

A3.1.2 For a full summary of relevant planning policy, refer to the Planning Statement submitted with the planning application.

A3.2 The London Plan consolidated with alterations since 2011[5] (March 2015)

A3.2.1 The Mayor of London's London Plan was adopted by the GLA in July 2011. In October 2013 the Mayor published Revised Early Minor Alterations to the London Plan 2011, which act as formal alterations to the London Plan 2011 and form part of the development plan for Greater London. Further Alterations to the London Plan were published in March 2015.

A3.2.2 The London Plan provides the strategic framework for the development of London until 2036 and forms part of the development plan for Greater London. It integrates economic, transport, environmental and social plans for the capital. The London Plan provides the context for development plans for all individual boroughs which are required to be in accordance with the policies set out in the Plan.

A3.2.3 It provides the strategic plan setting out an integrated economic, environmental, transport and social, environmental framework for the future development of London. It also integrates the geographic and locational aspects of the Mayor's other strategies and provides the context within which individual London boroughs should set local planning policy.

A3.2.4 London Plan Policy 5.3 relates to "*Sustainable design and construction*" which is relevant to the project states that the highest standards of sustainable design and construction should be achieved. For major developments minimum design standards outlined in the Mayor's SPG Sustainable Design and

Construction should be demonstrated within the design and access statement. The standards include measures to achieve other polices in the London Plan and the following sustainable design principles:

a. minimising carbon dioxide (CO_2) emissions across the site, including the building and services (such as heating and cooling systems);

b. avoiding internal overheating and contributing to the urban heat island effect;

c. efficient use of natural resources (including water), including making the most of natural systems both within and around buildings;

d. minimising pollution (including noise, air and urban run-off);

e. minimising the generation of waste and maximising reuse or recycling;

f. avoiding impacts from natural hazards(including flooding);

g. ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions;

h. securing sustainable procurement of materials, using local supplies where feasible; and

i. promoting and protecting biodiversity and green infrastructure.

Mayor's Supplementary Planning Guidance on Sustainable Design and Construction[6] (April 2014)

A3.2.5 To support London's resilience to a changing climate and to tackle climate change, the London Plan Policy 5.3 states the need for all development to incorporate sustainable design and construction principles. A number of other policies, relevant to design and construction are also listed in the London Plan.

A3.2.6 To support these policy, the Mayor's Sustainable Design and Construction SPG sets out in greater detail the mayor's priorities in delivery high quality design and construction in a range of areas, including noise, air quality, flood risk, energy and site layout.

A3.2.7 The Mayor's Sustainable Design and Construction SPG aims to support developers, local planning authorities and neighbourhoods to achieve sustainable development. It provides guidance on to how to achieve the London Plan objectives effectively, supporting the Mayor's aims for growth, including the delivery of housing and infrastructure.

A3.2.8 The guidance in the SPG is intended to:

a. provide detail on how to implement the sustainable design and construction and wider sustainability policies in the London Plan;
b. provide guidance on how to develop more detailed local policies on sustainable design and construction;
c. provide best practice guidance on how to meet the sustainability targets set out in the London Plan; and
d. provide examples of how to implement sustainability measures within developments.

A3.2.9 To support the policies in the London Plan the Mayor's Sustainable Design and Construction SPG includes guidance on:

a. Land
b. Site layout and building deign
c. Energy and carbon emissions
d. Renewable energy
e. Water efficiency
f. Materials and waste
g. Nature conservation and biodiversity
h. Tackling increased temperature and drought
i. Increasing green cover and trees
j. Flooding
k. Land contamination
l. Air pollution
m. Noise
n. Light pollution
o. Water pollution

A3.2.10 As Mayor's Sustainable Design and Construction SPG, this document does not set new policy, but explains how policies in the London Plan should be carried through into action. While this SPG does not have formal development plan status, as it has undergone a formal consultation process and has been formally adopted by the Mayor as supplementary planning guidance it is a material consideration in taking planning decisions.

A3.3 Mayoral strategies

A3.3.1 Within London, the GLA Act 1999 as amended by the 2007 Act has led to the development of a number of Mayoral strategies which provide the strategic direction for London on certain issues. The Mayoral strategies relevant to this application are outlined below in chronological order.

Cultural strategy

A3.3.2 The Mayor's Culture Strategy – 2012 and beyond[7] (November 2010) is the principal means by which the Mayor sets out his vision, objectives and work programme for culture in London.

A3.3.3 The Strategy "*recognises the significance of the cultural and creative sectors in making London a world city, and advocates continued support and investment*".

A3.3.4 The Strategy identifies the following priority areas:

a. Maintaining London's position as a world city for culture;

b. Widening the reach to excellence;

c. Education, skills and careers;

d. Infrastructure, environment and the public realm;

e. Culture and London 2012; and

f. Delivering the Cultural Strategy.

A3.3.5 For each priority area a number of policies and associated actions have been set and partner bodies identified to help achieve their delivery.

Climate change adaptation strategy

A3.3.6 The aim of the Mayor's Climate Adaptation Strategy "Managing Risks and Increasing Resilience[8]" is to "*assess the consequences of climate change on London and to prepare for the impacts of climate change and extreme weather to protect and enhance the quality of life of Londoners*". The Mayor proposes that this aim will be met though achieving seven key objectives and will work collaboratively with partners to manage climate change impacts.

A3.3.7 The Strategy outlines who and what is vulnerable to extreme weather today, considers how climate change will affect the existing climate risks, or create new risks or opportunities in the future and provides a framework for action.

Climate change mitigation and energy strategy

A3.3.8 The Mayor's Climate Change Mitigation and Energy Strategy "Delivering London's Energy Future"[9] contains 17 policies and supporting actions to reduce London's CO_2 emissions from 2011 to 2025.

A3.3.9 The Strategy has four objectives:

a. to reduce CO_2 emissions to mitigate climate change;

b. to maximise economic opportunities from the transition to a low carbon capital;

c. to ensure a secure and reliable energy supply for London; and

d. to meet, and where possible exceed, national climate change and energy objectives.

A3.3.10 To limit further climate change the Mayor has set a target to reduce London's CO_2 emissions by 60 per cent of 1990 levels by 2025. The Strategy details the programmes and activities that are on-going across London to achieve this. These include:

a. RE:NEW – retrofitting London's homes with energy efficiency measures, and helping Londoners save money off their energy bills;

b. RE:FIT – retrofitting London's public sector buildings, saving millions of pounds every year;

c. RE:CONNECT – ten low carbon zones in London aiming to reduce CO_2 emissions by 20 per cent by 2012 across the community; and

d. Decentralised energy programme – aiming to supply 25 per cent of London's energy from secure, low carbon local sources.

Water strategy

A3.3.11 The purpose of the Mayor's Water Strategy "London's Water Future[10]" is to promote improved water management – both in terms of the water we want (such a drinking water) and the water we don't want (such as sewage and floodwater in the wrong place). Twenty actions have been established for implementation within London.

A3.3.12 The Strategy promotes increasing water efficiency and reducing water wastage to balance supply and demand for water, safeguard the environment and help tackle water affordability problems. It also sets out how the Mayor will help communities at risk of flooding to increase their resilience to flooding.

A3.3.13 Four key objectives for water management in London under pin the Strategy:

a. to use the water London already has more effectively and efficiently;

b. to minimise the release of untreated wastewater and diffuse pollution into the water environment;

c. to manage, and where possible reduce, the threat of flooding to people and their property; and

d. to reduce the greenhouse gas emissions produced from supplying water and treating wastewater.

Business waste strategy

A3.3.14 The Mayor's Business Waste Strategy "Making Business Sense of Waste[11]" sets out initiatives to help London businesses to save money and reduce harm to the environment through better waste management.

A3.3.15 Four broad policies set out the direction of the Business Waste Strategy:

a. Policy 1: Promoting the commercial value of a resource-efficient business – supporting businesses to realise the hidden savings and revenue opportunities from waste prevention and more effective management of the waste they generate.

b. Policy 2: Boosting reuse, recycling and composting participation in the commercial and industrial sector – dealing with the practical issues that require intervention to help businesses prevent waste at source, access cost-effective recycling services, and to separate and store their waste in a way that does not cause harm to the environment, health or local area

c. Policy 3: Supporting the waste infrastructure market in London to grow and to deliver for businesses – providing assistance to the waste sector to broker new partnerships, access new sources of business waste, develop new waste infrastructure, find suitable sites for development, overcome planning and investment issues, and access new sources of business waste, develop new waste infrastructure, find suitable sites for development, overcome planning and investment issues, and maximise opportunities for carbon reduction and energy generation.

d. Policy 4: Driving improvements in resource efficiency in the construction and demolition sector while continuing to maintain the good levels of reuse and recycling performance already being achieved – focusing on driving environmental performance for the large source of waste arisings in London.

A3.3.16 A number of proposals are outlined within the policy areas, together these set the high-level direction for managing business waste between until 2031 to address the need for better resource efficiency and an improved waste infrastructure to meet the objectives and targets in the London Plan.

Transport strategy

A3.3.17 The Mayor's Transport Strategy[12] contains the aims and objectives for transport in supporting London as a world-class city. The Strategy acknowledges existing traffic-related issues, and presents proposals to alleviate these and improve the capacity of

the transport network to accommodate demographic and economic growth.

A3.3.18 The focus of the Strategy is for the period up to 2031.

A3.3.19 The Transport Strategy has six goals:

a. to support economic development and population growth
b. enhance the quality of life for all Londoners
c. improve the safety and security of all Londoners
d. improve transport opportunities for all Londoners
e. reduce transport's contribution to climate change, and improve its resilience
f. support delivery of the London 2012 Olympic and Paralympic Games and its legacy.

A3.3.20 Closely aligned with the Transport Strategy is the Mayor's Air Quality Strategy, which is summarised below.

Economic development strategy

A3.3.21 The Mayor's Economic Development Strategy[13] sets out the Mayor's long-term vision with respect to London's economy and provides a direction for London as a whole over the next 20 years. The vision is for London to be the best big city on the world. Underlying the Strategy is a projection of continuing growth in London's economy and population to 2031 and beyond.

A3.3.22 The Mayor has set five economic objectives as part of the Strategy. A number of themes run through them including the statutory cross-cutting themes of equality of opportunity, community safety, health and health inequalities, sustainable development, and climate change adaptation and mitigation.

A3.3.23 The five objectives are:

a. objective 1: to promote London as the world capital of business, the world's top international visitor destination, and the world's leading international centre of learning and creativity;
b. objective 2: to ensure that London has the most competitive business environment in the world;
c. objective 3: to make London one of the world's leading low carbon capitals by 2025 and a global leader in carbon finance;
d. objective 4: to give all Londoners the opportunity to take part in London's economic success, access sustainable employment and progress in their careers; and
e. objective 5: to attract the investment in infrastructure and regeneration which London needs, to maximise the benefits from this investment and in particular from the opportunity

created by the 2012 Olympic and Paralympic Games and their legacy.

Air quality strategy

A3.3.24 The Mayor's Air Quality Strategy "Clearing the Air"[14] overarching aim is "*to reduce air pollution in London so that the health of Londoners is improved*".

A3.3.25 The vision is "*To protect the health of Londoners and enhance their quality of life by significantly improving the quality of the air we breathe in London. This will:*

a. make London a more pleasant place to live and work in;

b. reduce the burden on health services in the capital;

c. enhance London's reputation as a green city – making it more attractive to tourists and businesses; and

d. make London cleaner whilst safeguarding its biodiversity."

A3.3.26 The Strategy sets out how the vision will be achieved and actions that will be taken to reduce air pollution in London. The policies and proposals are based around transport and non-transport measures for reducing emissions and improving air quality.

A3.3.27 As a priority, the European Union (EU) air quality limit values for particulate matter (PM10), (PM2.5) and nitrogen dioxide (NO_2) need to be met as well as prioritising the objectives set by the Government in its Air Quality Strategy.

Noise strategy

A3.3.28 The Mayor's strategy for noise management 'A Sounder City'[15] outlines the approach and action plan to manage ambient noise levels within the Greater London area. The Strategy identifies the following key issues:

a. securing good, noise reducing surfaces on Transport for London's roads;

b. securing a night aircraft ban across London;

c. reducing noise through getter planning and design of new housing.

Biodiversity strategy

A3.3.29 The Mayor's Biodiversity Strategy "Connecting with London's nature"[16] states that the vision for London is:

"to develop London as an exemplary, sustainable world city, based on three interwoven theme of strong and diverse long term economic growth, social inclusiveness to give all Londoners the opportunity to share in London's future success, and fundamental improvements in London's environment and use of resources".

A3.3.30 The objectives of the biodiversity Strategy include:

a. biodiversity for people: ensuring all Londoners have ready access to wildlife and natural green spaces.

b. nature for its own sake: to conserve London's plants and animals and their habitats.

c. economic benefits: greening plays an integral role in the urban renaissance in new and existing infrastructure.

d. functional benefits: biodiversity assists in reducing flooding and erosion prevention. It also provides local climatic benefits through amelioration of ambient noise and absorption of some pollutants.

e. sustainable development: quality open spaces together with green footpaths and cycleways. Food grown locally and organically in allotments and gardens provides wildlife habitat and composting of green waste and growing energy crops in London can reduce its wider ecological footprint.

A3.3.31 Policy proposal 6 of the Strategy states,

"The Mayor will and boroughs should ensure that new developments capitalise on opportunities to create, manage and enhance wildlife habitat and natural landscape. Priority should be given to sites within or near to areas deficient in accessible wildlife sites, areas of regeneration, and adjacent to existing wildlife sites."

A3.3.32 This requires that, wherever appropriate, new developments should include new or enhanced habitat, or design (e.g. green roofs) and landscaping which promotes biodiversity, and provision for their management.

A4 Local policy

A4.1 Introduction

A4.1.1 This Appendix summarises relevant local policy guidance on sustainable development.

A4.1.2 Planning applications in LB Enfield are determined against the Enfield Local Plan[19]. The Local Plan includes: The Enfield Plan Core Strategy 2010-2025[17] and the Development Management Document Supplementary Planning Document[1]. Other local development plan documents currently being prepared include the Central Leeside Area Action Plan[18]. A site allocations schedule is planned for adoption in 2017. These documents will form part of the Enfield Local Plan upon adoption.

A4.1.3 The Edmonton EcoPark Planning Brief Supplementary Planning Document expands upon policies in the Local Plan.

A4.1.4 For a full summary of relevant planning policy, refer to the Planning Statement submitted with the planning application.

A4.2 Enfield Plan Core Strategy 2010-2025 (November 2010)

A4.2.1 Enfield Plan Core Strategy 2010-2025 (the Core Strategy) was adopted in November 2010. It sets out the spatial framework for the long term development of the borough until 2025.

A4.2.2 The Core Strategy is a strategic document that provides the broad strategy for the scale and distribution of development and the provision of supporting infrastructure in Enfield. It contains core policies for guiding patterns of development.

A4.2.3 Chapter 3 sets out the overarching spatial vision and objectives for Enfield up to 2026 – with the aim of making Enfield "a prosperous and sustainable borough, with a strong sense of place and identity". A number of objectives are outlined, including community cohesion, maximising employment potential, developing housing, and environmental sustainability.

A4.2.4 Chapters 4 onwards outline the specific policies of the Core Strategy.

A4.2.5 The Core Strategy includes 10 strategic objectives that give direction for the spatial strategy and outline LB Enfield's vision for what will need to be achieved to deliver the Core Strategy and address the key issues identified for the borough. Although they are numbered from 1 to 10, they are not ranked by importance:

a. Strategic Objective 1: Enabling and focusing change

b. Strategic Objective 2: Environmental sustainability

c. Strategic Objective 3: Community cohesion
d. Strategic Objective 4: New homes
e. Strategic Objective 5: Education, health and wellbeing
f. Strategic Objective 6: Maximising economic potential
g. Strategic Objective 7: Employment and skills
h. Strategic Objective 8: Transportation and accessibility
i. Strategic Objective 9: Natural environment
j. Strategic Objective 10: Built environment

A4.3 Development Management Document (November 2014)

A4.3.1 LB Enfield's DMD (November 2014) provides both detailed criteria and standard based policies for assessing planning applications and guides future development at the site.

A4.3.2 The DMD forms part of LB Enfield's statutory Local Plan and policies within the document will be used alongside policies contained in the London Plan, the adopted Core Strategy, and area based documents (such as the recently adopted North Circular Area Action Plan October 2014) in the determination of planning applications.

A4.3.3 The DMD builds on the Core Strategy to enable the delivery of its vision and principles for Edmonton. The DMD guides planning decisions within Enfield, and each policy is linked to one (or more) of those set out in the Core Strategy.

A4.3.4 The development management policies within the DMD seek to ensure that decisions are made which deliver the economic, social and environmental components of sustainable development for Enfield.

A4.3.5 To deliver this objective, the policies set out in the DMD aim to protect employment land and jobs, homes, community facilities, open space and natural habitats and through policies which set standards for sustainable design and construction, and energy savings.

A4.3.6 The DMD policies provide a framework for addressing these challenges. They support the Core Strategies and are also consistent with the London Plan and relevant national policies. The themes covered in the DMD policies are:

a. Housing
b. Community facilities
c. Enfield's economy
d. Town centred and shopping

e. Design and heritage
f. Transport and parking
g. Tackling climate change
h. Environmental protection
i. Green infrastructure
j. Green belt

A4.4 Proposed Submission Central Leeside Area Action Plan (published for consultation January 2015)

A4.4.1 The Proposed Submission Central Leeside Area Action Plan outlines the planning framework for delivery of employment, housing and community facilities for the area to the South East of LB Enfield, stretching from the Haringey Boundary up to Pickett's Lock in the North, identifying sites for new development and associated infrastructure to support and facilitate future growth.

A4.4.2 The Proposed Submission Central Leeside Area Action Plan was approved by the Council for statutory consultation on 19 November 2014. It was available for comment and consultation between 5 January and 16 March 2015 – the final consultation stage.

A4.4.3 Within the Proposed Submission Central Leeside Area Action Plan, Edmonton EcoPark is recognised as a preferred location for the management of north London's municipal waste and a potential energy from waste hub. One of its key objectives relates specifically to Edmonton EcoPark (Objective 4: Delivering Sustainable Regeneration) outlining a desire to nurture a centre of excellence in sustainable waste management around the Edmonton EcoPark.

A4.4.4 Chapter 8 of the Proposed Submission Central Leeside Area Action Plan focusses on the redevelopment of Edmonton EcoPark, acknowledging that it is needed "*to provide the next generation of waste services and additional community benefits through the provision of heat for a decentralised energy network.*"

A4.4.5 Policy CL22 of the Proposed Submission Central Leeside Area Action Plan (Redevelopment of the EcoPark site) outlines the council's requirements for the Edmonton EcoPark. These include: providing improved waste treatment facilities to meet the needs of north London's residents; taking a design-led approach to redevelopment with high quality design, landscaping and materials; minimising emissions to air and water; maximising energy and resource efficiency; and ensuring local access to employment and training opportunities. It also requires

Edmonton EcoPark to support the implementation of the Lee Valley Heat Network (LVHN).

A4.4.6 The Edmonton EcoPark is identified as the key heat source for initial development of the LVHN. This requirement is set out in Policy CL30, which states that an energy centre will be established on Edmonton EcoPark alongside a network route linking the energy centre to the Meridian Water development. This policy goes on the state that in order to support the LVHN's delivery, any development at Edmonton EcoPark should use its existing heat and energy from the current EfW facility to supply the LVHN energy centre, and once the new EfW facility is in operation, heat from this should then supply the energy centre. There is to be a break of no longer than 6 months in the heat supply between the decommissioning of the existing EfW facility and the proposed development. The policy also imposes a requirement to incorporate space for an energy centre on the site, alongside a connection from EfW sources of energy/heat into the LVHN energy centre, low temperature hot water, and if requested in the future steam, pipe network leaving the site.

A4.4.7 The Proposed Submission Central Leeside Area Action Plan also focusses on the transport impacts of any new development, suggesting that there is potential to reduce the impacts on the road network by transferring road freight to the waterways. The Water Transport Study (Appendix I of AD05.11) considers the transportation of IBA and MSW from Edmonton EcoPark via water as a technically feasible option, with the capacity to accommodate an annual flow of 300,000Te and requiring fewer containers compared to road transport. However, while the transport IBA and MSW by water would have environmental benefits, the overall cost of transporting IBA and/or MSW via the waterways would be substantially more expensive than the equivalent road transport scenario and without significant investment in the waterways, it would not be feasible.

A4.5 Edmonton EcoPark Planning Brief (supplementary planning document to the Local Plan) (May 2013)

A4.5.1 The Edmonton EcoPark Planning Brief Supplementary Planning Document (The Brief) was adopted in May 2013, and guides future development at the site. It sets out the opportunities and constraints for the development of new waste management and other facilities on the site, and provides the principles which these should follow.

