Industrie Cartarie Tronchetti

CUNDALL

Industrie Cartarie Tronchetti (ICT) UK Limited, Crag Hill Estates Ltd (CHEL)

Paper Mill Facility, Plot C

Airfields, Northern Gateway

Environmental Statement

Part 2 – Energy Technical Paper 11

Revision D 16 September 2021

Revision Record

Revision Reference	Date of Revision	Nature of Revision	Author	Checked By
-	25/10/2019	First Issue	S. Papathanasopoulos	S. Vasinton
A	30/10/2019	Incorporating comments	S. Papathanasopoulos	S. Vasinton
B	25/08/2021	Incorporating comments and design changes	A. Krania	N. Correia
C	06/09/2021	Incorporating further comments	A. Krania	N. Correia
D	16/09/2021	Incorporating further comments	A. Krania	N. Correia

Report Author	A. Krania
Report Date	06/09/2021
Project No.	1022988
Document Ref.	1022988-RPT-SY-001
Revision	D

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1. Introduction

1.1. Cundall have prepared this ES Technical Paper for Energy in the context of the Proposed Development as described in the ES Project Description outlined in the ES Part 1 Report.

1.2. The Paper examines the anticipated energy demands and subsequent carbon emissions for the operational site and the proposals approach toward meeting the energy and sustainability targets, as set out by Flintshire County Council (FCC).

1.3. The assessment will take into consideration the type of buildings proposed and subsequent energy demand and carbon emissions.

1.4. The principal objectives are to reduce the site's contribution to the cause of climate change by minimising the emissions of CO2, by reducing the site's needs for energy and by providing some of the requirement by renewable/sustainable means. Issues such as water and waste, biodiversity, etc. have also been addressed in the Paper.

1.5. The MEP strategy is based on assumptions, as described in this document section 5, as at this stage there is no consultant appointed. The fabric properties have been based on the architect's specifications. The values used in the energy model and the associated results are subject to change depending on the progression of the MEP strategy.

1.6. It is important to mention that this report assesses the office building and the admin areas of the industrial building. It does not assess the process areas of the building, however this is dependent on the progression of the design at later stages and whether specific conditioning requirements could be set out going forward. Furthermore, it is on the basis that the current design does not provide heating, cooling or ventilation to non-office or admin areas and therefore have been excluded from this assessment.

2. Documents Consulted

2.1. The following baseline data has been used to undertake the assessment to support this Paper.

National Policy Wales (February 2021)

2.2. Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. PPW, the TANs1, MTANs2 and policy clarification letters comprise national planning policy.

2.3. The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty. A well functioning planning system is fundamental for sustainable development and achieving sustainable places.

2.4. The Welsh Government planning policy recognises an energy hierarchy. The Welsh Government expects all new development to mitigate the causes of climate change in accordance with the energy hierarchy for planning, as set out in the following energy policies. Reducing energy demand and increasing energy efficiency, through the location and design of new development, will assist in meeting energy demand with renewable and low carbon sources. This is particularly important in supporting the electrification of energy use, such as the growing use of electric vehicles and heat pumps. All aspects of the energy hierarchy have their part to play, simultaneously, in helping meet decarbonisation and renewable energy targets.

2.5. The Welsh Government has set targets for the generation of renewable energy:

- for Wales to generate 70% of its electricity consumption from renewable energy by 2030;
- for one Gigawatt of renewable energy capacity in Wales to be locally owned by 2030; and
- for new energy projects to have at least an element of local ownership.

2.6. Sustainable building design principles should be integral to the design of new development. Development proposals should:

- mitigate the causes of climate change, by minimising carbon and other greenhouse gas emissions associated with the development's location, design, construction, use and eventual demolition;
- include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change.

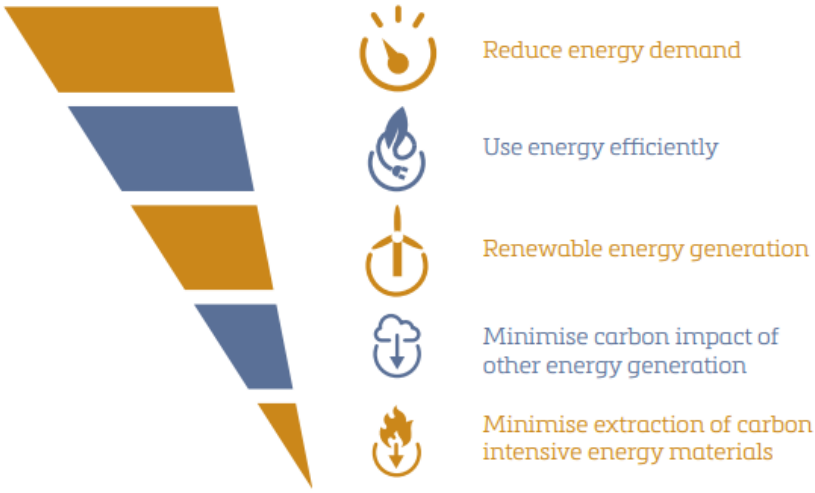


Figure 11. 1 Energy Hierarchy for planning

Flintshire Unitary Development Plan (2000 – 2015)