A4.5.2 There is no additional policy contained in the Brief, but it does give detailed, site specific guidance on how to achieve the objectives set out in the Enfield Local Plan, particularly the adopted Core Strategy, the North London Waste Plan and Central Leeside Area Action Plan.

A4.5.3 Chapter 3 of the Edmonton EcoPark Planning Brief SPD provides a detailed site assessment outlining the key opportunities and constraints. This involves consideration of location, existing land uses, existing site conditions, and wider regeneration context.

A4.5.4 Chapter 4 sets out the principles which future development at Edmonton EcoPark should follow, including: the use of sustainable design and construction methods; and high quality design principles for layout, aesthetics and materials. In addition it highlights overarching drivers of change which should be taken into account by any future development at Edmonton EcoPark, including: sustainable treatment of waste; decentralised energy provision; and employment in green industries.

A4.5.5 Chapter 5 outlines how it is expected the Edmonton EcoPark Brief would be implemented. This includes a list of the documents which would be expected to accompany any application, details of consultation requirements, and possible planning obligations which might be expected to accompany any permission.

As a supplementary planning document to LB Enfield's statutory Local Plan, the Brief will be a material consideration for PINs in assessing the application.

Appendix B: Assessment review table

B1 Assessment review table of project compliance with sustainability policies

B1.1.1 The table below provides an overview assessment of how the Project aligns with the Mayor's Priorities and Best Practice as outlined in the London Plan 2015, Sustainable Design and Construction SPG April 2014 and the policies set out in Appendix 3: Sustainable Design and Construction Statements of the LB Enfield DMD (2014).

Table B1.1: Project compliance with the Mayor's Priorities and Best Practice for Sustainable Design and Construction and local borough policy

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Land Use, Site Layout and Building Management				
Use of land (SPG Section 2.2)	Through both their Local Plans and planning decisions, boroughs should ensure development patterns reflect the strategic spatial vision for London's growth as set out in Chapter 2 of the London Plan. Through both their Local Plans and planning decisions, boroughs should aim for 100% of development to be delivered on previously developed land. Developers should optimise the scale and density of their development, considering the local context, to make efficient use of London's limited land.			✓ The Project meets the SPG priority standards.
Basements and lightwells (SPG Section 2.2)	When planning a basement development, developers should consider the geological and hydrological conditions of the site and surrounding area, proportionate to the local conditions, the size of the basement and lightwell and the sensitivity of adjoining buildings and uses, including green infrastructure. When planning and constructing a basement development, developers should consider the amenity of neighbours.	Where there is pressure for basement developments, boroughs should consider whether there are any particular local geological or hydrological issues that could particularly effect their construction, and adopt appropriate policies to address any local conditions.		✓ The Project meets the SPG priority and best practice standards.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Local food growing (SPG Section 2.2)	To protect existing established food growing spaces.	To provide space for individual or communal food growing where possible and appropriate. To take advantage of existing spaces to grow food, including adapting temporary spaces for food growing.		N/A The nature of the Project is not appropriate to provide space to grow food.
Site layout and building design (SPG Section 2.3)	The design of the site and building layout, footprint, scale and height of buildings as well as the location of land uses should consider: **Existing features** • the possible retention and reuse of existing buildings and structures; • the retention of existing green infrastructure, and potential for its improvement and extension; and **New design of development** • the existing landform; • the potential to take advantage of natural systems and the potential for adaption and reuse in the future; • potential for incorporating green infrastructure, to enhance biodiversity, open space and recreation space; • energy demands and the ability to take advantage of natural systems and low and zero carbon energy sources; • site wide infrastructure;	Any existing buildings that can be practically refurbished, retrofitted, altered, or extended should be retained and reused. A mix of uses, where suitable should be included to provide a range of services commensurate to the public transport accessibility.	**Achieving High Quality and Design-Led Development (DMD Policy 37)** **Sustainable Design and Construction Statements (DMD Policy 49)** **Environmental Assessment Methods (DMD Policy 50)**	✓ The Project meets the SPG priority and best practice standards and LB Enfield policy. ✓ The Project meets the SPG priority and best practice standards.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
	• potential to address any local air quality, noise disturbance, flooding and land contamination issues; and • the potential effect on the micro-climate.			
Transport				
Site layout and building design (SPG Section 2.3)	The design of the site and building layout, footprint, scale and height of buildings as well as the location of land uses should consider: **Existing features** • access routes to public transport and other facilities. **New design of development** • access to and promotion of low carbon transport modes including walking and cycling;		**Access, New Roads and Servicing (DMD Policy 47)**	✓ The Project meets the SPG priority standards and LB Enfield policy.

Resource Management

<table>
<tr><th>Policy ref.</th><th>Mayor's Priority Standard</th><th>Mayor's Best Practice Standard</th><th>Local Borough Policy</th><th>Compliance</th></tr>
<tr><td colspan="5">Energy and carbon dioxide emissions</td></tr>
<tr><td>Energy and Carbon (SPG Section 2.4)</td><td>The overall CO_2 emissions from a development should be minimised through the implementation of the energy hierarchy set out in London Plan policy 5.2.</td><td>Developments should contribute to ensuring resilient energy infrastructure and a reliable energy supply, including from local low and zero carbon sources.</td><td>Low and Zero Carbon Technology (DMD Policy 53)</td><td>✓
The Project meets the SPG priority and best practice standards and LB Enfield policy.</td></tr>
<tr><td></td><td>Developments should be designed to meet the following Regulated CO_2 standards, in line with London Plan policy 5.2.<table><tr><th colspan="2">Non-domestic buildings</th></tr><tr><td colspan="2">Improvements beyond 2010 Building Regulations</td></tr><tr><td>01/10/2013 – 2016</td><td>40 per cent</td></tr><tr><td>2016 – 2013</td><td>As per the Building Regulation requirements</td></tr><tr><td>2019 - 2031</td><td>Zero carbon</td></tr></table></td><td>Developers are encouraged to include innovative low and zero carbon technologies to minimise CO_2 emissions within developments and keep up to date with rapidly improving technologies.</td><td>Energy Efficiency Standards (DMD Policy 51)</td><td>✓
The Project meets the SPG priority and best practice standards and LB Enfield policy.</td></tr>
<tr><td>Energy demand assessment (SPG Section 2.4)</td><td>Development applications are to be accompanied by an energy demand assessment.</td><td></td><td>Energy Efficiency Standards (DMD Policy 51)</td><td>✓
The Project meets the SPG priority standards and LB Enfield policy.</td></tr>
</table>

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Use less energy (SPG Section 2.4)	The design of developments should prioritise passive measures.	Developers should aim to achieve Part L 2013 Building Regulations requirements through design and energy efficiency alone, as far as is practical.	**Energy Efficiency Standards (DMD Policy 51)** **Heating and Cooling (DMD Policy 56)**	✓ The Project meets the SPG priority and best practice standards and LB Enfield policy.
Efficient energy supply (SPG Section 2.4)	Where borough heat maps have identified district heating opportunities, boroughs should prepare more detailed Energy Master Plans (EMPs) to establish the extent of market competitive district heating networks. Developers should assess the potential for their development to: • connect to or/and expand an existing district heating or cooling network; and • establish a site wide network, and enable the connection of existing buildings in the vicinity of the development. Where opportunities arise, developers generating energy or waste heat should maximise long term CO_2 savings by feeding the decentralised energy network with low or zero carbon hot, and where required, cold water.		**Decentralised Energy Networks (DMD Policy 52)**	✓ The Project meets the SPG priority standards.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Renewable energy				
Renewable energy (SPG Section 2.5)	Boroughs and neighbourhoods should identify opportunities for the installation of renewable energy technologies in their boroughs and neighbourhoods. Major developments should incorporate renewable energy technologies to minimise overall CO_2 emissions, where feasible.		**Use of Roof Space / Vertical Surfaces (DMD Policy 55)**	✓ The Project meets the SPG priority standards and LB Enfield policy.
Carbon dioxide off-setting (SPG Section 2.5)	Boroughs should establish a carbon off-set fund and identify suitable projects to be funded. Where developments do not achieve the Mayor's CO_2 reduction targets set out in London Plan policy 5.2, the developer should make a contribution to the local borough's carbon dioxide off-setting fund.			N/A This priority standard relates to action by boroughs and does not apply to the Project. ✓ The Project meets the SPG priority standard.
Retrofitting (SPG Section 2.5)	Boroughs should set out policies to encourage the retrofitting of CO_2 and water saving measures in their borough.			N/A This priority standard relates to action by boroughs and does not apply to the Project.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
	Where works to existing developments are proposed developers should retrofit CO_2 and water saving measures.			✓ The Project meets the SPG priority standard.
Monitoring energy use (SPG Section 2.5)		Developers are encouraged to incorporate monitoring equipment, and systems where appropriate to enable occupiers to monitor and reduce their energy use.		✓ The Project meets the SPG best practice standard.
Supporting a resilient energy supply (SPG Section 2.4)		Developers are encouraged to incorporate equipment that would enable their schemes to participate in demand side response opportunities.		✓ The Project meets the SPG best practice standard.
Water Efficiency				
Water efficiency (SPG Section 2.6)	Developers should maximise the opportunities for water saving measures and appliances in all developments, including the reuse and using alternative sources of water. Developers should design residential schemes to meet a water consumption rate of 105 litres or less per person per day.			✓ The Project meets the SPG priority standard. ✓ The Project meets the SPG priority standard.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
	New non-residential developments, including refurbishments, should aim to achieve the maximum number of water credits in a BREEAM assessment or the 'best practice' level of the AECB (Association of Environment Conscious Building) water standards.	All residential units, including individual flats / apartments and commercial units, and where practical, individual leases in large commercial properties should be metered.	**Water Efficiency (DMD 58)**	✓ The Project meets the SPG priority and best practice standards and LB Enfield policy.
	Where a building is to be retained, water efficiency measures should be retrofitted.			✓ The Project meets the SPG priority standard.
	All developments should be designed to incorporate rainwater harvesting.			✓ The Project meets the SPG priority standard.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Materials and Waste				
Design phase (SPG Section 2.7)	The design of development should prioritise materials that: • have a low embodied energy, including those that can be re-used intact or recycled; at least three of the key elements of the building envelope (external walls, windows roof, upper floor slabs, internal walls, floor finishes / coverings) are to achieve a rating of A+ to D in the BRE's The Green Guide of specification; • can be sustainably sourced; at least 50% of timber and timber products should be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of Forestry Certification (PEFC) source; • are durable to cater for their level of use and exposure; and will not release toxins into the internal and external environment, including those that deplete stratospheric ozone	The design of developments should maximise the potential to use pre-fabrication elements.	**Responsible Souring of Materials, Waste Minimisation and Green Procurement (DMD Policy 57)**	✓ The Project meets the SPG priority and best practice standards and LB Enfield policy.
Construction phase (SPG Section 2.7)	Developers should maximise the use of existing resources and materials and minimise waste generated during the demolition and construction process through the implementation of the waste hierarchy.		**Responsible Souring of Materials, Waste Minimisation and Green Procurement (DMD Policy 57)**	✓ The Project meets the SPG priority standard and LB Enfield policy.

Resource Management

Policy ref.	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Operation phase (SPG Section 2.7)	Developers should provide sufficient internal space for the storage of recyclable and compostable materials and waste in their schemes. The design of development should meet borough requirements for the size and location of recycling, composting and refuse storage and its removal.		**Responsible Souring of Materials, Waste Minimisation and Green Procurement (DMD Policy 57)**	✓ The Project meets the SPG priority standards and LB Enfield policy.
Nature conservation and biodiversity				
Nature conservation and biodiversity (SPG Section 2.8)	There is no net loss in the quality and quantity of biodiversity. Developers make a contribution to biodiversity on their development site.		**Nature Conservation (DMD Policy 78)** **Wildlife Corridors (DMD Policy 76)** **Green Chains (DMD Policy 77)** **Ecological Enhancements (DMD Policy 79)** **Landscaping (DMD Policy 81)**	✓ The Project meets the SPG priority standards and LB Enfield policy.

Climate Change Adaptation

Initiative	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Tackling Increased Temperature and Drought				
Overheating (SPG Section 3.2)	Developers should include measures, in the design of their schemes, in line with the cooling hierarchy set out in London Plan policy 5.9 to prevent overheating over the scheme's life- time		**Heating and Cooling (DMD Policy 56)**	✓ The Project meets the SPG priority standard and LB Enfield policy.
Heat and drought resistant planting (SPG Section 3.2)		The design of developments should prioritise landscape planting that is drought resistant and has a low water demand for supplementary watering.	**Landscaping (DMD Policy 81)**	✓ The Project meets the SPG best practice standard and LB Enfield policy.
Resilient foundations (SPG Section 3.2)		Developers should consider any long term potential for extreme weather events to affect a building's foundations and to ensure they are robust.	**Flood Control and Mitigation Measures (DMD Policy 62)**	✓ The Project meets the SPG best practice standard and LB Enfield policy.
Increasing Green Cover				
Urban greening (SPG Section 3.3)	Developers should integrate green infrastructure into development schemes, including by creating links with wider green infrastructure network.		**Avoiding and Reducing Flood Risk (DMD Policy 59)**	✓ The Project meets the SPG priority standard and LB Enfield policy.

Climate Change Adaptation

Initiative	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
	Major developments in the Central London Activity Area (CAZ) should be designed to contribute to the Mayor's target to increase green cover by 5% in this zone by 2030.			N/A The Project is not located within the CAZ.
Trees **(SPG Section 3.3)**	Developments should contribute to the Mayor's target to increase tree cover across London by 5% by 2025. Any loss of a tree/s resulting from development should be replaced with an appropriate tree or group of trees for the location, with the aim of providing the same canopy cover as that provided by the original tree/s.		**Trees on Development Sites (DMD Policy 80)** **Landscaping (DMD Policy 81)**	✓ The Project meets the SPG priority standards and LB Enfield policy.
Flooding				
Surface water flooding and sustainable drainage **(SPG Section 3.4)**	Through their Local Flood Risk Management Strategies boroughs should identify areas where there are particular surface water management issues and develop policies and actions to address these risks.			N/A This priority standard relates to action by boroughs and does not apply to the Project.
	Developers should maximise all opportunities to achieve greenfield runoff rates in their developments. When designing their schemes developers should follow the drainage hierarchy set out in London Plan policy 5.13.		**Managing Surface Water (DMD Policy 61)**	✓ The Project meets the SPG priority standards and LB Enfield policy.

Climate Change Adaptation

Initiative	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
	Developers should design Sustainable Drainage Systems (SuDS) into their schemes that incorporate attenuation for surface water runoff as well as habitat, water quality and amenity benefits.			
Flood resilience and resistance of buildings in flood risk areas (SPG Section 3.4)	Development in areas at risk from any form of flooding should include flood resistance and resilience measures in line with industry best practice.		**Avoiding and Reducing Flood Risk (DMD Policy 59)** **Assessing Flood Risk (DMD Policy 60)** **Flood Control and Mitigation Measures (DMD Policy 62)**	✓ The Project meets the SPG priority standard and LB Enfield policy.
Flood risk management (SPG Section 3.4)	Developments are designed to be flexible and capable of being adapted to and mitigating the potential increase in flood risk as a result of climate change.		**Protection and Improvement of Watercourses and Flood Defences (DMD Policy 63)**	✓ The Project meets the SPG priority standard and LB Enfield policy.
	Developments incorporate the recommendation of the TE2100 plan for the future tidal flood risk management in the Thames estuary. Where development is permitted in a flood risk zone, appropriate residual risk management measures are to be incorporated into the design to ensure resilience and the safety of occupiers.			

Climate Change Adaptation

Initiative	Mayor's Priority Standard	Mayor's Best Practice Standard	Local Borough Policy	Compliance
Other sources of flooding (SPG Section 3.4)	Development should maximise all opportunities to achieve an 8m setback on fluvial watercourses between built development and watercourses, flood defences and culverts.		**Waterways (DMD Policy 75)**	✓ The Project meets the SPG priority standards and LB Enfield policy.
	Development should maximise all opportunities to achieve a 16m setback on tidal watercourses between built development and watercourses and flood defences.			N/A The Project site is not located within 16m of a tidal watercourse.
	All sources of flooding need to be considered when designing and constructing developments.			✓ The Project meets the SPG priority standard.

Pollution Management

Initiative	Mayor's Priority	Mayor's Best Practice	Local Borough Policy	Compliance
Land Contamination				
Land contaminat-ion (SPG Section 4.2)	Developers should set out how existing land contamination will be addressed prior to the commencement of their development. Potentially polluting uses are to incorporate suitable mitigation measures.			✓ The Project meets the SPG priority standards.
Air Pollution				
Air pollution (SPG Section 4.3)	Developers are to design their schemes so that they are at least 'air quality neutral'. Developments should be designed to minimise the generation of air pollution. Developments should be designed to minimise and mitigate against increased exposure to poor air quality. Developers should select plant that meets the standards for emissions from combined heat and power and biomass plants set out in Appendix 7. Developers and contractors should follow the guidance set out in the emerging The Control of Dust and Emissions during Construction and Demolition SPG when constructing their development.			✓ The Project meets the SPG priority standards.

Pollution Management

Initiative	Mayor's Priority	Mayor's Best Practice	Local Borough Policy	Compliance
Noise Pollution				
Noise pollution (SPG Section 4.4)	Areas identified as having positive sound features or as being tranquil should be protected from noise. Noise should be reduced at source, and then designed out of a scheme to reduce the need for mitigation measures.			✓ The Project meets the SPG priority standards.
Light Pollution				
Light pollution (SPG Section 4.5)	Developments and lighting schemes should be designed to minimise light pollution.			✓ The Project meets the SPG priority standards.
Water Pollution				
Surface water runoff (SPG Section 4.6)	In their aim to achieve a greenfield runoff rate developers should incorporate sustainable urban drainage systems (SuDS) into their schemes which also provide benefits for water quality.	Encourage good environmental practice to help reduce the risk from business activities on the London water environment. Encourage those working on demolition and construction sites to prevent pollution by incorporating prevention measures and following best practice.		✓ The Project meets the SPG priority standards.
Wastewater treatment	Residential developments discharging domestic sewage should connect to the public foul sewer or combined sewer network where it is reasonable to do so.			N/A The Project does not include provision for

Pollution Management

Initiative	Mayor's Priority	Mayor's Best Practice	Local Borough Policy	Compliance
(SPG Section 4.6)				residential programme.
	Commercial developments discharging trade effluent should connect to the public foul sewer or combined sewer network where it is reasonable to do so subject to a trade effluent consent from the relevant sewerage undertaker.			N/A The Project does not include provision for commercial development discharging trade effluent.
	Developments should be properly connected and post- construction checks should be made by developers to ensure that mis-connections do not occur.			✓ The Project meets the SPG priority standards.

Appendix C: BREEAM Pre-assessment

North London Waste Authority

North London Heat and Power Project

Sustainability Statement Appendix C – BREEAM Pre-Assessment

AD05.13 Appendix C

The Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(q)

Issue | October 2015

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Appendix C: BREEAM Pre-Assessment

C1 Introduction

C1.1 Purpose of this report

C1.1.1 This BREEAM pre-assessment has been prepared to support North London Waste Authority's (the Applicant's) application (the Application) for a Development Consent Order (DCO) made pursuant to the Planning Act 2008 (as amended).

C1.1.2 The Application is for the North London Heat and Power Project (the Project) comprising the construction, operation and maintenance of an Energy Recovery Facility (ERF) of around 70 megawatts (MW_e) at the Edmonton EcoPark in north London with associated development, including a Resource Recovery Facility (RRF). The proposed ERF would replace the existing Energy from Waste (EfW) facility at the Edmonton EcoPark.

C1.2 The Project

C1.2.1 The Project would replace the existing EfW facility at Edmonton EcoPark, which is expected to cease operations in 2025, with a new and more efficient ERF which will produce energy from municipal waste, and associated development, including temporary works required to facilitate construction, demolition and commissioning. The proposed ERF would surpass the requirement under the Waste Framework Directive (Directive 2008/98/EC) to achieve an efficiency rating in excess of the prescribed level, and would therefore be classified as a recovery operation rather than disposal.

C1.2.2 The main features of the Project once the proposed ERF and permanent associated works are constructed and the existing EfW facility is demolished comprise:

a. a northern area of the Edmonton EcoPark accommodating the proposed ERF;

b. a southern area of the Edmonton EcoPark accommodating the RRF, a visitor and education centre with offices, and a base for the Edmonton Sea Cadets ('EcoPark House');

c. a central space, where the existing EfW facility is currently located that would be cleared; and

d. a new landscape area along the edge with the River Lee Navigation.

C1.3 BREEAM assessment

C1.3.1 It is proposed to carry out three BREEAM assessments using the BREEAM New Construction 2014 methodology. The ERF and RRF would each be assessed as Industrial building types while EcoPark House, which would include a visitor and education centre with offices, and a base for the Edmonton Sea Cadets, would be assessed under the BREEAM Offices

scheme. The buildings have been registered with the BRE against version 3.0 of BREEAM NC 2014 and have the following registration numbers:

NLHPP Energy Recovery Facility (BREEAM Scheme Classification: Industrial)	BREEAM-0058-2007
NLHPP Resource Recovery Facility (BREEAM Scheme Classification: Industrial)	BREEAM-0058-2015
NLHPP EcoPark House (BREEAM Scheme Classification: Office)	BREEAM-0058-2023

C1.3.2 This pre-assessment report provides an indication of the BREEAM rating that may be achievable for the three buildings based on the limited design information that is available at the current stage of the project. A single pre-assessment scorecard based on the Office building criteria has been presented. Although the criteria for the Industrial buildings differ slightly, it is not anticipated that these would result in significant differences in the anticipated ratings. Differences in the BREEAM requirements for the two building types have been noted within the assessment scorecard.

C1.3.3 This pre-assessment has been produced by a BREEAM Assessor and BREEAM Accredited Professional. This report does not contain full details of the BREEAM requirements for each credit and should be read in conjunction with the BREEAM New Construction (Non-Domestic) Technical Manual 2014, available at http://www.breeam.org/BREEAMUK2014SchemeDocument/.

C2 Overview of BREEAM

C2.1.1 The Building Research Establishment Environmental Assessment Method (BREEAM) is a suite of environmental assessment tools for building design, construction and operation. BREEAM is owned and administered by the Building Research Establishment and is one of the most widely used environmental assessment tools for buildings in the world.

C2.1.2 BREEAM UK New Construction consists of fifty one individual assessment issues spanning ten environmental categories; management, health and wellbeing, energy, transport, water, materials, waste, land use and ecology, pollution and innovation. Each issue addresses a specific building related environmental impact or issue and has a number of 'credits' assigned to it. Credits are awarded where the project team demonstrates that the building meets the performance criteria defined for that issue.

C2.1.3 Each of the categories has an environmental weighting which reflects their relative environmental impact. This is applied to the credit score so that the output of the assessment is an achieved "weighted percentage" of the total available credits. This weighted percentage is translated to a BREEAM rating as shown below:

BREEAM Rating	Weighted Percentage Score
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30

C2.1.4 Most credits are optional such that strong performance in one issue can offset a weaker performance elsewhere. However, a number of credits are defined as minimum standards and these must be achieved for a rating to be awarded, regardless of the overall percentage score.

C2.1.5 The BREEAM rating benchmarks enable the performance of a newly constructed building to be compared with other BREEAM rated buildings, and the typical sustainability performance of new UK non-domestic building stock.

C2.1.6 In this respect each BREEAM rating broadly represents performance equivalent to:

1. Outstanding: Less than top 1% of UK new non-domestic buildings (innovator)
2. Excellent: Top 10% of UK new non-domestic buildings (best practice)
3. Very Good: Top 25% of UK new non-domestic buildings (advanced good practice)

4. Good: Top 50% of UK new non-domestic buildings (intermediate good practice)
5. Pass: Top 75% of UK new non-domestic buildings (standard good practice)

C2.1.7 Assessments are carried out by a network of assessors who are trained and licenced by the BRE. Formal assessment takes places in two stages; an interim assessment of the design based on detailed design information provided by the design team and a post-construction review following completion of the project. Each of these assessments is assessed by the BREEAM Assessor then submitted to the BRE for QA checking and certification.

C2.1.8 The pre-assessment stage is not part of the formal assessment process and is not submitted to the BRE. However, the pre-assessment is an important element of the process for which credit is available within the scheme. The pre-assessment sets performance targets at the outset of the project, informs the design team of the BREEAM requirements for the design and forms the basis of the formal assessment process.

C3 Credits and comments table

C3.1.1 The table below shows the available credits for each issue assessed by BREEAM and the number of these which would be targeted in this case. A commentary outlining brief details of the credit requirements is also provided.

		Available	Targeted	Comments
Management				
Man 01	Project brief and design	4	4	One credit can be achieved for agreeing the project's BREEAM target with a BREEAM Accredited Professional (AP) at the outset. The current process of establishing the target credits would meet this requirement. There is a requirement for the target to be met in the Design Stage Assessment report therefore progress should continue to be monitored by a BREEAM AP during design development. A further credit can be achieved for appointment of a sustainability champion through the design and construction stages of the project. Margaret Hamilton, a BREEAM AP with Arup has been appointed to provide this role during preparation of the DCO application. A further credit can be achieved for third party consultation. The consultation process taking place as part of the DCO application should meet this requirement. Another credit is targeted for documenting how the project has been set up in the early stages and demonstrating that the design team were involved in developing the initial brief.
Man 02	Life cycle cost and service life planning	4	2	This requires a component level Life Cycle Cost plan to be completed by the end of RIBA stage 4 (Technical Design) in line with PD156865:2008. This would require appointment of a cost consultant to carry out this study. A further credit is targeted for reporting of capital cost information to the BRE.
Man 03	Responsible construction practices	6	6	These credits are awarded for actions carried out by the contractor such as monitoring of site energy and water use, management of site impacts and responsible sourcing of site timber. In addition, the contractor would be required to provide a qualified Site Sustainability Manager. The basis of these requirements is set out in the project's Code of Construction Practice (AD05.12) and should be

		Available	Targeted	Comments
				reflected in contractual requirements for the Construction Manager/ Main Contractor.
Man 04	Commissioning and handover	4	3	One credit is targeted for the production of a non-technical building user guide which would be produced (in addition to the building log book and O&M manuals). A credit is also targeted for carrying out commissioning of the building services in line with best practice guidance. It has also been assumed that thermographic testing of the building fabric and remediation of any problems identified would be carried out prior to handover. This should be reflected in the Façade Specification or the contractual requirements for the Construction Manager/Main Contractor.
Man 05	Aftercare	3	3	Three credits are targeted which requires a “soft handover” approach to be pursued on the project. This requires additional aftercare to be procured from the contractor including seasonal commissioning of building services and aftercare services. The final credit also requires the client to appoint a consultant to carry out post-occupancy evaluation one year after the building is occupied.
Management Totals:		**21**	**18**	
Management score totals:		**12**	**10.286**	
Health and Wellbeing				
Hea 01	Visual Comfort	4	1	The internal and external lighting element of this issue is targeted. This requires internal and external lighting levels and control to be designed in line with the best practice guidance outlined in the BREEAM requirements.
Hea 02	Indoor Air Quality	5	2	Two credits are targeted which require the design team and contractor to meet VOC emissions levels for finishes materials. The second credit requires VOC emissions testing to be carried out prior to handover. These requirement would need to be included in the Employer's Requirements for the Contractor and should also be reflected in the selection of finishes materials.
Hea 04	Thermal comfort	3	1	One credit is targeted for completion of dynamic thermal modelling to

		Available	Targeted	Comments
				demonstrate that internal temperatures within the building can be maintained in line with relevant industry guidance. This should be completed alongside development of the building services design following the DCO process.
Hea 05	Acoustic Performance	3	3	Three credits are assumed in the base case scenario. This requires the appointment of an acoustician to advise on internal ambient noise levels, reverberation times and noise insulation between acoustically sensitive rooms. Pre-completion testing of the building would also be required to demonstrate that requirements are met.
Hea 06	Safety and Security	2	2	Two credits are targeted. This requires that a security consultant or the architectural liaison officer from the local police force is consulted on the design prior to the end of RIBA stage 2 (concept design) and their recommendations are incorporated into the design. It also requires the layout of pedestrian routes and footpaths on the site to follow guidelines laid out in the BREEAM technical manual.
Health & Wellbeing Totals:		**17**	**8**	
Health & Wellbeing score totals:		**15**	**7.059**	
Energy				
Ene 01	Reduction of energy use and carbon emissions	12	8	A Building Energy Assessment (Appendix D of AD05.13) has been prepared as part of the DCO application. This considers energy use for the administration areas and demonstrates how energy use can be reduced following a hierarchy of passive measures, efficient energy supply and renewable energy measures. Detailed modelling of the buildings would take place during design development to establish the overall level of energy saving for each separate assessment. The Building Energy Assessment notes that, subject to cost-benefit analysis, the Project may pursue a strategy of zero carbon emissions from regulated energy uses. Should this be the case, the number of credits achieved for this issue will exceed the target.

		Available	Targeted	Comments
Ene 02	Energy Monitoring	2	2	Two credits have been targeted. The design criteria should include the following: Energy metering systems to be installed that enable at least 90% of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories of energy. Energy consuming systems metered using an appropriate energy monitoring and management system with end energy consuming uses are identifiable to the building users through labelling or data outputs. An accessible energy monitoring and management system or separate accessible energy sub-meters with open protocol communication outputs to enable future connection to an energy monitoring and management system to be provided. This should cover a significant majority of the energy supply to relevant function areas or departments.
Ene 03	External Lighting	1	1	One credit has been targeted. The average initial luminous efficacy of the external light fittings within the construction zone should not be less than 60 luminaire lumens per circuit Watt and all external light fittings should be automatically controlled for prevention of operation during daylight hours. Presence Detection should also be provided in areas of intermittent pedestrian traffic.
Ene 04	Low carbon design	3	1	A Building Energy Assessment (Appendix D of AD05.13) has been prepared as part of the DCO application. This considers energy use for the administration areas and demonstrates how energy use can be reduced following a hierarchy of passive measures, efficient energy supply and renewable energy measures.
Ene 06	Energy Efficient Transportation Systems	3	3	Three credits are targeted. This requires the following to be included in the design requirements for the building services: An analysis of the transportation demand and usage patterns for the building should be carried out to determine the optimum number and size of lifts, escalators and/or moving walks. Calculation of energy consumption for lifts should be carried out in accordance with BS EN ISO 25745 Energy

		Available	Targeted	Comments
				performance of lifts, escalators and moving walks, Part 2 : Energy calculation and classification for lifts (elevators) and/or Part 3: Energy calculation and classification for escalators and moving walks. Lifts should include the following energy efficiency features: Standby mode for ventilation, lighting and other operating equipment during off-peak periods. Lift car lighting and display with an average lamp efficacy, (across all fittings in the car) of > 55 lamp lumens/circuit Watt. Variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor. In addition, where the use of regenerative drives is demonstrated to save energy, these should be specified.
	Energy Efficient Equipment	2	0	These credits are not targeted as the appropriate energy efficiency labelling schemes can be difficult to achieve for all purchased equipment.
Energy Totals:		**23**	**16**	
Energy score totals:		**15**	**10.435**	
Transport				
Tra 01	Public Transport Accessibility	3	1	These credits are awarded based on the Accessibility Index (AI) of the project location. The project's accessibility index has been estimated using the TfL Planning Information Database and is between 3 and 4. This equates to 1 BREEAM credit for this issue.
Tra 02	Proximity to amenities	1	0	This credit requires a post box, ATM and food outlet to be located within 500m walking distance of the building. The site does not currently meet this requirement and is not expected to meet the requirement post-development.
Tra 03	Cyclist facilities	2	2	**Base Case** This credit requires 1 cycle storage space to be provided per 10 building users. It is proposed to provide 19 spaces for the 153 employees on the Edmonton EcoPark (an average of approximately one space per 8 employees) with 7 additional spaces for visitors. This exceeds requirements and so the first

		Available	Targeted	Comments
				credit is assumed in the base case scenario. The spaces must be covered and must have lighting in line with BS 5489-1:2013. The second credit is also targeted and requires showers and changing rooms with lockers to be provided for cyclists. Such facilities are proposed within the current design.
Tra 04	Maximum Car Parking Capacity	2	0	**Base Case** To achieve credits for this issue, the number of parking spaces must be less than 1 per 3 building users. The level of parking provision proposed is well above this level therefore these credits would not be achieved.
Tra 05	Travel Plan	1	1	This credit requires that a travel plan is produced based on a site specific transport study. A study and framework plan have been produced (Appendix k of AD05.11). Provided that the Travel Plan (Appendix K of AD05.11) is adopted in operation, this credit should be achieved.
Transport Totals:		**9**	**4**	
Transport score totals:		**9**	**4**	
Water				
Wat 01	Water Consumption	5	3	This requires that low flow and low flush sanitaryware to be installed. Rainwater harvesting is proposed and would also contribute to the credit if the harvested rainwater is used for WC flushing. Based on previous projects, a score of 3 for this issue is considered to be achievable.
Wat 02	Water Monitoring	1	1	This credit is targeted and requires the specification of a water meter on the mains water supply to each building. It also requires water-consuming plant or building areas, consuming 10% or more of the building's total water demand to be separately metered. Meters should be capable of open protocol communication output and should be connected to the site-wide Building Management System.
Wat 03	Leak Detection	2	2	Two credits are targeted which requires the following: A leak detection system, compliant with BREEAM criteria, which is capable of detecting a major water leak on the mains water supply within the building

		Available	Targeted	Comments
				and between the building and the utilities water. Flow control devices that regulate the supply of water to each WC area/facility according to demand. This is likely to be achieved by the use of solenoid valves controlled from PIR detectors.
Wat 04	Water Efficient Equipment	1	1	One credit is targeted which requires the following: Identification of all unregulated water demands that could be realistically mitigated or reduced. Identification of systems or processes to provide a meaningful reduction in the total water demand of the building.
Water Totals:		**9**	**7**	
Water score totals:		**7**	**5.444**	
Materials				
Mat 01	Life Cycle Impacts	5	2	This credit is awarded for using materials with a low environmental impact according to the BRE's Green Guide to Specification. The current scoring is an estimate based on the limited materials information currently available and experience from previous projects.
Mat 02	Hard Landscaping and Boundary Protection	1	1	This credit is targeted and requires at least 80% of all external hard landscaping and 80% of all boundary protection (by area) in the construction zone to achieve an A or A+ rating, as defined in the BRE's Green Guide to Specification.
Mat 03	Responsible Sourcing of Materials	4	1	One credit is targeted. This requires that materials are sourced from suppliers with third party environmental certification of their supply chain. A sustainable procurement strategy should be followed targeting at least the following materials: Concrete Plasterboard/Drylining Timber Sustainable procurement of other materials is to be encouraged but may not be reflected in the BREEAM scoring because of the methodology for awarding points to material groups rather than product.
Mat 04	Insulation	1	1	This credit is targeted and requires that building and building services insulation is A or A+ rated in the BRE's Green Guide to Specification. This is widely available in the market.

		Available	Targeted	Comments
Mat 05	Designing for durability and resilience	1	1	This credit is targeted and requires the following to be incorporated. Suitable durability and protection measures or designed features to prevent damage to vulnerable parts of the internal and external building and landscaping elements. Appropriate design and specification measures to limit material degradation due to environmental factors.
Mat 06	Material efficiency	1	0	This credit is not targeted. No provision has been made for the input required at the early design stages.
Materials Totals:		**13**	**6**	
Materials score totals:		**13.5**	**6.231**	
Waste				
Wst 01	Construction Waste Management	4	2	One credit is targeted for resource efficiency and a further credit for diversion of waste from landfill. A construction resource management plan would need to be produced by the Contractor.
Wst 02	Recycled Aggregates	1	0	This credit is not targeted as concrete requirements have not been fully developed. This could be considered at a later stage of the design.
Wst 03	Operational Waste	1	1	**Base Case** This credit is targeted and requires a central collection area to be provided where operational waste from the building can be collected and sorted. This is included in the current design.
Wst 04	Speculative Floor and Ceiling Finishes	1	1	**Base Case** This credit applies to the Reception building only. It requires that ceiling and floor finishes are selected by the building occupier. Because the building is owner occupied this is the case by default.
Wst 05	Adaptation to climate change	1	0	This credit is not targeted. The credits require specialist input at an early stage for which there is no current appointment.
Wst 06	Functional adaptability	1	0	This credit is not targeted. The credits require specialist input at an early stage for which there is no current appointment.
Waste Totals:		**9**	**4**	
Waste score totals:		**8.5**	**3.778**	

		Available	Targeted	Comments
Land Use and Ecology				
LE 01	Site Selection	2	1	The developed area of the site would be increased therefore the first credit would not be achieved. The Ecology recommendations produced by Arup (Vol 2 Section 5 of the ES (AD06.02)) on the basis of the Application Site survey confirm that there are several invasive species on the site including Japanese Knotweed. Invasive species can be considered a form of Land Contamination for BREEAM purposes and so removal of these species can contribute to award of the contaminated land credit.
LE 02	Ecological Value of Site and Protection of Ecological Features	2	0	The Ecologist's recommendations provided by Arup (Vol 2 Section 5 of the ES (AD06.02)) following Application Site survey work confirms that there are features of Ecological value on the Edmonton EcoPark so the first credit can not be awarded. Furthermore, some native tree species are scheduled to be removed therefore the protection of Ecological Features credits would also not be achieved.
LE 03	Minimising impact on existing site ecology	2	2	Two credits have been targeted based on the assumption that the final landscaping design would not reduce the ecological value of the Edmonton EcoPark. One of these credits is a mandatory requirement for a Very Good rating.
LE 04	Enhancing site ecology	2	1	One credit has been targeted. An Ecologist would be appointed to provide recommendations on enhancement of site Ecology. It is assumed that these would also be implemented.
LE 05	Long Term Impact on Biodiversity	2	2	Two credits are targeted. These are awarded where an Ecologist advises on compliance with relevant UK and EU legislation. A landscape and habitat management plan covering the first five years of operation is also required. In addition, there are a number of site management requirements for the contractor related to ecology which must be complied with.
Land Use & Ecology Totals:		**10**	**6**	
Land Use & Ecology score totals:		**10**	**6**	

		Available	Targeted	Comments
Pollution				
Pol 01	Impact of Refrigerants	3	2	Two credits are targeted. This requires the following to be incorporated: All systems (with electric compressors) must comply with the requirements of BS EN 378:20081 (parts 2 and 3) and where refrigeration systems containing ammonia are installed, the Institute of Refrigeration Ammonia Refrigeration Systems Code of Practice. Systems using refrigerants should have have Direct Effect Life Cycle CO2 equivalent emissions ≤ 1000 kgCO2e/kW Systems using refrigerants have a permanent automated refrigerant leak detection system installed.
Pol 02	NOx emissions	3	0	No credits are currently targeted as the NOx emissions from the waste heat system are likely to exceed the BREEAM requirements for these credits.
Pol 03	Surface Water Run Off	5	4	Four credits are targeted. This assumes that the outcome of the drainage design is such that the risk of flooding from all sources is mitigated to the extent that it is low and that surface water run-off is controlled using appropriate SuDs measues.
Pol 04	Reduction of Night Time Light Pollution	1	1	One credit is targeted. This requires the following: External lighting should be designed in compliance with Table 2 (and its accompanying notes) of the ILP Guidance notes for the reduction of obtrusive light, 2011. All external lighting (except for safety and security lighting) should be automatically switched off between 23:00 and 07:00. Safety or security lighting used between 23:00 and 07:00 should comply with the lower levels of lighting recommended during these hours in Table 2 of the ILP's Guidance notes. Illuminated advertisements, where specified, must be designed in compliance with ILE Technical Report 5 – The Brightness of Illuminated Advertisements.
Pol 05	Noise Attenuation	1	1	A noise impact assessment is required which would be produced for planning. One credit is assumed for providing attenuation for building services plant is provided to meet the noise levels required by BREEAM. These are

		Available	Targeted	Comments
				generally less stringent than local authority requirements.
Pollution Totals:		**13**	**8**	
Pollution score totals:		**10**	**6.154**	
Innovation				
Man 03	Responsible construction practices	1	0	This credit may be achieved by the contractor but it is difficult to make this a contractual obligation as scoring relies on the views of a third party site monitor. It is not currently assumed in any scenario.
Man 05	Aftercare	1	0	This credit would require NLWA to commit to collecting post-occupancy evaluation, energy use and water use data for the first three years of occupation. This information would need to be shared with the design team and the BRE. This credit has been included in the uplift scenario.
Hea 01	Visual Comfort	1	0	This credit is for exemplary daylighting performance. As the core daylighting credit is not targeted in any scenario, this credit cannot be included.
Hea 02	Indoor Air Quality	2	0	These exemplary performance credits are for zero regulated carbon or carbon negative buildings. This level of energy performance is not proposed.
Ene 01	Reduction of energy use and carbon emissions	5	0	These exemplary performance credits are for zero regulated carbon or carbon negative buildings. This level of energy performance is not proposed.
Wat 01	Water Consumption	1	0	This credit is for exemplary water consumption performance. As the full core water consumption credits are not targeted in any scenario, this credit cannot be included.
Mat 01	Life Cycle Impacts	3	0	This credit is for exemplary life cycle impacts performance. As the full core credits are not targeted in any scenario, this credit cannot be included.
Mat 03	Responsible Sourcing of Materials	1	0	This credit is for exemplary responsible sourcing performance. As the full core credits are not targeted in any scenario, this credit cannot be included.
Wst 01	Construction Waste Management	1	0	This credit is for exemplary construction waste management performance. As the full core credits are not targeted in any scenario, this credit cannot be included.