2.7. This document is the 'adopted' version of the Unitary Development Plan for Flintshire for the 15-year period 2000 to 2015 (There is a new draft plan out for consultation, but still not adopted). The aim of the Plan is to provide a framework for making rational and consistent decisions on planning applications, and to guide development to appropriate locations. The preparation of the Plan has allowed local people, businesses, and others with an interest in the County, an opportunity to shape the communities and environment of the future. It identifies land for new housing, employment, retailing and other forms of development and sets out general policies to control new development, changes in the use of land or buildings, and to protect the environment from insensitive change. The Plan also sets out the basis to bring about sustainable development.

2.8. There are a series of policies detailed in this document which directly relate with the energy performance of the Proposed Developments. These are documented below.

EWP1 Sustainable Energy Generation

2.9. The generation of clean and sustainable energy is critical to addressing global warming and minimising the long-term impact of climate change upon the global and local environment. The objectives of the emerging Energy Policy for Wales are to reduce energy consumption and to facilitate the expansion of renewable energy. Ultimately such objectives could reduce the need for finite resources, reduce greenhouse gas emissions and to encourage the development of a low carbon energy economy.

EWP2 Energy Efficiency in New Development

2.10. In all new development the Council must be satisfied that sufficient steps have been taken in the siting, aspect, form and design of new buildings to minimise the wasteful consumption of energy and resources both in the construction and use of buildings.

EWP3 Renewable Energy in New Development

2.11. All major new residential and non-residential (>1,000m²) developments will be required to incorporate renewable energy production equipment on site to reduce predicted carbon emissions by a minimum of 10% except where:

- it would not be viable given the type of development, its location and design;
- it would have an adverse effect on amenity which would outweigh the benefits of the technology; or
- it is not possible to incorporate renewable energy production to achieve the full 10%.

2.12. Examples of renewable energy technologies are passive solar design, solar water heating, photovoltaic cells, wind turbines, geothermal/water heat pumps, combined heat and power schemes and community heating schemes.

3. Consultations

3.1. In the case of this application, we have not undertaken a detailed Screening or Scoping Opinion Request to the Council. On this basis, Spawforths have sought to confirm with the Council by letter the information to be provided in the Environmental Statement, in accordance with Part 4 (13) of the EIA Regulations, to ensure the scope of the technical chapters and the methodology for assessing the significance of effects is robust. To enable the Council to consider this, Spawforths enclosed the following plans and information:

- A Location Plan identifying "The Land";
- A description of the nature and purpose of the development including a Character Area Plan;
- Topic/Technical Chapters of the ES based on the issues to be assessed;
- Methodology for the Assessment of Significant Effects in accordance with EIA Regulations;

3.2. The Council subsequently confirmed that they accepted this approach and methodology including the range of environmental issues against which the proposals should be assessed as part of the Environmental Impact Assessment process. The letter confirming this in contained in Appendix 14, of the ES Part 1 Report.

3.3. Whilst a detailed Scoping Report was not submitted to the Council, details of consultation on the previous scheme between Spawforths and Sadie Waterhouse, Energy Conservation Engineer at Flintshire County Council, are also detailed below, which dates back to 2019.

Theme / Issue	Date	Consultee	Method	Summary of Discussion	Outcome / Output
Verification of targets and assessments required under the energy and sustainability scope of the project	*13-08-2019*	*Sadie Waterhouse* *Flintshire Council*	*Email*	*Agree the requirements and targets of the energy and sustainability assessment*	*Verified the assessments that are required from the Flintshire's Council and proposed additional studies such as district heating networks*
Verification of targets and assessments required under the energy and sustainability scope of the project	*August -July 2021*	*Spawforths*	*Pre-application meetings*	*Update the requirements and targets of the energy and sustainability assessment*	*Update to the previous Energy and Sustainability Assessemnt To Reflect Current 2021 Scheme*

Table 11. 1 Summary of Consultations and Discussions

4. Methodology and Approach

4.1. This section outlines the design strategy that has been adopted and all the relevant factors that the development can have an impact on during the construction and the operational phase of the project.

Calculation of Carbon Emissions

The initial baseline carbon emissions have been calculated based on the National Calculation Methodology (NCM) and the Welsh Part L2A 2014 documentation. The modelling of the building has been carried out in the accredited software IES-VE 2021.

4.2. The methodology that has been adopted in this study is based on Wales' Energy Hierarchy and has been organized as per the below;

- Reduce energy demand;
- Use energy efficiently;
- Renewable energy generation.