		Available	Targeted	Comments
Wst 02	Recycled Aggregates	1	0	This credit is for exemplary recycled aggregates performance. As the full core credits are not targeted in any scenario, this credit cannot be included.
Wst 05	Adaptation to climate change	1	0	This credit is for exemplary adaption performance. As the full core credits are not targeted in any scenario, this credit cannot be included.
AI	Approved Innovation	1	0	No approved innovations are proposed.
Innovation Totals:		**19**	**0**	
Innovation score totals:		**19**	**0**	
OVERALL SCORE TOTALS:		**119**	**60.27**	

C4 Conclusion

C4.1.1 This document outlines the BREEAM credits which would be targeted for the assessments of the new buildings to be developed as part of the North London Heat and Power Project.

C4.1.2 The targeted credits result in a BREEAM score of 60.27% which exceed the 55% threshold for a Very Good rating with a small margin to allow flexibility during design development.

C4.1.3 All of the mandatory credits for a Very Good rating are targeted and are considered to be achievable.

C4.1.4 The Project sets out a series of design parameters for approval. Should a Development Consent Order be issued further input as outlined in this pre-assessment document would be required during detailed design in order for the targeted credits to be awarded at the formal assessment stages.

Appendix D: Building Energy Assessment

North London Waste Authority

North London Heat and Power Project

Sustainability Statement Appendix D - Building Energy Assessment

AD05.13 Appendix D

The Planning Act 2008 Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5 (2)(q)

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Executive summary

i.i.i This Building Energy Assessment has been prepared to support North London Waste Authority's (the Applicant's) application (the Application) for a Development Consent Order (DCO) made pursuant to the Planning Act 2008 (as amended).

i.i.ii The Application is for the North London Heat and Power Project (the Project) comprising the construction, operation and maintenance of an Energy Recovery Facility (ERF) of around 70 megawatts (MW_e) at the Edmonton EcoPark in north London with associated development, including a Resource Recovery Facility (RRF) and other buildings. The ERF would replace the existing Energy from Waste (EfW) facility at the Edmonton EcoPark.

i.i.iii The Building Energy Assessment includes the buildings in the Project which are subject to Part L Building Regulations (Part L 2013): the ERF offices, the RRF offices and EcoPark House. The ERF offices are attached to the ERF facility and include offices for the ERF staff and Edmonton EcoPark administration, support and staff welfare facilities, control room and visitor facilities. The RRF offices are attached to the RRF and include administration facilities, visitor facilities and staff welfare facilities. EcoPark House also includes offices, a visitor centre and the Edmonton Sea Cadet Centre. Industrial buildings are exempt from Part L 2013.

i.i.iv The relevant Part L 2013 and policy in the London Plan[1] and the Enfield Core Strategy[2], as well as the guidance on building energy assessments published by the Greater London Authority (GLA), have been taken into consideration in preparing this assessment.

i.i.v The carbon reduction stages set out in this report follow the Mayor's Energy Hierarchy:

Stage 1: use less energy (Be-lean)

i.i.vi A combination of passive design measures and improved building systems are proposed in order to reduce emissions from the baseline scenario. The measures were modelled and result in total carbon emission reduction of 12 per cent.

Stage 2: supply energy efficiently (Be-clean)

i.i.vii This Assessment proposes the supply of low carbon heat from an ERF heat-offtake to the ERF offices, RRF offices and EcoPark House.

i.i.viii A low carbon cooling supply is proposed for the ERF offices making use of absorption chillers supplied from the ERF heat off-take; however a site-wide cooling network was ruled out due to low cooling demands of EcoPark House and the RRF offices.

[1] Greater London Authority (GLA) (2015) The London Plan, the Spatial Development Strategy for London Consolidated with Alterations since 2015, March 2015.
[2] LB Enfield (2010) The Enfield Plan Core Strategy 2010 – 2025, Adopted November 2010.

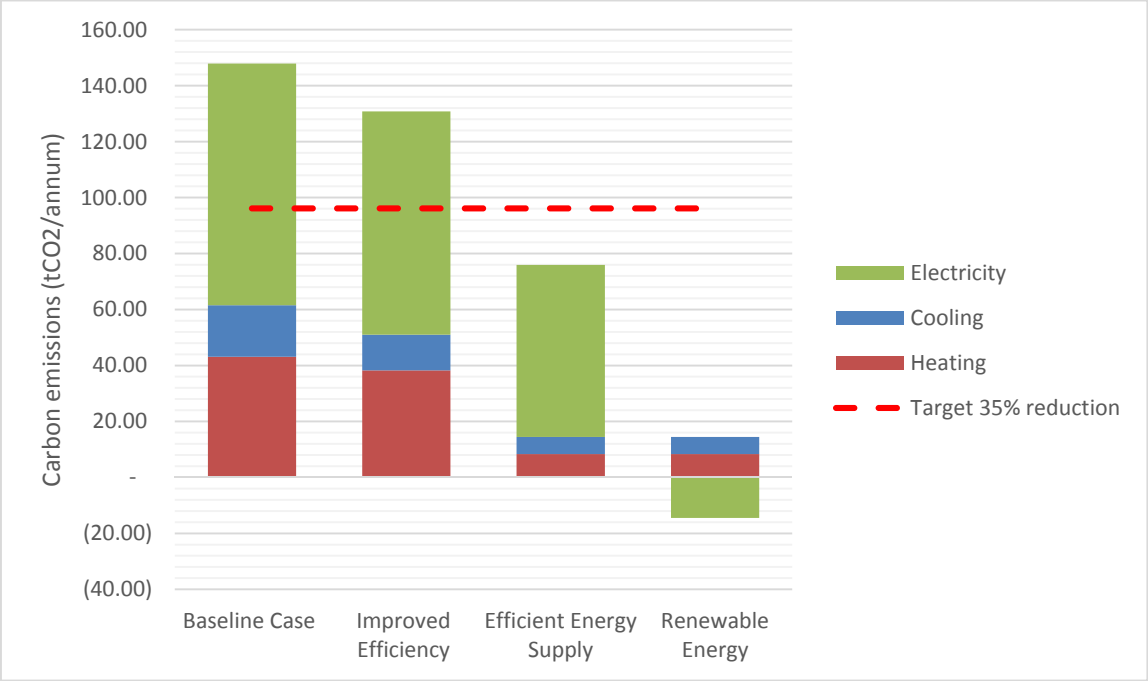
i.i.ix An electricity connection is also proposed from the ERF to other buildings within the Edmonton EcoPark to supply low carbon electricity from the ERF to all connected buildings.

i.i.x Supplying energy by these means results in a 49 per cent reduction in regulated carbon emissions from the baseline. The measures identified at Stage 1 and 2 meet the requirements of the London Plan that buildings must achieve a 35 per cent reduction in emissions below Part L 2013.

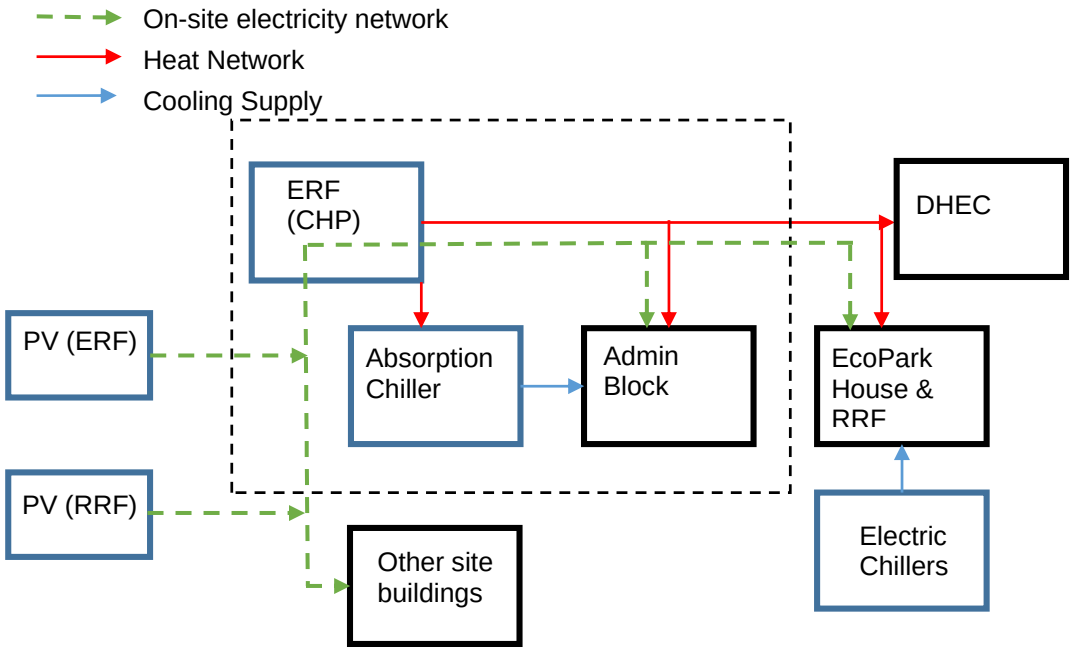
Stage 3: use renewable energy (Be-green)

i.i.xi The renewable technology proposed for the Project is photovoltaic (PV) solar panels on 2,200m^2 of roof area to be located above the ERF or the RRF, subject to cost-benefit analysis. This level of provision would completely offset any remaining regulated carbon emissions after Stage 2 and would achieve a peak output of approximately 160kW$_e$ and output of 146,000 kWh/annum. By installing the PV panels suggested, the site buildings would achieve zero carbon on regulated emissions.

i.i.xii The findings of the three stages are set out in the Figure below.



i.i.xiii The proposed strategy with solar PV (shown in the Figure below) would be subject to feasibility and cost benefit analysis and will be reviewed at detailed design stage.



i.i.xiv As a result the Project makes the following commitments:

a. eligible buildings will incorporate measures to meet the London Plan's target of reducing regulated carbon emissions by 35 per cent below Part L 2013. The Project will also endeavour to meet carbon reduction targets in place at the time of construction; and

b. the Applicant will endeavour to install a site-wide heat network to connect the eligible buildings and supply them with low carbon heat sourced from an ERF heat-offtake.

i.i.xv However, all measures are subject to cost benefit analysis and feasibility which may be revised at detailed design with an updated Building Energy Assessment or submission detailing changes in carbon reduction targets, policy requirements and updates in the energy strategy proposals included here.

i.i.xvi The technology mix and assumptions on performance specifications used for this assessment demonstrate that the development can meet the carbon reduction targets; however, these could be varied while still meeting the carbon reduction targets. For example, the final design could include a higher amount of solar PVs, but use an electric chiller instead of an absorption chiller in the ERF offices. It is for this reason that the Applicant will endeavour to meet a specific carbon emissions target rather than a specific design or technology solution.

1 Introduction

1.1 Purpose of this report

1.1.1 This Building Energy Assessment has been prepared to support the Applicant's Application for a DCO made pursuant to the Planning Act 2008 (as amended). The assessment has been completed for the proposed ERF offices, RRF offices and EcoPark House as these are the only buildings within the Edmonton EcoPark required to meet Part L 2013 (Conservation of Fuel and Power) Building Regulations (Part L 2013) and demonstrates the carbon reduction commitments for those buildings under Part L 2013 and targets set by the London Plan[1].

1.1.2 The Application is for the North London Heat and Power Project (the Project) comprising the construction, operation and maintenance of an ERF of around 70 MW_e at the Edmonton EcoPark in north London with associated development, including a RRF. The proposed ERF will replace the existing EfW facility at the Edmonton EcoPark.

1.1.3 This Report should be read alongside the other information that has been submitted with the Application, in accordance with the statutory requirements set out in Regulations 5, 6 and 7 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended).

1.2 Document structure

1.2.1 The report structure follows the Energy Hierarchy as proposed by the GLA's guidance on energy planning set out in the London Plan (2015). Therefore, following an applied policy review, the report details a building carbon emissions baseline which meets Part L 2013 emission levels (be-lean). It then proceeds to report the efficient energy supplies proposed for the buildings (be-clean), followed by an assessment of on-site renewable energy generation (be-green).

1.3 The Applicant

1.3.1 Established in 1986, the Applicant is a statutory authority whose principal responsibility is the disposal of waste collected by the seven north London boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest (the Constituent Boroughs).

1.3.2 The Applicant is the UK's second largest waste disposal authority, handling approximately 3 per cent of the total national Local Authority Collected Waste (LACW) stream. Since 1994 the Applicant has managed its waste arisings predominantly through its waste management contract with LondonWaste Limited (LWL) and the use of the EfW facility at the existing Edmonton EcoPark and landfill outside of London.

1.4 The Application Site

1.4.1 The Application Site, as shown on the Site Location Plans (A_0001 and A_0002 in the Book of Plans (AD02.01)), extends to approximately 22 hectares and is located wholly within the London Borough of Enfield (LB Enfield). The Application Site comprises the existing waste management site known as the Edmonton EcoPark where the permanent facilities would be located, part of Ardra Road, land around the existing water pumping station at Ardra Road, Deephams Farm Road, part of Lee Park Way and land to the west of the River Lee Navigation, and land to the north of Advent Way and east of the River Lee Navigation (part of which would form the Temporary Laydown Area and new Lee Park Way access road). The post code for the Edmonton EcoPark is N18 3AG and the grid reference is TQ 35750 92860.

1.4.2 The Application Site includes all land required to deliver the Project. This includes land that would be required temporarily to facilitate the development.

1.4.3 Both the Application Site and the Edmonton EcoPark (existing and proposed) are shown on Plan A_0003 contained within the Book of Plans (AD02.01). Throughout this report references to the Application Site refer to the proposed extent of the Project works, and Edmonton EcoPark refers to the operational site. Upon completion of the Project the operational site would consist of the Edmonton EcoPark and additional land required to provide new access arrangements and for a water pumping station adjacent to the Deephams Sewage Treatment Works outflow channel.

2 Legislative and policy framework

2.1.1 This section presents a brief review of the key relevant statutory and planning requirements and guidance which have informed the development of the Building Energy Assessment. It also highlights key policy and regulatory issues and sets out how the assessment has taken account of these matters. Details of key regulations and policies are set out in Appendix A, along with commentary on how the assessment has addressed them.

2.2 National policy statement

2.2.1 The relevant national policy statements for the Project are Overarching National Policy Statement for Energy[3] (NPS EN-1) and National Policy Statement for Renewable Energy Infrastructure[4] (NPS EN-3). Both these policy statements are relevant to the principal development but do not cover energy consumption and emissions from on-site buildings and spaces such as EcoPark House and the ERF's offices.

2.3 National Planning Policy Framework

2.3.1 The National Planning Policy Framework[5] (NPPF), 2012 sets out the Government's planning policies for England. It must be taken into account for the preparation of local plans, and is a material consideration in planning decisions. Section 10, Meeting the challenges of climate change, flooding and costal change (Paragraphs 93 to 99), is applicable to this Building Energy Assessment and requires developments to minimise carbon emissions, minimise vulnerability and increase resilience to the impacts of climate change, and to support the delivery of renewable and low carbon energy.

2.4 Building regulations

2.4.1 Energy in buildings is regulated by the provisions of Part L 2013 (Conservation of Fuel and Power) of the Building Regulations. The most recent version of Part L is 2013, which incorporated an average 6 per cent improvement for dwellings and 9 per cent improvement for non-domestic buildings on the Target Emissions Rate (TER) from Part L 2010. Part L regulates energy associated with the operation of buildings including heating, cooling, ventilation, vertical transport and lighting systems. Un-regulated energy uses include cooking, appliances, IT equipment and small power devices. In addition, process energy for industrial uses is also unregulated.

[3] Department of Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1), July 2011.
[4] Department of Energy and Climate Change (2011) National Policy Statement for Renewable Energy Infrastructure (EN-3), July 2011,
[5] Department for Communities and Local Government (2012) National Planning Policy Framework, March 2012

2.4.2 Part L (Conservation of Fuel and Power) of the Building Regulations sets out the types of buildings that are exempt from meeting requirements on carbon emissions. In this document it states that exempt buildings include "*temporary buildings with a planned time of use of two years or less, industrial sites, workshops and non-residential agricultural buildings with low energy demand."*[6] The ERF and RRF industrial building areas are therefore exempt from Part L regulations and have not been included in this Building Energy Assessment.

2.5 The London Plan

2.5.1 The London Plan is the spatial development strategy for London. The most recent adopted version of the plan was published by the GLA in March 2015. The following policies are relevant to the Building Energy Assessment:

a. Policy 5.2 Minimising Carbon Dioxide Emissions. Policy 5.2 C and D state the requirement for an Building Energy Assessment;

b. Policy 5.3 Sustainable Design and Construction;

c. Policy 5.6 Decentralised Energy in Development Proposals;

d. Policy 5.7 Renewable Energy;

e. Policy 5.8 Innovative Energy Technologies; and

f. Policy 5.9 Overheating and Cooling.

2.5.2 The overarching principle for new development is to develop a low carbon energy solution in accordance with the Mayor's Energy Hierarchy which meets or exceeds the carbon emissions reduction target defined in Policy 5.2 of 35 per cent below a Part L 2013 baseline.

2.5.3 The purpose of a Building Energy Assessment is to demonstrate compliance with London Plan carbon reduction targets and to propose carbon reduction measures according to the energy hierarchy. The energy hierarchy is:

a. Be lean: use less energy;

b. Be clean: supply energy efficiently; and

c. Be green: use renewable energy.

2.6 Local planning context

2.6.1 The London Borough of Enfield Local Plan includes: The Enfield Plan Core Strategy 2010-2025 (the Core Strategy) and the Development Management Document[7] (DMD).

[6] HM Government, Approved Document L2A: Conservation of Fuel and Power, 2013 Edition (online version), page 32.
[7] LB Enfield (2014), Development Management Document, Adopted November 2014.

2.6.2 The Core Strategy was adopted in November 2010. It sets out the spatial framework for the long-term development of the borough until 2025. The following chapters are relevant to the Building Energy Assessment:

d. Chapter 3 sets out the overarching spatial vision and objectives for Enfield up to 2026 – with the aim of making Enfield "*a prosperous and sustainable borough, with a strong sense of place and identity*". A number of objectives are outlined, including community cohesion, maximising employment potential, developing housing, and environmental sustainability; and

e. Chapter 7 "*Core policies for delivering Physical Infrastructure*" includes Core Policy 20 Sustainable Energy Use and Energy Infrastructure, which sets out that all new developments must address the causes and impacts of climate change by minimising energy use; supplying energy efficiently; and using energy generated from renewable sources in line with the London Plan and national policy.

2.6.3 The DMD Policy 49 sets out the requirement for a Building Energy Assessment to be included within a Sustainable Design and Construction Statement in order to:

a. achieve the highest sustainable design and construction standards having regard to technical feasibility and economic viability;

b. include measures capable of mitigating and adapting to climate change to meet future needs having regard to technical feasibility and economic viability; and

c. Appendix 3 of the DMD sets out the contents of the Building Energy Assessment in line with the GLA Guidance on producing Building Energy Assessments.

2.6.4 The Edmonton EcoPark Planning Brief Supplementary Planning Document[8] (SPD) expands upon policies in the Local Plan and is a material consideration in planning decisions. The following are relevant:

a. Paragraph 4.2.51 states "*All development will be required to demonstrate high levels of energy efficiency (taking account of both regulated and unregulated energy uses), retrofitting existing installations where practicable and technically feasible, as well as exploring the feasibility of incorporating further Low and Zero Carbon Technologies*"

b. Paragraph 5.2.6 within the SPD sets out the requirement for a Building Energy Assessment for a planning application.

2.6.5 The Draft Decentralised Energy Networks Technical Specification Supplementary Planning Document[9] sets out in Part C the specification for the substation plant room and secondary heating network at commercial

[8] LB Enfield (2013) Edmonton EcoPark Planning Brief Supplementary Planning Document to the Local Plan, May 2013.
[9] LB Enfield (2015) Draft Decentralised Energy Networks Technical Specification Supplementary Planning Document, March 2015.

developments, but is not directly relevant to this Building Energy Assessment.

2.7 Zero carbon buildings

2.7.1 The UK Government's 'Zero Carbon Buildings' policy forms part of the wider strategy for achieving the provisions of the Climate Change Act 2008 (as amended), specifically an 80 per cent CO_2 emission reduction from 1990 levels is targeted by 2050. The three core requirements include:

a. fabric performance must, at a minimum, comply with the Fabric Energy Efficiency Standard (FEES);

b. any CO_2 emissions that remain after consideration of heating, cooling, fixed lighting and ventilation, must be less than or equal to the Carbon Compliance limit established for zero carbon homes; and,

c. any remaining CO_2 emissions, from regulated energy sources (after requirements 1 and 2 have been met), must be reduced to zero through offsetting via 'Allowable Solutions'.

2.7.2 Allowable Solutions will allow off-setting of carbon which cannot be cost-effectively off-set on-site through remote solutions. The specific framework under which Allowable Solutions will operate has not yet[10] been defined.

[10] http://www.zerocarbonhub.org/zero-carbon-policy/allowable-solutions as accessed 22/01/2015

3 Methodology

3.1.1 This section describes the methodology applied to the Building Energy Assessment. It identifies how relevant guidance was applied to ensure that the proposals can meet carbon reductions targets, according to the Energy Hierarchy of the London Plan Policy 5.2 D.

3.2 Relevant guidance

3.2.1 The latest GLA guidance on preparing Building Energy Assessments was published in April 2015[11]. The Project is categorised as a Non-Standard Application because the proposal includes generating energy from residual waste. Key requirements for non-standard applications include:

a. demonstrating that Part L 2013 standards have been met through energy efficiency measures alone. The Building Energy Assessment should only cover buildings which are not exempt from the energy efficiency requirement;

b. demonstrating that heat off-take facilities have been allowed to provide heat to an existing or future district heat network. The requirement is addressed separately in document AD05.06 Combined Heat and Power Development Strategy submitted as part of the Application;

c. select renewable energy solutions which are compatible with the selected heat network solution.

3.2.2 In addition, the document provides specific guidance on the assessment method and reporting format. These requirements have been taken into account in developing the assessment and this report.

3.3 Included buildings

3.3.1 The buildings required to meet Part L 2013 are EcoPark House, the ERF offices and the RRF offices. As shown in the Book of Plans (AD02.01), the ERF offices are integral to the ERF building and located on its northern side. The ERF and RRF operational areas are excluded from the assessment because it is classified as an industrial facility and therefore is exempt from Part L regulations. Table 3.1 identifies the included buildings and their floorspace.

[11] Energy Planning – GLA Guidance on preparing energy assessments. Source: https://www.london.gov.uk/priorities/planning/strategic-planning-applications/preplanning-application-meeting-service/energy-planning-gla-guidance-on-preparing-energy-assessments

Table 3.1: Included Buildings

Building	Short description of purpose	Approximate Gross Internal Area (m^2)	Included in Assessment?
ERF	Industrial building for processing residual waste for energy recovery in the form of heat and power.	N/A	No
ERF offices	Offices associated with administration of the ERF and Eco Park site	4,500	Yes
EcoPark House	A visitor and education centre with offices, and a base for the Edmonton Sea Cadets	1,500	Yes
RRF	Resource Recovery Facility	N/A	No
RRF Offices	Offices and staff area	830	Yes

3.4 Overall approach

3.4.1 The overall approach taken for the Building Energy Assessment comprised the following work elements:

a. a model of the buildings that are required to meet the requirements of Part L 2013 was created. After Part L 2013 was met, further improvements were applied working towards the 35 per cent reduction from the baseline as required by the London Plan.

b. the potential for energy efficient supplies was assessed including the following options:

- the potential for a site-wide district heat network supplied by heat from the ERF;
- the impact of buildings using the low carbon electricity directly from the ERF; and
- feasibility and potential for a site-wide cooling network using absorption cooling;

c. feasibility of on-site renewable and low carbon energy generation was assessed and the potential yields from each viable technology was estimated;

d. preferred options were identified and configured to create a complete energy solution for the Project; and

e. the proposed key energy commitments are summarised.

3.5 Modelling assumptions

3.5.1 The ERF offices, and EcoPark House have been modelled using government approved software[12] in order to establish baseline energy

[12] Integrated Environmental Solutions (IES) 2014 for commercial and retail building calculations

demand and carbon dioxide emission rates. Benchmarks from ERF offices modelling were applied to the RRF offices floor area.

3.6 Carbon factors

3.6.1 The Project is programmed to begin construction around 2019 with EcoPark House and the RRF completed around 2021 and the ERF around 2025. The Project will therefore be subject to Part L 2013, a revised London Plan as well as other local policy yet to be published. An update to the Building Energy Assessment may therefore be required in order to align with the building regulations applicable at the time of construction.

3.6.2 Part L 2013 carbon factors have formed the basis of emission calculations in this Building Energy Assessment. Two sets of updated carbon factors have been published for use with Part L 2013 compliance (both domestic and non-domestic); the three-year carbon factors have been used in the carbon calculations[13] as shown in Table 3.2.

Table 3.2: Carbon emission factors

Item	Carbon Factor ($kgCO_2/kWh$)	Source
Grid Electricity	0.519	Part L 2013 3-year factors
Grid Displaced Electricity	0.519	Part L 2013 3-year factors
Mains Gas	0.216	Part L 2013 3-year factors
Electricity from ERF	0.400	GLA Guidance*
Heat from ERF	0.047	SAP 2012**

*Note on Electricity from ERF – 400gCO_2/kWh figure was used for Energy from Waste in accordance with the London Plan's maximum allowable value for electricity from energy from waste plants[14].

**Note on Heat from ERF – This value was taken from Standard Assessment Procedure (SAP) 2012 under waste combustion emission factor for community heating schemes. This factor is associated with pumping electricity required for the scheme.

3.7 Building Energy Assessment limitations

3.7.1 This Building Energy Assessment provides a strategy for achieving the carbon targets required by legislation and planning policy. The proposed measures are subject to cost benefit analysis and feasibility at detailed design stage.

3.7.2 Due to the time lag between this Application and the beginning of construction, an update may be required to account for updates in building regulations that are expected in 2016 and 2019; this assessment demonstrates the route to zero carbon buildings is possible through the proposed measures.

[13] Department of Energy and Climate Change, Building Research Establishment (2012)The Government's Standard Assessment Procedure for Energy Rating of Dwellings SAP 2012
[14] Mayor of London (2015) Energy Planning – Greater London Authority Guidance on preparing energy assessments, April 2015.

4 Baseline Building Energy Assessment

4.1 Baseline inputs

4.1.1 Appendix A1 includes building envelope performance and system inputs to the Integrated Environmental Solutions software that were required to meet Part L 2013 Target Emissions Rates (TER). The Incinerator Bottom Ash (IBA) bunker was not included in the analysis for the ERF offices. U values, air tightness, and Seasonal Energy Efficiency Ratios (SEERs) for heating and cooling equipment were chosen to comply with Part L(2A) 2013.

4.1.2 The following factors were applied according to the National Calculation Methodology (NCM) for this type of building:

a. occupancy schedule basis; and

b. typical zoning.

4.2 Baseline model outputs

4.2.1 The modelled baseline energy demand for the two buildings is presented in Table 4.1. The Building Regulation UK Part L (BRUKL) reports as evidence of the modelling are provided in Appendix B.

4.2.2 The carbon emissions for regulated and unregulated are presented for the baseline case in Table 4.2. Figure 4.1 presents the breakdown of regulated carbon emissions according to the source of energy consumption: heating, cooling and electricity.

Table 4.1: Baseline energy demand assessment results

	Heating (MWh_{th}/year)	**Cooling (MWh_{th}/year)**	**Regulated Electricity (MWh_e/year)**	**Unregulated Electricity (MWh_e/year)**
Total EcoPark House Baseline	36	7	41	32
Total ERF offices Baseline	139	24	106	174
Total RRF offices Baseline	25	4	19	32
Total Baseline	200	35	166	237

Table 4.2: CO_2 emissions for baseline case

	CO_2 emissions (tCO_2/annum)	
	Regulated	**Unregulated**
Baseline Case	148	123

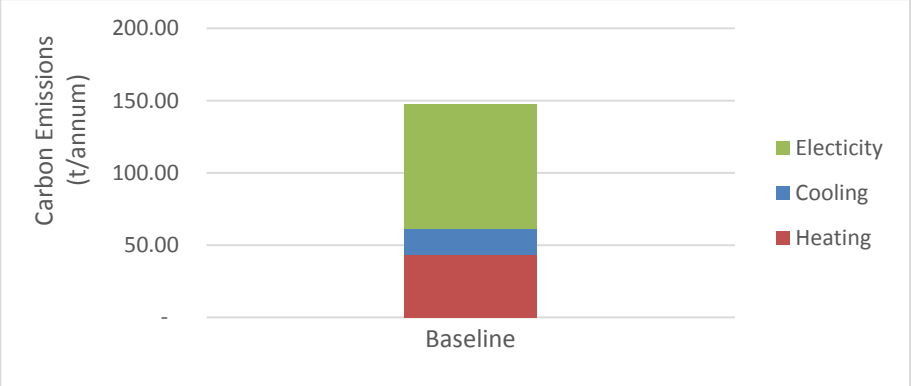


Figure 4.1: Baseline regulated emissions breakdown for heating, cooling and electricity

5 Stage 1: use less energy (Be-Lean)

5.1.1 This section examines the first stage of the Mayor's energy hierarchy for reducing regulated carbon emissions, which involves reducing energy demand through adopting sustainable design principles. The same performance measure improvements have been applied to EcoPark House, ERF offices and RRF offices. This has been split into two sections:

a. passive interventions, which involve performance improvements to passive elements such as the walls, glazing, build quality etc.; and

b. active interventions to maximise the efficiency and type of building services for minimum energy consumption.

5.2 Passive interventions

5.2.1 Optimising passive design is the most effective means, both in carbon and financial terms, of ensuring buildings are inherently low in energy usage by reducing the heating demand and any active cooling requirements. Table 5.1 shows a summary of improvements proposed for façade performance:

Table 5.1: Improved building envelope performance

Item	Baseline U-value (W/m^2K)	Improved U-values (W/m^2K)
External Wall	0.26	0.18
External Glazing	1.60	1.20
Roof	0.18	0.18
Internal partition	1.78	1.78
Internal floor/ceiling	1.09	1.09

5.2.2 The following list covers the approach to passive measures suggested:

a. enhanced thermal envelope performance as proposed above, to reduce the heating and cooling demands for the building;

b. the glazed area of façade would incorporate high efficiency glazing throughout. The glazing performance serves to reduce the heating and cooling energy consumption;

c. passive shading using internal blinds is proposed for all buildings;

d. envelope air tightness would be kept at a stringent value to minimise infiltration heating and cooling energy losses, per the baseline assumptions;

e. daylight penetration into the spaces should be maximised to reduce the need for perimeter lighting requirements;

f. natural ventilation is not proposed for the ERF offices given the proximity of heavy vehicle transit and industrial activities associated with the Ash Bunker located on the ground floor below the offices. The RRF offices would also not apply natural ventilation due to proximity to waste treatment. EcoPark House may apply natural ventilation based on the

outcome of design investigations into any issues affecting the occupant requirements. For energy modelling purposes, mechanical ventilation has been assumed in all cases to simulate a worst case scenario; and

g. thermal mass should be increased, where possible, with increased use of exposed concrete ceilings and columns in order to smooth the heating and cooling demand profiles and improve energy efficiency.

5.3 Active interventions

5.3.1 The improved building systems proposed for the buildings take advantage of energy saving devices and best practice control systems to maximise energy efficiency and reduce demand. Based on mechanical ventilation as suggested for all buildings, the available options include the following measures subject to cost benefit analysis at detailed design stage:

a. passive chilled beam systems with displacement ventilation supplied via a raised floor, as this has been proven to be a highly efficient means of providing free cooling, reducing fan power and active cooling requirements;

b. high efficiency chillers to provide cooling with minimum electrical energy demand;

c. automated lighting controls where appropriate, and including perimeter lighting controls to benefit from natural daylight penetration into the space;

d. smart building control systems with capability to integrate with a wider control network;

e. low energy lighting installations using LED lighting to reduce the overall lighting energy consumption as well as the cooling demand;

f. low pressure drops on the hot water and chilled water pipework systems by designing pipework to 200Pa/m maximum pressure drop;

g. low pressure drops on the air delivery systems resulting in lower system specific fan powers;

h. lower temperature heating systems to interface with future low temperature heat networks and improve the efficiency of any heat supply technology. Suggested temperatures are 50°C for flow and 30°C for return temperatures; and

i. improved active cooling performance through implementation of higher chilled water temperatures. Flow and return temperatures of 10°C and 16°C respectively and higher are suggested where possible.

j. Appendix A2 includes the detailed Improved model input assumptions as used for the Be-lean analysis.

5.4 Unregulated energy

5.4.1 An estimate has been made of the unregulated energy which arises from user equipment and other unregulated uses. At this stage, the assessment was made on the basis of established benchmarks per CIBSE Guide F[15]. However, reduction of unregulated energy is possible and beneficial to reducing carbon emissions, and could be achieved through the use of efficient equipment, building controls and good management practices.

5.5 Conclusions of stage 1: use less energy

5.5.1 The total energy demand following the implementation of the energy reduction measures is outlined in Table 5.2.

5.5.2 The carbon emissions for regulated and unregulated are presented for the baseline case in Table 5.3, while the savings on regulated emissions are presented in Table 5.4. presents the breakdown of regulated carbon emissions according to the source of energy consumption (heating, cooling and electricity), against the baseline.

Table 5.2: Results of energy demand reduction measures

Summary	Heating (MWh_{th}/year)	Cooling (MWh_{th}/year)	Regulated Electricity (MWh_e/year)	Unregulated Electricity (MWh_e/year)
Baseline	200	35	166	238
Demand reduction measures	177	25	154	238
Net Demand change per cent	-11%	-31%	-8%	0%

Table 5.3: Total carbon emissions

	CO_2 emissions (tCO_2/annum)	
	Regulated	**Unregulated**
Baseline Case	148	123
Stage 1 Improved Efficiency	131	123

Table 5.4: Regulated emissions savings

	Regulated CO_2 emissions savings (tCO_2/annum)	
	Tonnes	**per cent saving**
Baseline Case	0	0%
Stage 1 Demand Reduction measures	17	**12%**

[15] CIBSE Guide F: Energy Efficiency In Buildings, 2012

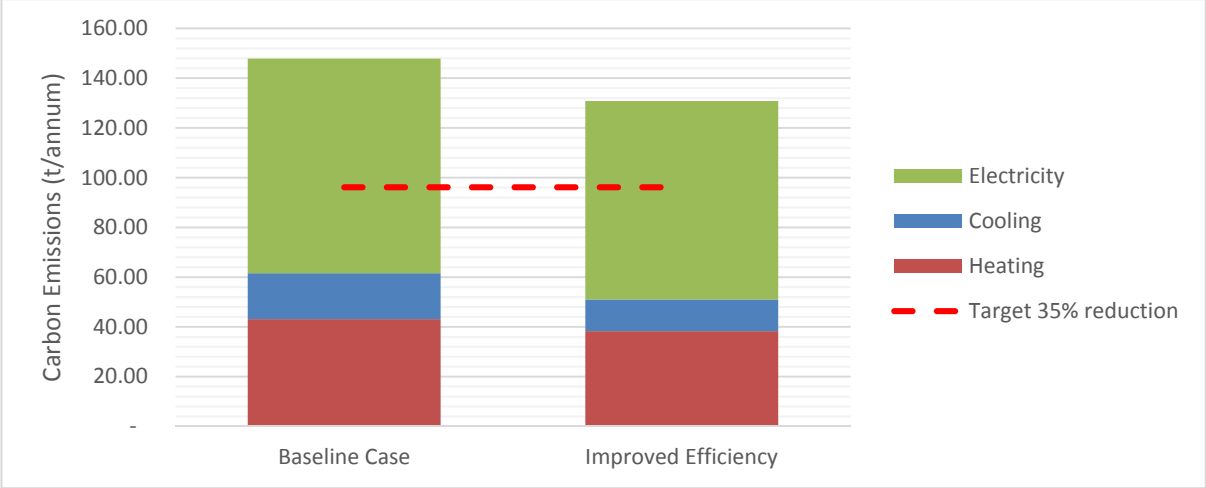


Figure 5.1: Stage 1 regulated carbon emissions breakdown

6 Stage 2: supply energy efficiently (Be-clean)

6.1.1 This section examines the second stage of the Mayor's energy hierarchy. It considers specifically the opportunity for the development of a heat network on the Edmonton EcoPark supplied by heat available from the proposed ERF, a cooling network on the Edmonton EcoPark and the impact of a proposed electricity connection from the ERF.

6.2 Low carbon heat supply

Energy Recovery Facility

6.2.1 As set out in Section 1 of this report the Project includes an ERF which would process residual waste and would allow export of heat and electricity off-site. The ERF is proposed to generate circa 70MW_e (gross) in power only mode, and a proposed heat supply available to supply a district heating network. However, the proposed ERF also provides an opportunity to supply buildings on the Edmonton EcoPark with low carbon heating, cooling and electricity.

Existing and planned heat networks

6.2.2 The Lee Valley Heat Network (LVHN) is being promoted by the London Borough of Enfield and it is understood that the planned heat network could be set to supply around 100GWh of heat to customers in the area. The Applicant is actively working towards an agreement for the supply of heat should the network materialise.

Edmonton EcoPark secondary heat sources

6.2.3 The main opportunity to harvest secondary heat at the Edmonton EcoPark is that generated by the proposed ERF which would be available as a result of the electrical generation process.

6.2.4 A second opportunity would be to harvest heat from the electricity transformers/ substation of the proposed ERF. However, this opportunity was not pursued as a heat off-take from the ERF would be prioritised and pursuing both options was not considered economic.

Edmonton EcoPark heating network

6.2.5 The Application proposes that, should plans for a district heating network(s) go ahead, a heat supply pipeline is provided to connect the proposed ERF to that network(s) to enable heat export from the Edmonton EcoPark. This resource provides the opportunity to establish an internal heat network within the Edmonton EcoPark.

6.2.6 Subject to technical feasibility and cost benefit analysis, the Applicant would endeavour to connect the ERF offices, EcoPark House and RRF offices to an internal heat network as indicatively shown in Figure 6.1 and as follows:

a. the ERF offices are proposed to be supplied from the ERF heat off-take equipment, with pipework running through the ERF building to the office block;

b. EcoPark House and RRF offices would be connected to the proposed heat supply pipeline connecting the ERF to the District Heating Energy Centre (DHEC). This heat off-take would be before the DHEC.

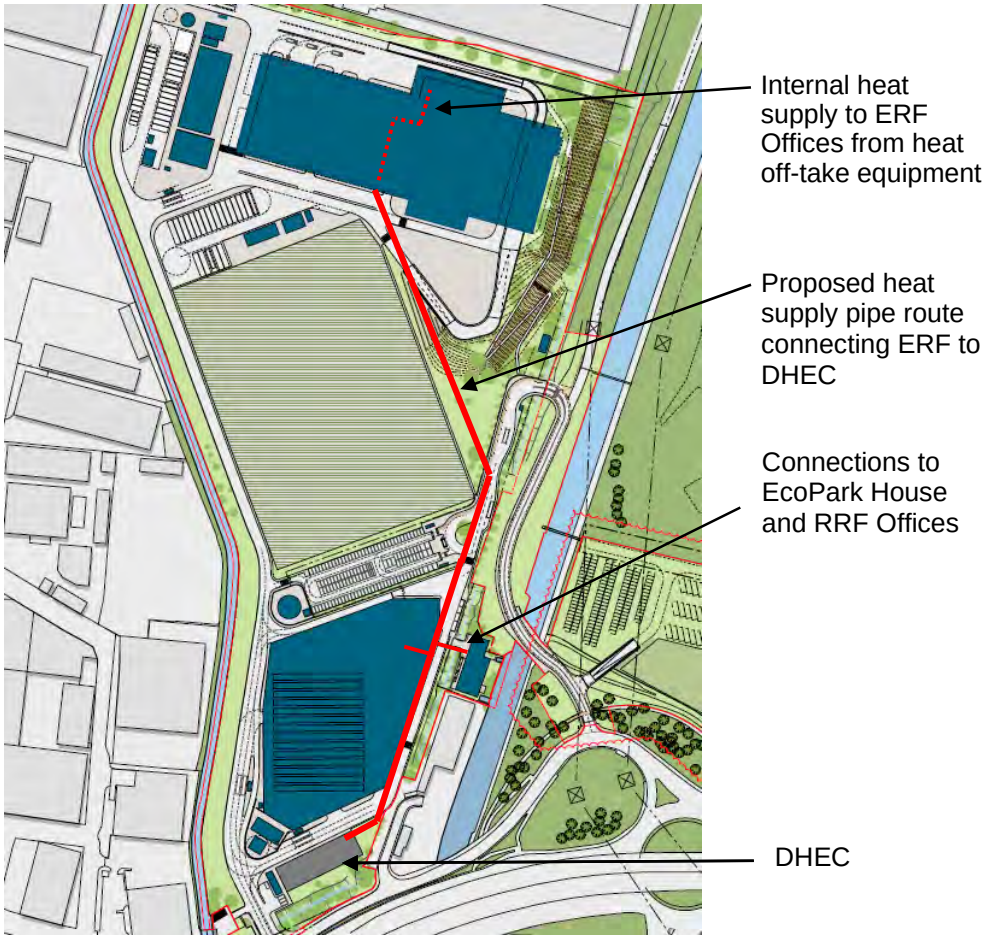


Figure 6.1: Proposed heat network indicative routing

6.3 Low carbon cooling supply

6.3.1 Should a heat network from the proposed ERF be developed, heat demand in summer months will be considerably lower than in winter and there may be an opportunity to harvest excess heat for use in a cooling network. Subject to feasibility and cost benefit analysis, a low carbon cooling system is proposed by use of absorption chillers to supply the ERF offices. A SEER of 0.7 was used in the assessment of efficient energy supplies.