Receptors

4.3. The geographical extent of the potential impact from the development is outlined on the table below:

Designation	Receptors
International	Not applicable
National	Not applicable
Regional	Not applicable
County	Not applicable
Borough / District	Existing utility networks
Local / Neighbourhood	Existing residential receptors within the surrounding area

Table 11. 2 Receptors

Environmental Impacts

4.4. The magnitude of impact is directly affected and defined by the energy strategy that has been adopted for this project.

Magnitude	Environmental Impact
Major	Permanent/irreversible change to key characteristics of the strategic utility network as a result of the energy demand with important consideration at a district scale plus increased CO_2 emissions.
	Permanent/irreversible change to key characteristics of the local utility network as a result of the energy demand with important consideration at a local scale plus increased CO_2 emissions.
Moderate	Permanent/irreversible change to the local utility network that may result in temporary disruptions locally as a result of the energy demand plus increased CO_2 emissions.
Minor	Temporary change over a limited area to key characteristics of the utility network. Impacts likely to occur (e.g. increase in loading due to the Proposed Development) plus increased CO_2 emissions.
Negligible	Minor temporary change over a limited area to key characteristics of the utility network. Impacts unlikely or rarely to occur and minimal increases to CO_2 levels.
Neutral	No impact on existing utility servicing and on CO_2 emissions.

Table 11. 3 Environmental Impacts

Significance of Effects

4.5. The significance of effect is determined using the significance matrix in Section 6 of Spawforth's Environmental Statement Part 1 Report. This identifies the receptor level across the top of the matrix and the magnitude of environmental impact down the side and where they meet within the matrix identifies the significance of the effect.

Impact Prediction Confidence

4.6. It is also of value to attribute a level of confidence by which the predicted impact has been assessed. The criteria for these definitions are set out below:

Confidence Level	Description
High	The predicted impact is either certain i.e. a direct impact, or believed to be very likely to occur, based on reliable information or previous experience.
Low	The predicted impact and its levels are best estimates, generally derived from first principles of relevant theory and experience of the assessor. More information may be needed to improve confidence levels.

Table 11. 4 Confidence Levels

5. Baseline Information

5.1. The baseline carbon emissions for the development have been calculated through the simulation of the Part L2A model, created in IES-VE 2021.

5.2. The MEP strategy is based on assumptions, as at this stage there is no consultant appointed. The fabric properties have been based on the architect's specifications. The values used in the energy model and the associated results are subject to change depending on the progression of the MEP strategy.

Reduce Energy Demand

5.3. Reductions in energy usage for the scheme are achieved through the consideration of the passive elements of the design, along with improved occupant comfort. The aim is to optimise the passive building elements and hence reduce the energy consumption associated with the mechanical systems. This is balanced between a range of requirements and factors such as site constraints, acoustic and daylight considerations.

Passive Solar Design – Day Lighting vs. Solar Heat Gains

5.4. Maintaining adequate levels of natural light but at the same time limiting the solar heat gains inside the building is an essential part of the project's design philosophy. Selecting appropriate Visible Light Transmittance (VLT) and solar heat transmittance coefficient value (g-value) for the glazing, helps minimise the heating and cooling demand of the building and at the same time secures adequate levels of natural daylight for the occupants.

Climate change

5.5. The impact of climate change has been considered in the following Technical Reports, please refer to these for further detail.

Technical Paper	Description
Paper 1: Geology and Ground conditions	Ground conditions and geology study including the potential exposure to underlying soils or ground water as the increase of temperature and refined summer precipitation.
Paper 2: Traffic and Transportation	Transport and Infrastructure including potential disruptions from flood events which could lead to driver delay
Paper 3: Water	Flood risk and drainage with increased risk of fluvial and ground water flooding

Paper 7: Building Services	Heating, cooling, ventilation and water services will need to be adaptable to a changing climate.
Paper 8: Air Quality	Air quality impact regarding dry weather, as drier conditions will result in more dust, airborne contamination. Rainfall is beneficial in washing away pollutants but with an ongoing source, the conditions will resume when the drier weather returns. Sunny dry days are when we try to odour sniff testing as a worst case scenario. If there has been heavy rainfall beforehand, this can result in more odour nuisance once the weather dries up, and in particular if open water treatment tanks have overflown.

Table 11.5 Climate Change

Building Envelope

5.6. Improving the thermal insulation standards beyond the minimum Building Regulation standards helped reduce the annual CO_2 emissions associated with the building's heating and cooling systems, by limiting the heat loss through the building's fabric. The details of the building fabric are outlined on the table below, in accordance with the architect's specifications. These shall be re-evaluated at later stages of the design.