6.3.2 Due to the low projected cooling demand of EcoPark House and RRF offices, a cooling network connecting them to the ERF was not considered.

6.4 Efficient electrical supply

6.4.1 The existing EfW facility currently supplies low carbon electricity to the through an electrical network serving the Edmonton EcoPark only ('private wire'). As proposed in the Utility Strategy (AD05.10) a private wire arrangement (site wide electrical network) would also provide a connection

between the proposed ERF and associated development on the Edmonton EcoPark, prior to exporting electricity to the grid.

6.5 Conclusions for stage 2: supply energy efficiently

6.5.1 Subject to feasibility and cost benefit analysis, the Edmonton EcoPark is proposed to a have a local heat network supplied by the proposed ERF heat offtake and a private wire arrangement from the ERF supplying electrical power to the Edmonton EcoPark. By using both these supplies, emissions associated from both regulated and unregulated energy would be significantly reduced. Calculations were also made to ensure that if a heat network was not deemed feasible the Project would still meet the 35 per cent below Part L 2013 target:

a. if all buildings were connected to the heat network on the Edmonton EcoPark then cumulative saving after stage 2 would be 49 per cent below Part L 2013; and

b. assuming it is considered unfeasible to connect EcoPark House and RRF Offices the cumulative saving would be 42 per cent, 7 per cent less than with a heat network on the Edmonton EcoPark. This result still assumes that there is off-take within the ERF facility to supply the ERF offices with heat.

6.5.2 A site-wide cooling network serving the Edmonton EcoPark was not considered necessary or economical for this network given the small cooling load at EcoPark House and RRF Offices. However, subject to cost benefit analysis, the ERF offices are proposed to include a low carbon cooling supply via absorption chillers and a heat connection from the ERF heat off-take, making use of the excess heat available during the summer months.

6.5.3 Table 6.1 and Table 6.2 and show the results from Stage 3. Figure 6.3 illustrates the energy strategy at this Stage.

Table 6.1: Emission savings from an efficient supply

	CO_2 emissions (tCO_2/annum)	
	Regulated	**Unregulated**
Baseline Case	148	123
Stage 1 Improved Efficiency (Be lean)	131	123
Stage 2 Efficient Energy Supply (Be clean)	76	95

Table 6.2: Regulated CO_2 savings

	Regulated CO_2 emissions savings (tCO_2/annum)	
	Tonnes	**Per cent saving**
Baseline Case	0	0%
Stage 1 Improved Efficiency (Be Lean)	19	12%
Stage 2 Efficient Energy Supply (Be clean)	55	42%
Cumulative Stage 1 and Stage 2 Savings	72	49%

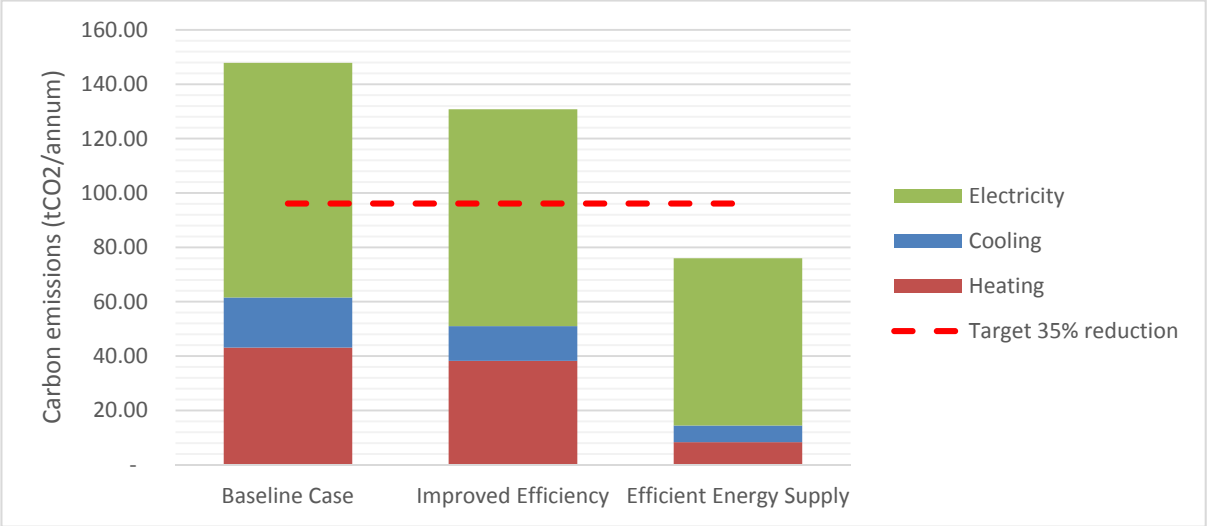


Figure 6.2: Stage 2 regulated emissions breakdown for heating, cooling and electricity

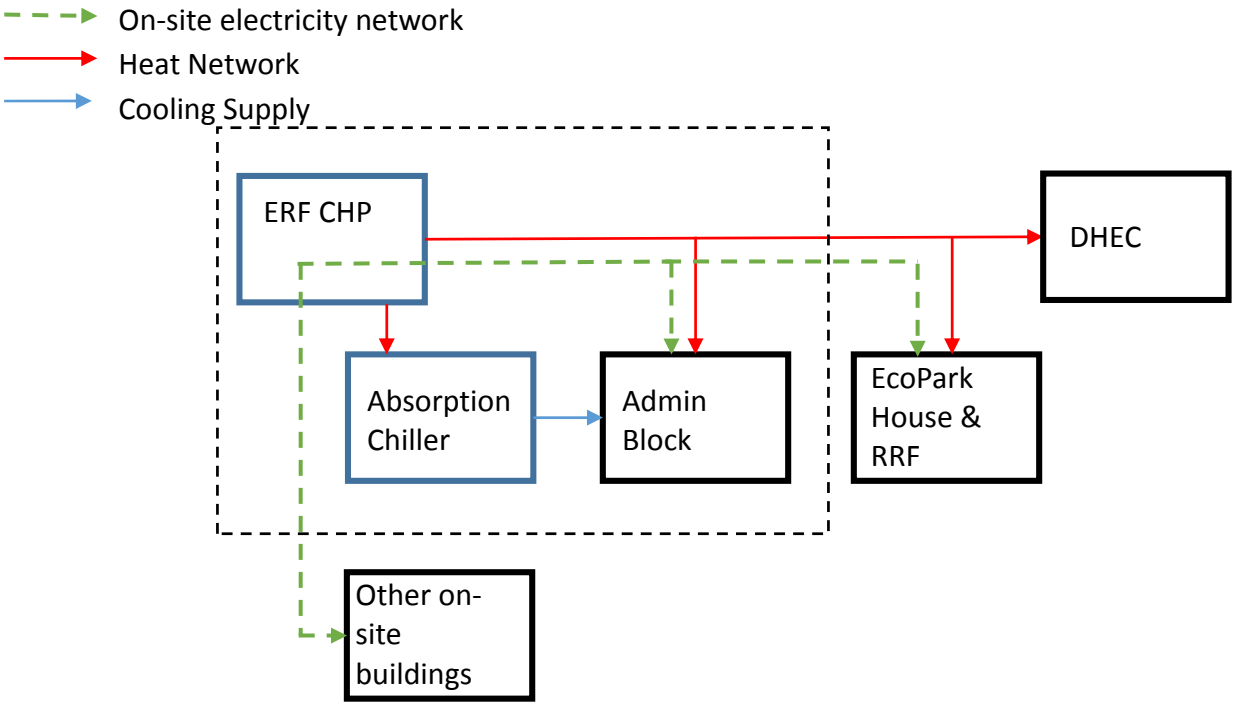


Figure 6.3: Block diagram illustrating efficient energy supply

7 Cooling and overheating

7.1.1 This section looks at the cooling and overheating analysis. The cooling hierarchy described follows that of Policy 5.9 of the London Plan.

7.2 Cooling hierarchy and proposed measures

Minimising internal heat generation through energy efficient design

7.2.1 Measures suggested in all buildings include an energy efficient lighting system to minimise internal gains; automated lighting controls; high efficiency chillers and a passive chilled beam system with displacement ventilation as a means of providing free cooling.

Reducing the amount of heat entering the building in summer

7.2.2 Internal blinds on the south facing façades are suggested on all buildings and high efficiency glazing incorporated throughout.

7.2.3 The ERF offices are oriented on the north side of the ERF main building and as such receive shading from the main building, minimising solar gains with majority north facing glazing.

7.2.4 EcoPark House has a proposed glazing shading system which would limit solar gain.

Use of thermal mass and high ceilings to manage heat within the building

7.2.5 Enhanced thermal envelope measures to improve performance for all buildings are suggested in order to reduce cooling demand, including the use of exposed ceilings and columns used where possible to smooth heating and cooling demand profiles.

Passive ventilation

7.2.6 Natural ventilation is not considered in this assessment for the ERF offices given the proximity of heavy vehicle transit and industrial activities associated with the IBA Bunker located on the ground floor below the offices. The RRF offices would also not apply natural ventilation due to the proximity to waste treatment. EcoPark House may apply natural ventilation based on the outcome of design investigations into any issues affecting the occupant requirements. However this report is based on the assumption of mechanical ventilation and active cooling for all buildings.

Mechanical ventilation

7.2.7 The mechanical ventilation system will be controlled by the Building Management System to optimise flow depending on internal and external conditions.

7.3 Cooling and overheating

7.3.1 Overheating analysis was not required given that all of the buildings use active cooling. Active cooling is required because natural ventilation was not considered feasible due to the proximity of heavy vehicle transit and associated industrial activities near all of the buildings.

7.4 Active cooling demand

7.4.1 Table 7.1 shows the active cooling requirement was reduced by approximately 16 per cent from the notional building.

Table 7.1: Summary of active cooling energy demand

	Cooling Demand (MJ/m^2)	
	Notional	**Actual**
ERF Office	4.5	4
Eco Park House	2.0	5.2
RRF Offices	4.5	4
Total	11.0	13.2

8 Stage 3: use renewable energy (Be-green)

8.1.1 This section examines the third of the Mayor's energy hierarchy for reducing carbon emissions through the use of renewable energy on the Edmonton EcoPark. Given the phasing of construction (beyond 2020) the Edmonton EcoPark will potentially need to consider offsetting any remaining CO_2 emissions after Stages 1 and 2 under the 'Zero Carbon Buildings' policy outlined in Section 2.7.

8.1.2 Table 8.1 summarises the technologies which have been assessed for feasibility and which are proposed for the Edmonton EcoPark. This is followed by individual discussions of each technology.

Table 8.1: Summary of renewable energy options considered and assessment.

Technology	Feasible?	Key issues / risks	For further consideration
Solar Thermal	✓	Would not be appropriate if there is a site-wide district heat network.	✗
Solar PV	✓	Roof space required.	✓
Ground source heat pumps	✓	Could be feasible but would not be appropriate if there is a site-wide district heat network.	✗
Air source heat pumps	✓	Large surface area required, low coefficient of performance. Would not be appropriate if there is site-wide heat network.	✗
Water source heat pumps from River Lee Navigation	✗	Has the potential to decarbonise cooling of the development but is dependent on third party consent and access and not correlated to demand.	✗
Biomass heating	✓	Not considered appropriate given the proposed use of site-wide network and that the facility already processes municipal waste in the ERF.	✗
Biomass CHP	✓	Not considered appropriate given the proposed use of site-wide network and that the facility already processes municipal waste in the ERF.	✗
Secondary heat	✓	Secondary heat from transformers may be available from ERF substation, but may not be feasible given high cost of integrating this system (see Stage 2); and are a competing technology with district heating as proposed.	✗
Wind	✓	Considerable space required that may be used for a later development and likely that turbulence caused by surrounding tall buildings would make a wind turbine unfeasible.	✗

8.2 Proposed renewable generation

Photovoltaic panels

8.2.1 Solar PV modules are an established technology with the capability of integrating readily into a number of different site-wide energy strategies regardless of the heating or cooling strategy chosen. Further considerations regarding solar PV are:

a. the mean lifetime for inverters is 10-15 years. As these represent up to 25 per cent of installed cost, the owner of the building would need to set aside monies to cover replacement costs of this equipment; and

b. PV solar panels need to be cleaned periodically and therefore staff and resources would need to be made available over the lifetime of the installation.

8.2.2 The Project makes provision for installation of PV solar panels on the roofs of the ERF and the RRF buildings. A study carried out by AMEC (Appendix C) estimated that for panels at a 20° tilt with appropriate spacing, 66 kWh/m^2 could be produced[16]. Based on these values, 2,220m^2 of available roof area would be required to completely offset regulated emissions. Panels over this area could provide a peak output of approximately 160kW_e. Further details on PV solar calculations and assumptions are included in Appendix C

8.2.3 The total potential area available for PV installations is up to 8,800m^2, as shown on Figure 8.1 and included on relevant drawings in the Book of Plans.

[16] AMEC Foster Wheeler (2015) North London Heat and Power Project – Solar Assessment, March 2015

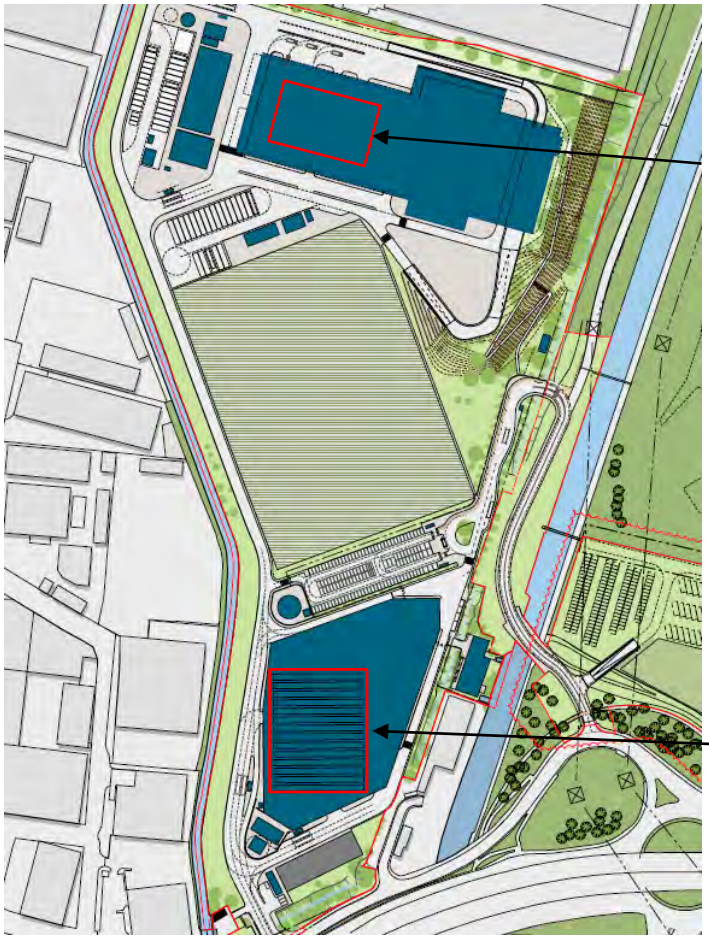


Figure 8.1: Potential areas for solar PV

8.3 Technologies not proposed

Solar thermal

8.3.1 Solar thermal energy is a proven, low-cost renewable heat technology. Its traditional application is for domestic hot water heating and it is normally paired with another higher temperature heat source such as gas to achieve target water temperatures. Solar thermal heating is generally considered a technology suitable solely for a building-by-building assessment, and would compete with the site-wide heating network. However, should the phasing of the heat network or other technical reasons not allow the preferable low carbon heating connection to EcoPark House, solar thermal would be a good alternative for hot water generation.

Ground source heating and cooling

8.3.2 The relatively constant year-round temperature of the ground makes it a possible heat source and heat sink to which a heat pump could be coupled to amplify its heating/cooling capacity. Coupling is achieved via a buried closed loop pipe circuit through which water is circulated, either in dedicated vertical boreholes or horizontal trenches, or as part of the structural piles of the building. Ground source heat pumps were deemed unnecessary for the Edmonton EcoPark given the potential for a site-wide heat network.

Air source heating and cooling

8.3.3 This is a similar technology to ground source heat pumps but it uses the air as a heat source instead of the ground. This means that the performance of the heat pump would vary according to the external conditions but avoids the need to provide a heat balance as is often required with ground source heat pumps. Units are now available that can provide simultaneous heating and cooling with a typical Seasonal Coefficient of Performance modelled of 3.0. The use of air source heat pumps was deemed unnecessary given the potential for a site-wide heat network.

Water source heating and cooling

8.3.4 The River Lee Navigation offers the potential for water as a third source of heating or cooling which could be harvested with a heat pump. A water source heat pump would use the relatively constant temperature of the river as a heat source and sink to amplify its heating and/or cooling capacity.

8.3.5 To apply this technology, permission would be required from the Environment Agency and the Canal and River Trust. The low flow rate of the River Lee Navigation presents a potential risk of overheating the water beyond limits acceptable by the river ecosystem. This option has therefore been ruled out.

Biomass heating and CHP

8.3.6 Biomass boilers and CHP units are normally supplied in the form of wood chips or wood pellets. There are numerous suppliers for each fuel around London, with the number of suppliers growing as the demand increases. Biomass boilers are typically slightly larger than gas boilers of equivalent size, but a significant additional volume is required for fuel storage on-site.

8.3.7 Given the priority to connect to the site heat network, this technology was ruled out. This is because any additional heat supplied through biomass would compete with the heat network and no further heat supply is required.

Wind power

8.3.8 Wind turbines are generally less suitable in urban environments such as the location of the Project, as the wind speed may be lower and more disrupted than on a similar site in a rural location.

8.3.9 Wind turbines have been ruled out due to logistics and space requirements due to limiting the area available for construction and the height of any proposed development in the future. In addition, surrounding buildings would increase turbulence and reduce the yield of the wind turbine which would render the system uneconomic.

8.4 Renewable technology integration

8.4.1 The assessment indicates a variety of renewable energy technologies which would be feasible for the Project. However, only solar PV have been proposed given the remaining technologies compete with the ERF heat supply and there being no further heat requirement.

8.4.2 Figure 8.2 illustrates the proposed strategy with solar PV subject to feasibility and cost benefit analysis; to be reviewed at detailed design stage.

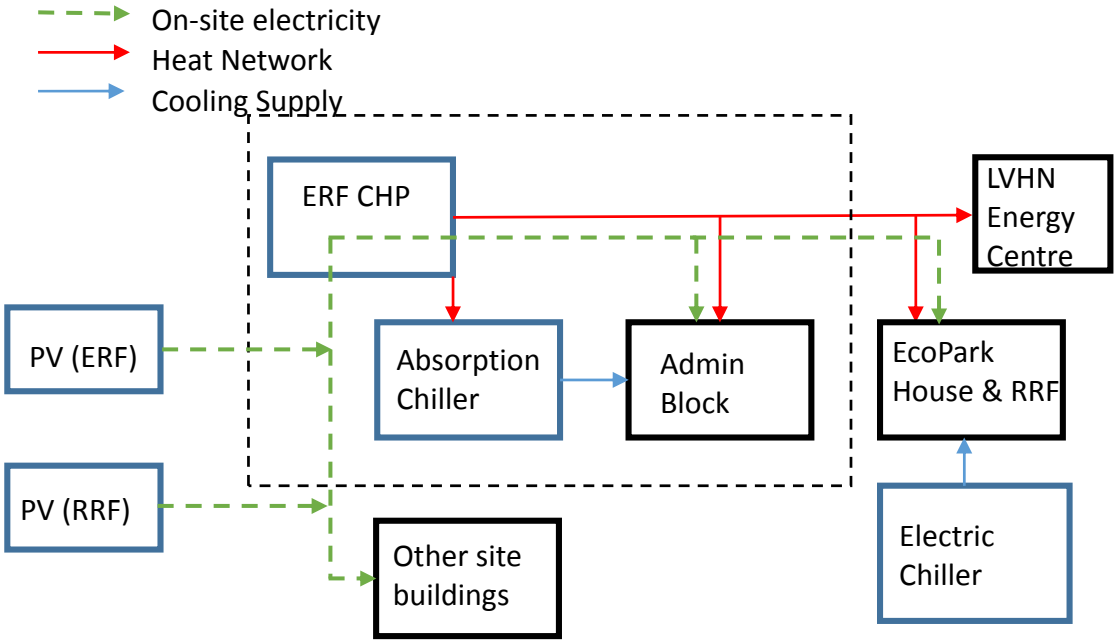


Figure 8.2: Potential energy supplies

8.5 Conclusions for stage 3: using renewable energy

8.5.1 Subject to cost benefit analysis, the Project proposes use of roof mounted solar PV panels. An area of around 2,200m^2 would offset regulated emissions resulting in a carbon saving of 76 tonnes per annum. This saving would completely offset regulated emissions and ensure that buildings meet zero carbon legislation.