Element	Design	Regulations (Part L2A)
Ground floor average U-value	0.25 W/m²K	0.25 W/m²K
Ground floor average U-value (office)	0.22 W/m²K	0.25 W/m²K
External wall average U-value	0.27 W/m²K	0.35 W/m²K
Roof average U-value	0.18 W/m²K	0.25 W/m²K
Door U-value	1.50 W/m²K	2.20 W/m²K
Window U-value (including frame)	1.50 W/m²K	2.20 W/m²K
Window total solar transmission	0.40	-
Window visible light transmittance	0.70	-
Skylight U-value (including frame)	1.30 W/m²K	2.20 W/m²K
Skylight total solar transmission	0.55	-
Skylight visible light transmittance	0.70	-
Air permeability @ 50 Pascals	3 m³/hr/m²	10 m³/hr/m²

Table 11. 5 Building fabric

Weather file

5.7. According to the Welsh Part L2A 2014, the weather zused for assessments in Wales is of the city of Cardiff (CardiffTRY05.fwt).

Thermal Bridging

5.8. Linear thermal bridge Ψ values if not considered carefully can have a high conductivity which requires a greater enhancement of the other elements of the building envelope to compensate. This shall be looked into more detail as the design progresses onto later stages of design.

Air Permeability

5.9. A significantly improved rate (as specified in table 11.6) shall be targeted for the development in comparison with the Building Regulation minimum standards for new buildings, as it could help in lowering energy demand. High level of air tightness should be achieved by prefabrication of a number of key building components under factory conditions, robust detailing of junctions and good building practices on site.

Use Energy Efficiently

5.10. After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice, the following principles shall be adopted throughout the Proposed Development where possible.

Low-Energy Lighting

5.11. Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual CO_2 emissions. To reduce the energy consumption associated with artificial lighting, internal lighting fittings should be energy efficient with high luminous efficacies of at least 110 lumens/Watt.

5.12. Daylight dimming is applied to all perimeter offices and meeting rooms, along with presence occupancy sensors. Parasitic power associated with these controls is at a maximum 0.10 W/m² for each type of sensor mentioned above.

HVAC System Plant Efficiencies

5.13. The design team shall specify all equipment and plant to exceed the minimum requirements of Non-Domestic Building Services Compliance Guide. This provides guidance on the means of complying with the requirements of Part L2A of the Building Regulations for conventional space heating systems, hot water systems and cooling systems. The MEP strategy is based on assumptions, as at this stage there is no consultant appointed.

Element	Efficiency
VRF heating	400%
VRF cooling	450%
Electric radiators	100%
DHW (Point of use)	100%
Mechanical Ventilation Specific Fan Power	1.10 W/l/s
MVHR (Thermal wheel)	80%

Table 11. 6 HVAC efficiencies assumptions

Variable Speed Pumps and Drives

5.14. All pumps should be specified with variable-speed drives, which can reduce their energy consumption by more than two-thirds compared with equivalent non-variable speed alternatives, by only supplying the required flow rate to meet the demand.

Controls

5.15. The heating systems shall be appropriately zoned, allowing fast local response to changes in loads. Appropriate lighting controls, including timers, occupancy controls and dimming shall be specified where applicable for all internal lighting.

Energy Metering

5.16. Metering of the energy uses within the development separately, could help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems.

5.17. Metering can allow the FM Teams to identify where leaks and/or faults are causing excess energy consumption to occur. For the Proposed Development, all energy supplies should be metered by end energy use, with energy display devices located in a visible place to enable building users to monitor and therefore take actions to reduce their CO_2 emissions.

Renewable Energy Generation

District Heating Schemes / Combined Heat & Power (CHP)

5.18. There are no planned district heating schemes in close proximity to the site, to facilitate a current or future connection. In addition, the fact that the current conditioning strategy of the building is not based on a water system, is the reason why district heating schemes have not been included in this assessment.

5.19. For the same reason that has been noted above (current non water-based strategy) a CHP system has been disregarded at this stage, as it would not be applicable in such a development.

5.20. The potential of 'HyNet North West', aimed at decarbonizing the industrial district through carbon capture, was considered. However, given that this is a longer time project, it is understood that this will be not applicable for the ICT Paper Mill Proposed Development.

ASHP (Air Source Heat Pump)

5.21. Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures. Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

5.22. To enable the development to be net zero carbon, heat pumps will be used throughout for the provision of heating, cooling and hot water in dedicated areas of the scheme. Full details of the MEP strategy are to be confirmed in later stages of the design.

GSHP (Ground Source Heat Pumps)

5.23. Ground source heat pumps require either horizontal trenches or vertical boreholes to be excavated in order to accommodate piles or loops. GSHPs only work when there is a relatively balanced heating and cooling load. The proposed building has a far larger heating than cooling demand. Over time, this would result in the abstraction of heat permanently from the ground, reducing the ground temperature to a point whereby the seasonal efficiency of the heat pumps drops off to a point where they are no more efficient than direct electric heating.