8.5.2 The results from this stage are summarised in the following tables and figures (Table 8.2, Table 8.3 and Figure 8.3):

Table 8.2: Regulated and unregulated emissions

	CO_2 emissions (tCO_2/annum)	
	Regulated	Unregulated
Baseline Case	148	123
Stage 1 Improved Efficiency	145	123
Stage 2 Efficient Energy Supply	76	95
Stage 3 Renewable Energy	-	95

Table 8.3: Regulated CO_2 savings after renewable energy

	Regulated CO_2 emissions savings (tCO_2/annum)	
	Tonnes	per cent saving
Baseline Case	0	0%
Stage 1 Improved Efficiency	17	12%
Stage 2 Efficient Energy Supply	55	42%
Stage 3 Renewable Energy	76	100%
Cumulative Savings	148	100%

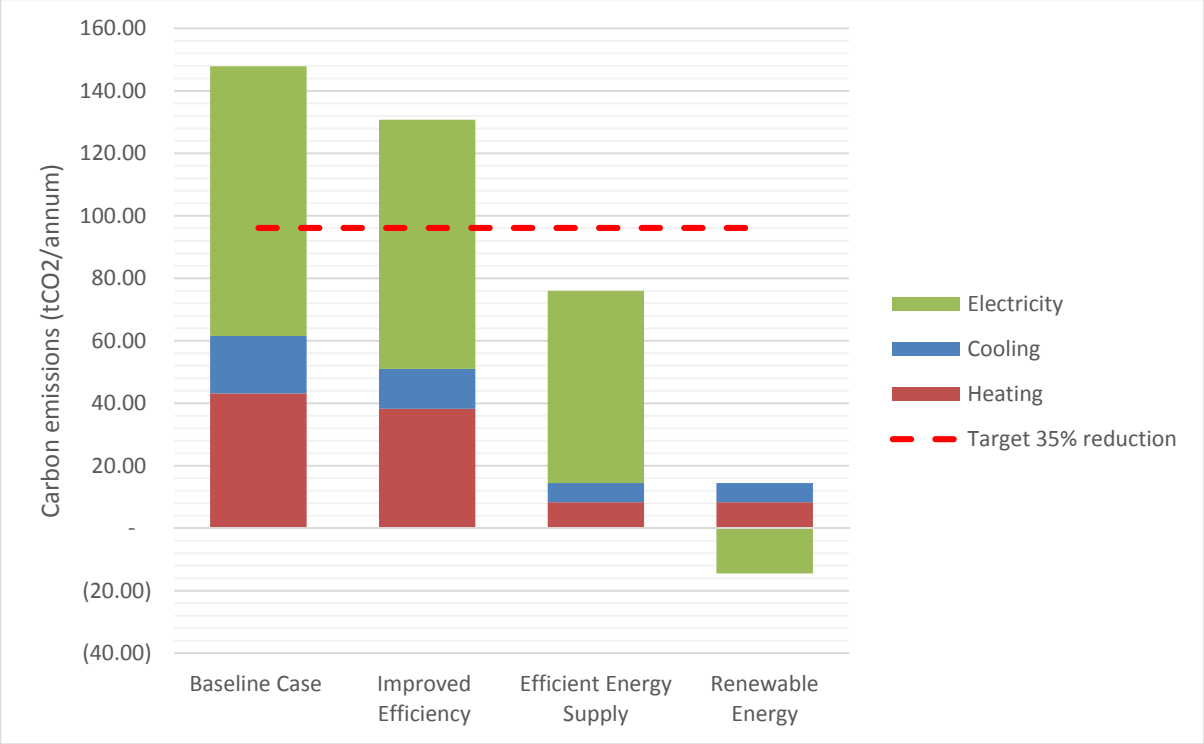


Figure 8.3: Summary chart of regulated CO2 emissions savings per source of energy consumption

9 Conclusions

9.1.1 The Building Energy Assessment for the buildings on the Edmonton EcoPark required for the Project assesses potential measures that meet the current London Plan carbon reduction target of 35 per cent below Part L 2013 requirements.

9.1.2 Measures under be-lean (Stage 1) provide a 12 per cent reduction in carbon emission from the baseline.

9.1.3 Measures under be-clean (Stage 2) provide a 42 per cent saving on regulated emissions and exceeds the current London Plan Target with cumulative savings of 49 per cent below the Part L 2013 baseline.

9.1.4 Under be-green (Stage 3), the renewable energy technology is solar PV panels, mounted on available rooftop space of the proposed ERF and RRF buildings subject to cost-benefit analysis, and integrated via a proposed on-site electrical network. It was calculated that annual emissions remaining after Stage 2 could be completely offset by using 2,220m^2 of roof area for photovoltaic panels which has been allowed for in the Application.

9.1.5 The technology mix and assumptions on performance specifications used for this assessment provide proof that the development can meet the carbon reduction targets; however, these could be varied while still meeting the carbon reduction targets. For example, the final design could include a higher amount of solar PV panels, but use an electric chiller instead of an absorption chiller in the ERF offices. It is for this reason that the Applicant will endeavour to meet a specific carbon emissions target rather than a specific design or technology solution.

9.1.6 The Applicant will endeavour to meet the carbon reduction targets at the time of construction of the included buildings. The measures assessed can be realised by the Project. All the measures considered in this assessment have been tested in the design development and provide a strategy to achieve Zero Carbon Building targets (on net regulated energy consumption). However, the measures are subject to cost benefit analysis and feasibility at detailed design stage. Amendments emerging at detailed design and due to updates in carbon reduction targets would be addressed though a detailed submission in accordance with the Requirements of the Order.

Appendix A: Detailed energy model inputs

A1 Baseline input assumptions

A1.1.1 The following tables include the baseline energy model inputs per SAP 2012 required to meet Part L 2013.

Table 9.1: Building envelope performance

Item	U-value (W/m^2K)
External Wall	0.26
External Glazing	1.60
Roof	0.18
Internal partition	1.78
Internal floor/ceiling	1.09

Table 9.2: Glazing as a percentage of facade area

Building	Glazing as a percentage of façade area
ERF offices	36 %
EcoPark House	35 %

Table 9.3: System performance inputs

Item	Value/Input
Ventilation	
Main system type	Fan Coil Unit (FCU)
Air permeability	3 $m^3/(h.m^2)$
System Specific Fan Power (SFP)	1.6 W/(l/s)
Gas Boiler Heating	
Heating seasonal efficiency (SEER)	0.81
Heat recovery type	Thermal wheel
Heat recovery efficiency	0.80
Cooling	
Cooling/ventilation system	Centralised air conditioning
Air cooled chiller SEER	4
Auxiliary Energy	
Pump type	Variable speed multiple pressure sensors

A2 Improved model input assumptions

A2.1.1 The following input assumptions were made for the Improved model (Be-lean):

Table 9.4: Improved building system specifications

Item	Baseline Systems	Improved Systems
Ventilation		
Main system type	Fan Coil Unit (FCU)	Passive chilled beam with free cooling
Specific Fan Power (SFP)	1.6 W/(l/s)	1.6 W/(l/s)
Heating		
Heating seasonal efficiency (SEER)	0.81	0.91
Heat recovery type	Thermal wheel	Thermal wheel
Heat recovery efficiency	0.80	0.80
Cooling		
Cooling/ventilation system	Centralised air conditioning	Centralised air conditioning
Air cooled chiller SEER	4	6
Auxiliary Energy		
Pump type	Variable speed multiple pressure sensors	Variable speed multiple pressure sensors

Appendix B: Modelling output BRUKL reports

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

ERF Offices Baseline — As designed

Date: Tue Mar 03 16:18:30 2015

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.2

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.2

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	20.9
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	SH000000:Surf[2]
Floor	0.25	0.22	0.22	SH000000:Surf[0]
Roof	0.25	0.18	0.18	RM000004:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.58	1.6	SH000000:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

2.b Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	3.2	0	1.6	0.8
Standard value	0.91*	2.55	N/A	1.6	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Offices (G)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Changing Room and Plant (G)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Offices (G)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Reception (G)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
Circulation (G)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
Cafe and seating area (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Office (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Plant and mixed use area (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Cafe and seating area (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Plant and mixed use area (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Office (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Meeting rooms (L3)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
Circulation (L3)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Plant and mixed use area (L3)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Circulation area (L3)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Plant (L4)	-	-	-	0.4	-	-	-	1.6	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Offices (G)	54	-	-	2651
Changing Room and Plant (G)	-	62	-	2402
Offices (G)	41	-	-	4594
Unknown (G)	-	68	-	546
Reception (G)	-	81	15	437
Circulation (G)	-	67	-	2727
Cafe and seating area (L1)	-	62	-	2248
Unknown (L1)	-	68	-	546
Office (L1)	41	-	-	12049
Plant and mixed use area (L1)	-	64	-	2075
Cafe and seating area (L2)	-	62	-	2248
Plant and mixed use area (L2)	-	64	-	2075
Office (L2)	41	-	-	12049
Unknown (L2)	-	68	-	546
Meeting rooms (L3)	42	-	-	5659
Circulation (L3)	-	75	-	1769
Plant and mixed use area (L3)	-	66	-	2541
Unknown (L3)	-	62	-	963
Circulation area (L3)	-	76	-	456
Plant (L4)	-	60	-	2028

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Offices (G)	NO (-71.3%)	YES
Changing Room and Plant (G)	N/A	N/A
Offices (G)	NO (-77.6%)	YES
Reception (G)	NO (-74.8%)	YES
Circulation (G)	N/A	N/A
Cafe and seating area (L1)	NO (-73.4%)	YES
Office (L1)	NO (-76%)	YES
Plant and mixed use area (L1)	N/A	N/A
Cafe and seating area (L2)	NO (-73.4%)	YES
Plant and mixed use area (L2)	N/A	N/A
Office (L2)	NO (-75.7%)	YES
Meeting rooms (L3)	NO (-75.4%)	YES
Circulation (L3)	NO (-47.1%)	YES
Plant and mixed use area (L3)	N/A	N/A
Circulation area (L3)	N/A	N/A
Plant (L4)	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	5963.8	5963.8
External area [m²]	5766	5766
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	2456.19	2275.13
Average U-value [W/m²K]	0.43	0.39
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.26	6.16
Cooling	5.3	4.5
Auxiliary	11.29	11.96
Lighting	11.68	12.59
Hot water	27.19	22.99
Equipment*	38.42	38.42
TOTAL**	**58.71**	**58.2**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	68.81	80.53
Primary energy* [kWh/m²]	121.75	122.5
Total emissions [kg/m²]	20.9	21

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	9.4	65.7	3.6	5.8	12.3	0.73	3.16	0.81	4
	Notional	20.9	67	6.7	4.9	13.1	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	SH000000:Surf[2]
Floor	0.2	0.22	SH000000:Surf[0]
Roof	0.15	0.18	RM000004:Surf[0]
Windows, roof windows, and rooflights	1.5	1.2	RM000009:Surf[2]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

EcoPark House Baseline — As designed

Date: Tue Mar 03 16:36:27 2015

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.2

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.2

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.4
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.4
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	21.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.26	0.26	GR000001:Surf[1]
Floor	0.25	0.22	0.22	GR000001:Surf[0]
Roof	0.25	0.18	0.18	GR000003:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.68	2.21	1S000005:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

2.b Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Main system

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	3.2	0	1.6	0.8
Standard value	0.91*	2.55	N/A	1.6	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
lecture theatre	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Cafe	-	-	-	0.4	-	-	-	1.6	-	-	N/A
plant room	-	-	-	0.4	-	-	-	1.6	-	-	N/A
kayak area	-	-	-	0.4	-	-	-	1.6	-	-	N/A
First aid room and locker room	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Exhibition Hall (G)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
meeting room (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Storage arrea (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
classrooms for cadets (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Meeting room 2 (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Flexible space (L1)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
Classrooms for cadets (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Shower, changing room (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Secure Storage (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Circulation space (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Flexible Space (L2)	-	-	-	0.8	-	-	-	1.6	-	-	N/A
Plant & cadet plant space (L2)	-	-	-	0.4	-	-	-	1.6	-	-	N/A
Equipment Storage (L1)	-	-	-	1.5	-	-	-	1.6	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Circulation space (L1)	-	-	-	0.4	-	-	-	1.6	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
lecture theatre	44	-	-	1320
Cafe	-	64	-	593
plant room	-	66	-	482
kayak area	-	60	-	718
First aid room and locker room	-	77	-	300
Exhibition Hall (G)	-	63	-	1114
meeting room (L1)	47	-	-	630
Storage arrea (L1)	-	77	-	172
classrooms for cadets (L1)	45	-	-	1125
Meeting room 2 (L1)	53	-	-	263
Flexible space (L1)	-	61	-	1625
Classrooms for cadets (L1)	44	-	-	1013
Shower, changing room (L2)	-	73	-	400
Secure Storage (L2)	-	75	-	130
Circulation space (L2)	-	72	-	209
Flexible Space (L2)	-	59	-	1414
Plant & cadet plant space (L2)	42	-	-	2186
Equipment Storage (L1)	-	90	-	73
Circulation space (L1)	-	73	-	166

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
lecture theatre	N/A	N/A
Cafe	NO (-72.8%)	YES
plant room	N/A	N/A
kayak area	N/A	N/A
First aid room and locker room	N/A	N/A
Exhibition Hall (G)	NO (-68.9%)	YES
meeting room (L1)	NO (-62.1%)	YES
Storage arrea (L1)	N/A	N/A
classrooms for cadets (L1)	NO (-82.7%)	YES
Meeting room 2 (L1)	NO (-62.6%)	YES
Flexible space (L1)	YES (+51.3%)	YES
Classrooms for cadets (L1)	NO (-54.6%)	YES
Shower, changing room (L2)	N/A	N/A
Secure Storage (L2)	N/A	N/A
Circulation space (L2)	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Flexible Space (L2)	NO (-60.7%)	YES
Plant & cadet plant space (L2)	NO (-65.1%)	YES
Equipment Storage (L1)	N/A	N/A
Circulation space (L1)	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1731.5	1731.5
External area [m²]	2773.5	2773.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1392.49	1386.03
Average U-value [W/m²K]	0.5	0.5
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	15.1	22.69
Cooling	4.62	5.2
Auxiliary	17.54	15.91
Lighting	9.45	8.35
Hot water	8.72	7.37
Equipment*	20.94	20.94
TOTAL**	**55.42**	**59.52**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	92.32	141.35
Primary energy* [kWh/m²]	123.65	124.86
Total emissions [kg/m²]	21.1	21.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	39.9	52.5	15.1	4.6	17.5	0.73	3.16	0.81	4
	Notional	70.4	70.9	22.7	5.2	15.9	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.26	GR000001:Surf[1]
Floor	0.2	0.22	GR000001:Surf[0]
Roof	0.15	0.18	GR000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.6	GR000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

ERF Offices Improved — As designed

Date: Tue Mar 03 16:19:24 2015

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.2

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.2

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.4
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	SH000000:Surf[2]
Floor	0.25	0.22	0.22	SH000000:Surf[0]
Roof	0.25	0.18	0.18	RM000004:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	SH000000:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.

** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

*** Display windows and similar glazing are excluded from the U-value check.

N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

2.b Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Chilled beam

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	1.3	0.8
Standard value	0.91*	2.55	N/A	1.6	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**Luminous efficacy [lm/W]**			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Offices (G)	54	-	-	2651
Changing Room and Plant (G)	-	62	-	2402
Offices (G)	41	-	-	4594
Unknown (G)	-	68	-	546
Reception (G)	-	81	15	437
Circulation (G)	-	67	-	2727
Cafe and seating area (L1)	-	62	-	2248
Unknown (L1)	-	68	-	546
Office (L1)	41	-	-	12049
Plant and mixed use area (L1)	-	64	-	2075
Cafe and seating area (L2)	-	62	-	2248
Plant and mixed use area (L2)	-	64	-	2075
Office (L2)	41	-	-	12049
Unknown (L2)	-	68	-	546
Meeting rooms (L3)	42	-	-	5659
Circulation (L3)	-	75	-	1769
plant and mixed use area (L3)	-	66	-	2541
Unknown (L3)	-	62	-	963
Circulation area (L3)	-	76	-	456
Plant (L4)	-	60	-	2028

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Offices (G)	NO (-8%)	YES
Changing Room and Plant (G)	N/A	N/A
Offices (G)	NO (-15.7%)	YES
Reception (G)	NO (-26.6%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Circulation (G)	N/A	N/A
Cafe and seating area (L1)	NO (-14.9%)	YES
Office (L1)	NO (-19.7%)	YES
Plant and mixed use area (L1)	N/A	N/A
Cafe and seating area (L2)	NO (-14.9%)	YES
Plant and mixed use area (L2)	N/A	N/A
Office (L2)	NO (-18.9%)	YES
Meeting rooms (L3)	NO (-15.5%)	YES
Circulation (L3)	NO (-47.1%)	YES
plant and mixed use area (L3)	N/A	N/A
Circulation area (L3)	N/A	N/A
Plant (L4)	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	5963.8	5963.8
External area [m²]	5766	5766
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1978.55	2275.13
Average U-value [W/m²K]	0.34	0.39
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.57	6.16
Cooling	4	4.5
Auxiliary	6.87	11.96
Lighting	11.68	12.59
Hot water	24.2	22.99
Equipment*	38.42	38.42
TOTAL**	**50.33**	**58.2**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	89.99	80.53
Primary energy* [kWh/m²]	101.39	122.5
Total emissions [kg/m²]	17.4	21

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Chilled ceilings or passive chilled beams and displacement ventilation, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Elect										
	Actual	11.2	87	3.9	4.4	7.5	0.8	5.53	0.91	6
	Notional	20.9	67	6.7	4.9	13.1	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	SH000000:Surf[2]
Floor	0.2	0.22	SH000000:Surf[0]
Roof	0.15	0.18	RM000004:Surf[0]
Windows, roof windows, and rooflights	1.5	1.2	SH000000:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

EcoPark House Improved — As designed

Date: Fri Mar 06 10:17:10 2015

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.2

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.2

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building should not exceed the target

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.4
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.4
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.4
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and the building services should achieve reasonable overall standards of energy efficiency

Values which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	GR000001:Surf[1]
Floor	0.25	0.22	0.22	GR000001:Surf[0]
Roof	0.25	0.18	0.18	GR000003:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	GR000002:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

2.b Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- Chilledbeams

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	1.6	0.8
Standard value	0.91*	2.55	N/A	1.6	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	**Luminous efficacy [lm/W]**			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
lecture theatre (G)	44	-	-	1320
Cafe (G)	-	64	-	593
plant room (G)	-	66	-	482
kayak area (G)	-	60	-	718
First aid room and locker room (G)	-	77	-	300
Exhibition Hall (G)	-	63	-	1114
meeting room (L1)	47	-	-	630
Storage arrea (L1)	-	77	-	172
classrooms for cadets (L1)	45	-	-	1125
Meeting room 2 (L1)	53	-	-	263
Flexible Space (L1)	-	61	-	1625
Classrooms for cadets (L1)	44	-	-	1013
Shower, changing room (L2)	-	73	-	400
Secure Storage (L2)	-	75	-	130
Circulation space (L2)	-	72	-	209
Flexible Space (L2)	-	59	-	1414
Plant & cadet plant space (L2)	42	-	-	2186
Equipment Storage (L1)	-	90	-	73
Circulation space (L1)	-	73	-	166

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
lecture theatre (G)	N/A	N/A
Cafe (G)	NO (-71%)	YES
plant room (G)	N/A	N/A
kayak area (G)	N/A	N/A
First aid room and locker room (G)	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Exhibition Hall (G)	NO (-66.8%)	YES
meeting room (L1)	NO (-59.5%)	YES
Storage arrea (L1)	N/A	N/A
classrooms for cadets (L1)	NO (-81.5%)	YES
Meeting room 2 (L1)	NO (-60.2%)	YES
Flexible Space (L1)	NO (-68.3%)	YES
Classrooms for cadets (L1)	NO (-51.6%)	YES
Shower, changing room (L2)	N/A	N/A
Secure Storage (L2)	N/A	N/A
Circulation space (L2)	N/A	N/A
Flexible Space (L2)	NO (-58.1%)	YES
Plant & cadet plant space (L2)	NO (-62.9%)	YES
Equipment Storage (L1)	N/A	N/A
Circulation space (L1)	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1731.5	1731.5
External area [m²]	2773.5	2773.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	1065.12	1386.03
Average U-value [W/m²K]	0.38	0.5
Alpha value* [%]	10	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	**B1 Offices and Workshop businesses**
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	9.65	22.69
Cooling	2.02	5.2
Auxiliary	9.14	15.91
Lighting	9.46	8.35
Hot water	8.72	7.37
Equipment*	20.94	20.94
TOTAL**	**38.98**	**59.52**

* Energy used by equipment does not count towards the total for calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	67.95	141.35
Primary energy* [kWh/m²]	84.12	124.86
Total emissions [kg/m²]	14.4	21.4

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Chilled ceilings or passive chilled beams and displacement ventilation, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Elect										
	Actual	28	39.9	9.6	2	9.1	0.81	5.49	0.91	6
	Notional	70.4	70.9	22.7	5.2	15.9	0.86	3.79	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The BCO can give particular attention to items with specifications that are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	GR000001:Surf[1]
Floor	0.2	0.22	GR000001:Surf[0]
Roof	0.15	0.18	GR000003:Surf[1]
Windows, roof windows, and rooflights	1.5	1.2	GR000002:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

Appendix C: Solar assessment and calculations

C1.1.1 PV Solar Calculation Summary

a. Output per m2 of roof space based on 20° tilt: 66 kWh/m2
b. kWh/kWp = 947
c. Electricity emission factor = 0.519 kgCO2/kWh
d. kgCO2 saved per m^2=0.519×66=34.25 kg/m^2
e. Area required to offset 76 tonnes=76,000/34.25=2220 m^2
f. Peak power output=(66×2220)/947=160kWp
g. Annual output (kWh)=2,220*66=146,376 kWh

Technical Note:
North London Heat and Power Project – Solar Assessment

1. Introduction

North London Waste Authority (the Applicant) have requested a brief assessment of the potential for roof-mounted solar arrays at Edmonton EcoPark as part of the North London Heat and Power Project (the Project).