5.24. For this reason, ground source heat pumps have not been considered for the ICT Paper Mill Proposed Development.

Biomass Heating

5.25. Biomass boilers are no longer recommended for inner city and urban deployment due to concerns related to air quality. Even with comprehensive treatment of exhaust gases, biomass boilers can exhaust more local pollutants than gas fired CHP units and high efficiency boilers.

5.26. Additionally, biomass boilers require significant space for storage and delivery of fuel. Therefore, biomass boilers have not been considered feasible for the Proposed Development.

Wind Turbines

5.27. The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind. The urban location of the site coupled with the adjacent buildings could result in a turbulent flow regime across the site. As such it is not proposed to include wind turbines as part of the development.

Photovoltaic Panels

5.28. Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current. The advantage of photovoltaic cells is once they are installed, they require minimal maintenance over their operational life and have no primary fuel requirements.

5.29. In this instance, given the large available roof space and the lack of overshadowing from neighboring buildings, photovoltaic panels have been included in the assessment. The specifications that have been assumed at this stage are documented on the following table. These have been sized to enable the development to achieve at least 10% reduction in regulated carbon emissions, as set out by Flint shire's UDP. As the MEP strategy is based on assumptions, should these change later on in the design the required PV area will also be subject to update.

Category	Value
Area	360 m²
Azimuth	180°
Inclination	30°
Panel efficiency	19%
Inverter efficiency	90%

Table 11. 7 PV Panel specification

Solar Thermal

5.30. Solar thermal collectors utilise solar radiation to heat water for use in buildings. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30° from the horizontal. Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. This usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load. Solar thermal collectors have been discarded at this stage, as available roof space has been favoured for PV panels.

Energy Performance

Steps followed

Reduce Energy Demand

5.31. The Proposed Development shall be well insulated ensuring that heat losses are kept to a minimum with enhanced U-values in the building envelope exceeding Building Regulations standards. This would reduce any potential heat losses via conduction.

Use Energy Efficiently

5.32. After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice, the following principles could be adopted throughout the proposed development where possible.

Renewable energy generation

5.33. In this instance, given the large available roof space and the lack of overshadowing from neighboring buildings, photovoltaic panels have been included in the assessment. The specifications that have been assumed at this stage are documented on the following table. These have been decided so that the development achieves the 10% reduction in regulated carbon emissions, as set out by Flintshire's UDP.

Performance of the development

After all stages of the energy hierarchy have been applied, the development is demonstrating a 10.5% area-weighted improvement over the TER, achieved via energy efficient equipment and PVs, thus complying with Policy EWP3 of Flintshire's Unitary Development Plan. The following tables and figures indicate the performance that is achieved. As the MEP strategy is based on assumptions, should these change later on in the design performance of the development will also be subject to update

Carbon emissions		
Category	**TER (kgCO2/m²)**	**BER (kgCO2/m²)**
Heating	3.0	5.0
DHW	1.1	2.4
Cooling	0.3	0.4
Auxiliary	1.6	2.2
Lighting	12.8	7.6
Renewables	-3.30	-3.8
Total emissions	15.4	13.8
Percentage reduction		10.5%

Table 11. 8 Regulated Carbon emissions estimates (using SAP2012 carbon emission factors)

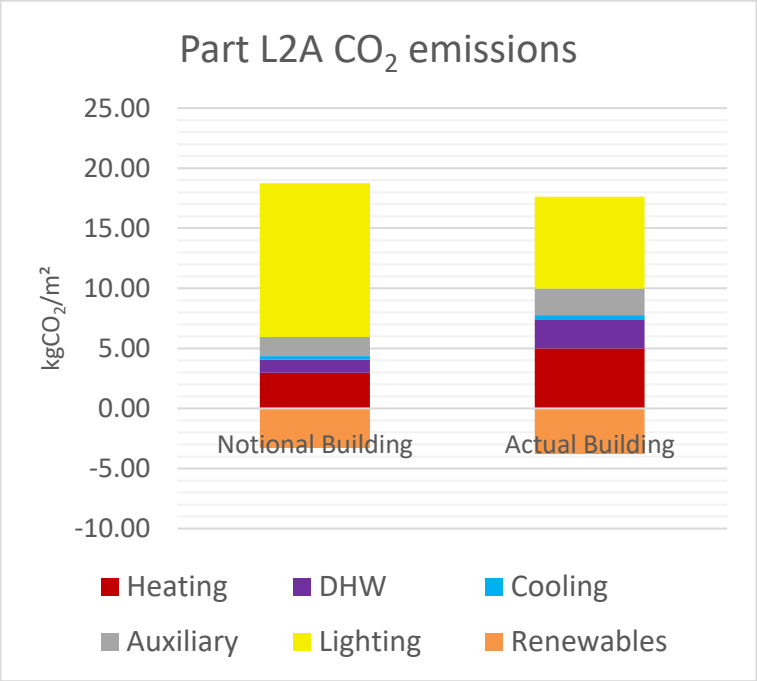


Figure 11. 2 Regulated carbon emissions comparison (using SAP2012 carbon emission factors)

Energy consumption		
Category	**TER (kWh/m²)**	**BER (kWh /m²)**
Heating	14.0	9.8
DHW	5.2	4.8
Cooling	0.6	0.7
Auxiliary	3.1	4.3
Lighting	25.1	15.0
Renewables	-6.4	-7.3
Total energy	41.7	27.3
Percentage reduction		34.5%

Table 11. 9 Regulated Energy consumption estimates

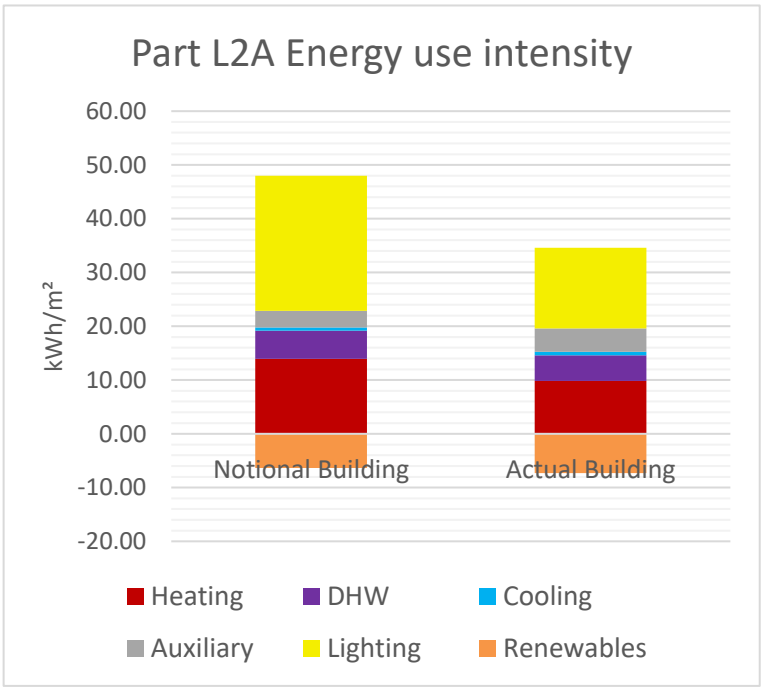


Figure 11. 3 Energy consumption comparison

6. Alternatives Considered

6.1. As part of the design's progress, several technologies and design choices have been assessed based on their suitability for this project.

Measure	Applicable?	Comments / Benefits
Natural ventilation	Maybe	Could be used for perimeter offices, reduces energy associated with mechanical ventilation
Daylight	Yes	Minimize electricity used for artificial lighting. Wellbeing benefits as well
Thermal mass	No	Not applicable for the region's climate
Air tightness	Yes	Can lower heating demand by minimising air infiltration
Solar shading	Maybe	Could be beneficial for the administration block, subject to further studies. Could reduce both heating and cooling loads if designed properly
Thermal insulation	Yes	Minimise heat loss through the fabric, reducing cooling/heating loads

Table 11. 10 Reducing demand

Measure	Applicable?	Comments
Heat recovery	Yes	Can recover heat from exhaust air, and minimise conditioning loads.
Low energy lighting	Yes	High efficient lamps can reduce electricity used
Variable speed drive	No	Effective in water-based systems
Energy metering	Yes	Systems are being assumed to be metered which can help in identifying problems and rectifying them, thus reducing excessive energy consumption
Lighting control	Yes	Both daylight dimming and occupancy sensors have been included in the design to reduce energy use

Table 11. 11 Energy efficiency

Measure	Applicable?	Comments
District heating	No	Currently there are no district heating networks close to the site, but could be incorporated in the future, shall such a system become available
CHP	No	The proposed systems are all electric and not water-based
Ground source heat pump	No	This requires a balanced heating and cooling demand to be efficient. In this case, the development has a far higher heating demand than cooling
Biomass heating	No	Restrictions on air quality
Wind turbines	Maybe	Could be assessed at later stages of design if required, but required performance can be met through other less risky means
Photovoltaic panels	Yes	Has been incorporated in the design
Solar hot water heating	Maybe	Current system for DHW is all-electric instantaneous. Could be assessed at later stages, since there is enough roof space to accommodate this

Table 11. 12 Renewable and low carbon technologies

7. Potential Environmental Effects

Construction Phase

7.1. The construction and erection of this Proposed Development could have the following environmental effects:

- Increased energy use due to the demand of construction activities;
- Increased carbon emissions associated with energy use;
- Increased air pollutants (e.g NOx) to be emitted via construction and vehicles.