The assessment provides suitable specifications for an array at the Edmonton EcoPark and typical generation values based on the local solar resource. The Applicant have requested a 'per m^2' generation capacity for their site which can then be applied to their roof spaces.

An initial assessment of site specific constraints of two roofs has also been made; the Energy Recovery Facility (ERF) roof in the northern area of the Edmonton EcoPark and the Resource Recovery Facility (RRF) located to the south of the Edmonton EcoPark.

Finally, a high level system sizing has been completed for each roof, outlining the potential capacity that would fit within the available roof space. For the RRF, two scenarios are assessed, one with an open flat roof and a second option mounting solar panels onto the proposed roof light upstands.

1.1 Solar array specifications

The specifications of an ideal solar array are outlined below:

- Directly south facing
- Tilted at angles between 20-30 degrees to the horizontal
- No shading obstacles in surrounding area
- Accessible for maintenance and cleaning

Regarding solar panel types, either poly-crystalline or mono-crystalline standard solar panels are most commonly used. Poly-crystalline panels are cheaper and have slightly lower efficiency than the mono-crystalline panels. If space is limited and maximum energy yield is required then mono-crystalline panels will provide the highest output for the space available.

1.2 Resource

The '*Guide to Installation of Photovoltaic Systems*'[1] identifies resource data for sites across the UK in kWh/kWp i.e. the number of kilowatt hours that could be expected to be generated by each kilowatt of installed solar power.

[1] Guide to the Installation of Photovoltaic Systems, Microgeneration Certification Scheme, 2012.

The values vary depending on the orientation (0° is directly south-facing) and inclination (tilt angle) of the solar panels. The table below outlines the kWh/kWp values for the site at Edmonton for a range of tilt angles.

Table 1.1 Solar resource data

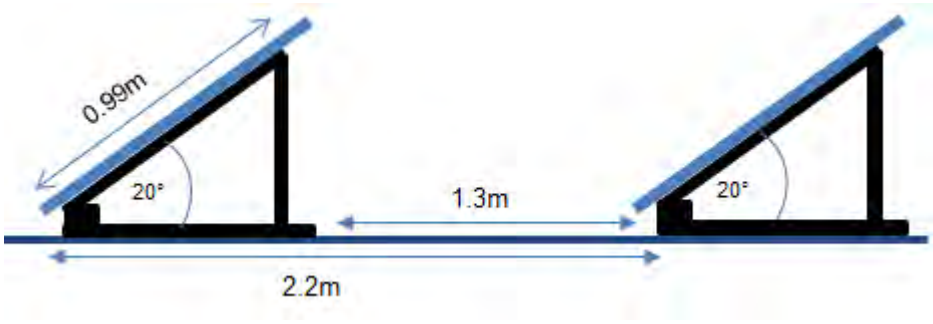
Tilt angle	kWh/kWp
20	947
25	964
30	977

From MCS Guide to Installation of Photovoltaics[1]

These values are useful for calculating the estimated annual energy yield for any sized array at the Edmonton EcoPark. More accurate values can be obtained by running simulations using PV Syst software however they are beyond the scope of this study.

1.3 Indicative solar potential

Solar panels mounted on flat roof spaces must include suitable spacing between rows to avoid excessive shading of panels by preceding rows. The amount of spacing required will vary depending on latitude and the tilt angle of the panels. Figure 1.1 below shows the spacing required for a solar panel tiled at 20° at Edmonton.



Drawing is not to scale and is for indicative purposes only

Figure 1.1 Schematic showing row spacing required for panels at 20° tilt

The Applicant has requested a 'per m^2' generation capacity for their site which can then be applied to its roof spaces. The table below shows the area required for a single 300W (0.3kW) solar panel at a range of tilt angles and the estimated generation per m^2 for each scenario. It shows that at a tilt angle of 20 degrees, higher generation per m^2 can be achieved.

Table 1.2 Table comparing generation per m^2 for a range of tilt angles

Tilt angle (°)	Row spacing (m)	Panel width plus row spacing (m)	Total area (m^2)	Panel rating (kW)	kWh/kWp	Output per panel (kWh)	Output per m^2 (kWh/m^2)
20	1.3	2.2	4.3	0.3	947	284	66
25	1.6	2.5	4.9	0.3	964	289	59
30	1.9	2.8	5.5	0.3	977	293	54

The schematic in Figure 1.2 shows dimensions included in this table

Figure 1.2 below shows the horizontal area required for a single solar panel tilted at 20° plus the required row spacing is 4.3m^2 in total (1.95m by 2.2m in plan view). The corresponding elevation view is shown in Figure 1.1. It should be noted that these dimensions are based on larger, higher rated solar panels such as Trina solar panels which are 1.956 x 0.992 x 0.4m (L x W x D) and are rated between 290-310W. Lower rated solar panels are usually 1.65m in length therefore it would be possible to fit more panels of a lower rating in a given space. For the purposes of this study, the larger panels have been used.

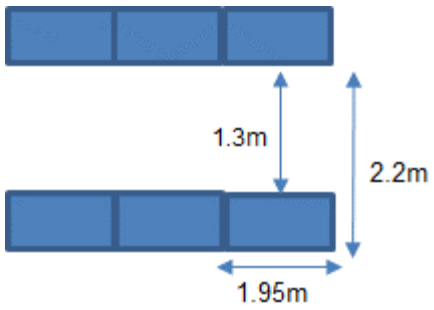


Figure 1.2 Schematic showing total surface area required for one solar panel with required row spacing, at 20° tilt angle

The total capacity that can be installed in each 4.3m^2 unit will depend on the rating of the solar panels chosen. The table below outlines a range of solar panel ratings and the estimated annual energy yield that could be expected for a single solar panel.

Table 1.3 A range of solar panel ratings and estimated annual energy yield per panel

Solar panel rating (W)	Annual energy yield (kWh/annum)
290	275
300	284
310	294

Annual energy yield is calculated using kWh/kWp values of 947 from Table 1 based on a 20^o tilt angle

This should allow the Applicant to calculate the potential solar capacity that could be installed on their available roof space however it should be noted that this unit value does not allow for irregular dimensions of the available roof space or obstacles that need to be avoided. For example the RRF roof space is an irregular shape therefore it may not be possible to fit a panel in every 4.3m^2 unit.

1.4 Roof constraints

ERF

The ERF is located close to a stack that is approximately 112m tall while the boiler hall roof is 65.5m high. There is potential for this stack to cast a shadow on the array when the sun is setting in the west during the summer months. This would require further evaluation to confirm the extent of the shadow and the likely losses in energy yield that it could cause.

There are heat generating turbines located in the boiler hall which could cause increases in temperature of the solar panels. Solar panel efficiency decreases with increasing temperatures however it is not known what range of temperatures the roof of the boiler hall would experience. This would require further investigation.

The proposed construction of the ERF roof is not known at this stage, however it is understood that the span will be significantly less than the RRF roof and the construction is likely to be more robust. Based on this the proposed solar panels (see section 1.3) and an assumed frame will increase the unfactored imposed load on the roof by a minimal amount. Based on the idealised arrangement shown in Figure 1.2 and assuming a fixed solution the resulting increasing in roof structure and cost is likely to be negligible.

A 'fixed' solution assumes the frame of the solar panel is mechanically connected to the roof structure/ roof envelope to prevent sliding and over topping of the solar panel frames. Fixing to the structure is achieved by penetrating the roof envelop and connecting to the structural frame. This requires numerous penetrations in the roof envelope and greatly increases the risk of leaks and ongoing maintenance issues. It may also be necessary to provide additional secondary roof structure to support the solar panel frames which will inevitably not align with the primary roof structure. A less severe form of fixing may be achieved by fixing to the external skin of the roof envelop (usually a composite roof panel) via a proprietary fixing system. This solution avoids the need to penetrate the roof envelope and does not require a secondary structure, however the solar panel frame is intrinsically linked to the choice of roof cladding and must be coordinated at an early stage.

It is possible to install solar panels without fixing and to instead use a ballast to prevent sliding and over topping, this significantly increases the imposed load on the roof. Although ballasting is likely to be an option for the ERF it is unlikely to be more cost effective than fixing to the roof envelope as described above.

RRF

The current roof design of the RRF includes roof light upstands which may inhibit the installation of a conventional solar array. However it may be possible to mount the solar panels onto the south-facing surface of the upstands.

The proposed solar panels (see section 1.3) and an assumed frame will increase the loading on the proposed 76m clear span of the RRF roof. Based on the idealised arrangement shown in Figure 1.2 and assuming a fixed solution, the unfactored imposed load on the roof would increase by 16%. This would represent a marginal increase in structure and cost to accommodate the additional load. Currently the roof is assumed to have 'no maintenance access' only 0.6kN/m² loading for cleaning and basic maintenance purposes. It is assumed that proposed solar panels would not require any service or maintenance loading in excess of this allowance.

Roof deflection (predominantly vertical movement of the roof due to imposed loading) is not anticipated to be an issue for the proposed solar panels however the deflection of long span structures is sensitive to additional loading. It is advised that proposed deflection range of the roof is provided to a solar panel supplier for comment.

A 'fixed' solution assumes the frame of the solar panel is mechanically connected to the roof structure/roof envelope to prevent sliding and over topping of the solar panel frames. Fixing to the structure is achieved by penetrating the roof envelop and connecting to the structural frame. This requires numerous penetrations in the roof envelope and greatly increases the risk of leaks and ongoing maintenance issues. It may also be necessary to provide additional secondary roof structure to support the solar panel frames which will inevitably not align with the primary roof structure. A less severe form of fixing may be achieved by fixing to the external skin of the roof envelop (usually a composite roof panel) via a proprietary fixing system. This solution avoids the need to penetrate the roof envelope and does not require a secondary structure, however the solar panel frame is intrinsically linked to the choice of roof cladding and must be coordinated at any early stage.

It is possible to install solar panels without fixing and to instead use a ballast to prevent sliding and over topping, this significantly increases the imposed load on the roof which is not practical for the proposed 76m clear span roof of the RRF.

Glint and Glare has been raised as a potential issue for drivers passing on the A406. The number of reflections that would be in the direct line of sight of passing drivers will depend on the tilt angle of the solar panels. It should be noted that there are numerous examples of solar arrays installed adjacent to roads and airport runways. It is often cited that the solar panels are designed to absorb not reflect light and that direct sunlight is significantly brighter than any reflections off solar panels. A Glint and Glare assessment could be completed by a specialist company for the proposed array which would assess the minimum and maximum angles of

reflection of light at various times throughout the year and comment on the likelihood of reflections impacting passing drivers.

1.5 System sizing ERF

The area of flat open roof space available on the boiler hall roof of the ERF is 5,338 m^2 (47.6m x 112.15m)^2. The building is orientated approximately 10 degrees from due south therefore the generation will be slightly reduced. The method of calculating the energy yield outlined in Section 1.2 does not take account of this orientation, the kWh/kWp value for a roof orientated 10 degrees from south is 945kWh/kWp compared to 947kWh/kWp for a due south installation. This allowance has been included in Table 1.4

Using the panel tilt angle (20°) and spacing outlined in Section 1.3, the ERF boiler roof area could accommodate 21 rows of 58 panels totalling 1,197 solar panels. The total installed capacity will depend on the rating of the solar panel used so three options are outlined in Table 1.4 below.

It may not be possible to install panels across the entire roof, as space may need to be left for access or to avoid other structures or roof features not yet known. To account for this we also show figures relating to a roof area reduction of 10%. Allowing for a 10% reduction in area, 1,080 panels could fit in the available roof space. The values for this scenario are shown in brackets in Table 1.4 below.

The method of calculating the energy yield outlined in Section 1.2, gives a conservative estimate of the energy yield therefore simulations have been run using PV Syst 6.2.0 to provide a more accurate estimation of the annual energy yield.

As mentioned previously, a degree of shading can be expected from the 100m stack located to the northwest of the ERF roof. No detailed study has been undertaken however based on previous experience, we would estimate that a 1-2% reduction in energy yield might be expected. A 1% reduction has been applied to each of the energy yield values provided in the table below. It should be noted that this is an estimation and the actual shading losses may differ from this amount.

Table 1.4 Total installed capacity and energy yield for ERF roof (values for 10% less roof space is in brackets)

Solar panel rating (W)	Total capacity (kWp)	Annual energy yield (kWh)[1]	Annual energy yield (kWh)[2]
290	347 (313)	324,636 (292,827)	367,785 (333,531)
300	359 (324)	335,862 (303,118)	377,142 (346,401)
310	371 (335)	347,089 (313,409)	391,545 (356,994)

[1] Energy yield calculated using 945kWh/kWp for 20° tilt and 10 degrees from south
[2] Energy yield calculated by simulation using PVSyst software

1.6 System sizing RRF

Two scenarios have been assessed for the RRF roof (i) assuming an open flat roof space and (ii) mounting of solar panels onto the proposed roof light upstands.

Open roof space

Without any roof light upstands, the area available for solar PV is approximately 7,000m^2, this excludes the cantilever in the northern area of the roof which is considered potentially unsuitable for solar panel installation. Using the panel tilt angle (20°) and spacing outlined in Section 1.3, the RRF roof area could accommodate 1,604 solar panels. The total installed capacity will depend on the rating of the solar panel used so three options are outlined in Table 1.5 below. As above we have included values for a roof space that is 10% less

[2] Provided by Grimshaw by email on 17th March 2015

that that outlined above. Allowing for a 10% reduction in area, approximately 1,438 panels could fit in the available roof space. The values for this scenario are giving in brackets in Table 1.5 below.

Table 1.5 Total installed capacity and energy yield for the RRF roof (values for 10% less roof space is in brackets)

Solar panel rating (W)	Total capacity (kWp)	Annual energy yield (kWh)[1]	Annual energy yield (kWh)[2]
290	465 (418)	440,355 (394,899)	503,000 (457,000)
300	481 (432)	455,507 (408,157)	520,000 (473,800)
310	497 (446)	470,659 (422,362)	545,000 (487,200)

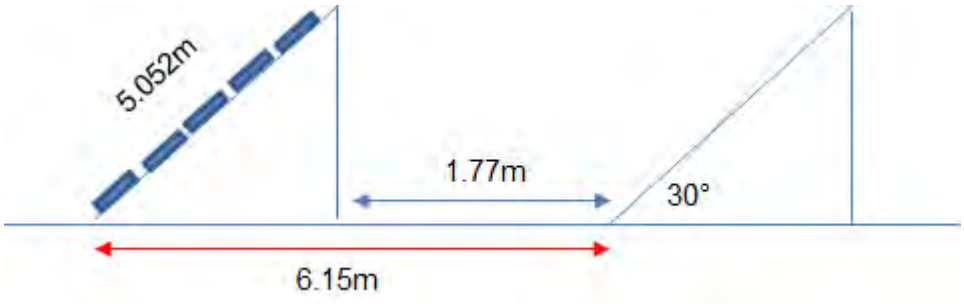
[1] Energy yield calculated using 947kWh/kWp for 20° tilt and orientation due south
[2] Energy yield calculated by simulation using PVSyst software

It should be noted that additional panels may be accommodated on the roof of the RRC canopy located to the east of the RRF roof. Further assessment would be required to assess the additional capacity that could be accommodated in this area, and natural lighting requirements on the roof.

Roof light upstands

A simple schematic is shown below which outlines the dimensions of the proposed upstands on the roof of the RRF. There are 14 upstands in total with a length of 64.4m each.

Figure 1.3 Schematic showing dimensions of RRF roof upstands and proposed solar panel formation



As Figure 1.3 shows, the spacing between rows is 1.77m. The required spacing between rows to minimise over-shading for a panel arrangement of these dimensions and tilt is 9.3m therefore significant shading losses can be expected. Assuming 5 No. panels could be located in landscape (each ~0.9m in breadth) on each upstand (as shown in Figure 1.3), 33 columns of panels could fit on each upstand meaning a total of 165 panels per upstand. This leads to a total of 2,310 panels mounted on to the upstands on the RRF roof. The structural feasibility and design impactions of stacking five panels has not been investigated at this stage.

Due to the expected shading losses caused by the row proximity, PV Syst simulations have been run for the three possible array capacities to allow for consideration of the shading losses. PV Syst shows that the shading losses for this row spacing are approximately 14% compared to 3% if the required spacing is provided. The energy yield for an array with the required spacing has also been modelled to show what effect the 14% shading losses have on the annual energy yield. The results are shown in Table 1.6 below.

Table 1.6 Total installed capacity and energy yield for the RRF roof upstands

Solar panel rating (W)	Total capacity (kWp)[1]	Annual energy yield (kWh) with required row spacing	Annual energy yield (kWh) with proposed upstand spacing
290	668	747,000	678,000
300	691	777,000	705,000
310	714	802,000	727,000

[1] Total capacity allows for suitable string configuration therefore does not match total number of panels that would fit in area

There is slightly less output per installed kWp with the upstands compared to the flat roof. Since the roof design is not yet finalised, there is an opportunity to optimise the light upstands and the solar array by designing the upstands to suit the requirements of the solar array. For example, the upstand dimensions could be adjusted to fit a certain number of panels exactly and the tilt angle reduced from 30 degrees to a lower angle to reduce shading losses. The number of upstand rows could also be reduced and increased row spacing provided. A detailed design process could optimise the natural daylight entering the building and the energy production from the roof. Details are provided in the following section.

2. Optimising the building design to maximise solar power output

There are many important considerations to make when designing such buildings, most of these relate to the primary function of the building and so are in many ways more important that the output of the solar panels. However, some small design changes could optimise the power output from the roof areas. Such changes could include:

- Orienting the roofs so that their long edge runs east to west.
- Maximising the roof area that can be used – such as by making all the roofs the same type and level.
- Placing any mezzanine roofs on the south side of the building so that they are not shaded by taller parts and use them as additional roof area.
- Using a sloped, rather than flat roof to allow more panels to be installed. A roof tilted at 20°-25° toward the south would maximise the space available and virtually eliminate shading.
- Integrating solar panels into other roof features, such as combining them with the upstands.

3. Results and conclusions

This assessment has outlined the resource data for the Edmonton EcoPark in terms of kWh/kWp for a range of tilt angles. It has compared the generation per m^2 for the same range of tilt angles taking the required row spacing into account. The results show that a lower tilt angle of 20 degrees gives the maximum generation per m^2 value.

The main constraints of the ERF and RRF roofs were provided along with details of the structural feasibility of a roof mounted array.

Finally, a high level system sizing has been completed for each roof, outlining the potential capacity that would fit within the available roof space. The results show that a 347-371 kWp array could be sited on the ERF roof depending on the solar panel rating chosen. The annual energy yield would be between 367,785 - 391,545 kWh estimated using PV Syst software and taking a 1% shading loss caused by the stack into account. This is assuming the full roof space is available for solar panel installation, we also provided results for a scenario where 10% less is available. This is considered prudent at this stage as drawings are not finalised and a site visit has not been undertaken.

For the RRF, two scenarios are assessed, one with an open flat roof and a second option mounting solar panels onto the proposed roof light upstands.

Assuming an open flat roof space on the RRF, a 465-497kWp array could be sited in the available area with estimated annual energy yields between 503,000- 545,000 kWh estimated using PV Syst software. We have also provided values for a roof space with 10% less space available.

If the panels are mounted on to the proposed roof upstands, it is estimated that an array between 668-714kWp could be accommodated. The estimated annual energy yield, taking the 14% shading losses due to over-shading of panel rows into account is between 678,000- 727,000 kWh. There is slightly less output per installed kWp with the upstands compared to the flat roof. We have suggested that if progressed, the design of the roof upstands could be refined to optimise the energy production of the solar panels whilst maintaining the natural light entering the building.

Author	Reviewer
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Series 05 Technical Documents

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