7.2. A summary of impacts is documented on the table below.

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
Increase in CO2 emissions	Local	Minor Negative	Negligible / Minor Adverse	High
Increase in NOx emissions	Local	Minor Negative	Negligible / Minor Adverse	High

Table 11. 13 Significance of Effect - Construction Phase

7.3. In summary the potential impacts at construction phase are not significant in the wider context of the environment in terms of energy use, please refer to Air Quality Technical Paper for details.

Operational Phase

7.4. The potential effects due to the operational use of the Proposed Development are listed below:

- Increased energy demand;
- Increased carbon emissions associated with energy use;
- Potential noise from factories' activities and process.

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level
Increased energy demand	Local	Minor Negative	Negligible / Minor Adverse	High
Increased carbon emissions	Local	Minor Negative	Negligible / Minor Adverse	High
Noise generated	Local	Minor Negative	Negligible / Minor Adverse	High

Table 11. 14 Significance of Effect - Operation Phase

In summary the potential impacts at the operational phase are not significant in the wider context of the environment in terms of energy use, the above effects are analysed in more detail in the relevant Technical Papers.

8. Proposed Mitigation

8.1. This section will seek to present the proposed mitigation measures to limit the impact of the Proposed Development over the environment, during construction and operational phases.

Construction Phase

Materials

8.2. Building and construction activities worldwide consume 3 billion tons of raw material each year, which account for approximately 50% of total global consumption. Using green/sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

8.3. The aim for the ICT Paper Mill Proposed Development is to minimise its overall environmental impact through the specification of sustainable materials.

Environmental Impact of Materials

8.4. New materials with low overall environmental impact shall be chosen and advice from the Green Guide to Specification should be taken into consideration for the selection. The Green Guide rates the environmental impact of different materials and components, taking into account factors like toxicity, ozone depletion, ease of recycling, waste disposal etc. Where viable, at least 80% (by area) of the new main elements in the building, fabric & building services insulation should be specified to achieve the best performing "A" and "A+" ratings from the Green Guide.

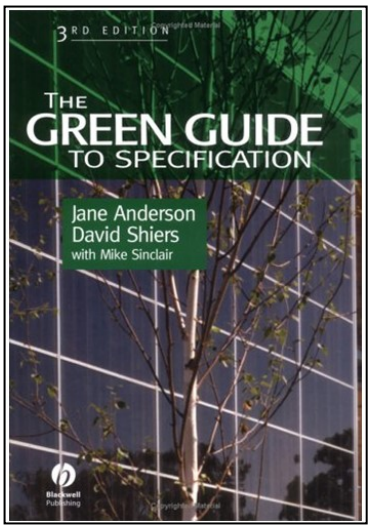


Figure 11. 4 Green guide to specification

Sustainable Timber

8.5. Any timber used for basic or finishing building elements in the scheme shall be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and fix CO2. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

Locally Sustainable Materials

8.6. A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practical, materials should be sourced from local suppliers, reducing the environmental impacts and CO2 emissions associated with transportation.

Recycled Materials

8.7. Scope for increased recycling should be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings' life.

8.8. Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed

Construction

8.9. Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution and waste and other disturbances. Impacts such as increased energy and water may also be significant. Therefore, attention is being given to site-related parameters with the aim to protect and enhance the existing site and its ecology.

8.10. The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighborliness. To achieve this, there can be a commitment to comply with the Considerate Constructors Scheme.

8.11. Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment are as follows:

- Monitor, report and set targets for CO2 or energy usage arising from site activities;
- Monitor, report and set targets for CO2 or energy usage arising from transport to and from site;
- Monitor, report and set targets for water consumption arising from site activities;
- Monitor construction waste on site, sorting and recycling construction waste where applicable;
- Adopt best practice policies in respect of air and water pollution arising from site activities;
- Operates an Environmental Management System;
- Additionally, all timber used on site should be responsibly sourced.

Figure 11. 5 Construction Site monitoring

Construction

8.12. During the construction phase a large amount of waste material can be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are: wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products, depending on the ultimate construction proposed.

8.13. Prior to the commencement on site, a Site Waste Management Plan (SWMP) that complies with the requirements of current legislation and BREEAM would be prepared. This plan can identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that quantifies the results and set targets. See Technical Paper 10 which details with matters in respect of Waste.

8.14. As a minimum, the SWMP shall contain:

- The target benchmark for resource efficiency e.g. m3 of waste per 100m2 or tonnes of waste per 100m2;
- Procedures and commitments for minimising non-hazardous waste in line with the benchmark;
- Procedures for minimising hazardous waste;
- Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;
- Procedures for sorting, reusing and recycling construction waste into defined waste groups either on site or through a licensed external contractor;
- The name or job title of the individual responsible for implementing the above.
- Opportunities for introducing more reused or reusable materials/components can be explored during detailed design.

Operational Phase

Water conservation

8.15. Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team should focus on reducing the demand for water and managing the existing resources.

8.16. The Building Regulations propose a limit on flow rates for sanitary ware fittings that can be used to inform the architect's eventual choice of bathroom fittings.

Demand Reduction and Water Efficiency

8.17. The aim is to minimise internal and external potable water use within the development. This can be achieved by considering:

8.18. Dual Flush Cisterns on WC's - These units have the ability to provide a single flush of 4L and/or a full flush of 6L.

8.19. Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms could be installed in all areas. The use of aerating taps means that the perceived pressure of a shower is the same as a standard flow model, however water consumption can be decreased by over 30%.

8.20. Water Meters - In 1995 approximately 33,200 million liters of water a day were extracted in England and Wales, this increased to 44,130 million liters/day in 2001, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building's consumption. Water meters shall be specified on the main supply.

Sustainable Urban Drainage

8.21. The site's drainage strategy aims to reduce the impact of development on the natural drainage patterns, by retaining water on site by the incorporation of Sustainable Urban Drainage techniques (SUDs).

8.22. The Natural Wales Agency Flood Map indicates that the site is located within the "Low risk area", indicating a low chance of flooding.

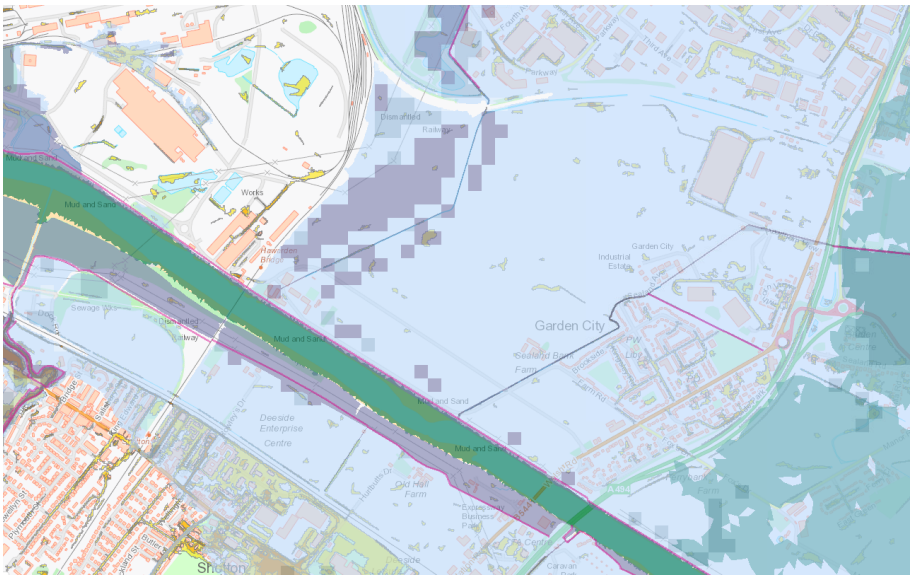


Figure 11. 6 Flood map for ICT Paper Mill project

Waste management

8.23. Buildings and building sites produce a significant amount of waste annually. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

Waste targets

8.24. Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this, target a number of measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development. Reducing waste is an important means of:

- Reducing unnecessary expenditure;
- Reducing the amount of natural resources used for production of new materials;
- Reducing energy for waste disposal;
- Reducing levels of contamination and pollution arising from waste disposal.

8.25. The Proposed Development shall minimise the impact of waste in the environment where possible.

Waste Management & Reporting on Operation

8.26. The detailed design phases should identify the potential waste streams that the development can produce. As a minimum, plans should be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points can facilitate easy access for all users.

8.27. The main aim is to recycle as much waste as possible; this could be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

8.28. A section shall be included in the Building User Guide outlining the options for recycling on site and explaining the different waste streams for the end user.

8.29. It is recommended that area is set aside to securely locate the necessary waste disposal bins. The development can include waste disposal area in the ground floor with easy access for building users.

Land use and ecology

8.30. The new development is proposed to include perimeter landscaping surrounding the buildings and site. This can help maintain and augment the existing biodiversity. The figure 11.7 indicates the proposed landscaping concept plan, following completion of Phase 3.

8.31. The project description in the ES Part 1 details the proposed landscaping. Strategic landscaping will be provided around sections of the boundary of the site as part of the separate landscaping work to be undertaken by the landowners CHEL as part of enabling works facilitate the development of Plot C. These works have been grounded approval as part of the application to discharge planning conditions (Ref: 061986) on the outline planning permission (Ref: 058990) and will include landscaping works which will include removal of self-seeded trees to provide slope stability, replacement of trees and aquatica logical habitats. This will include provision of reptile mitigation area at the northern end of a beacon of the application site (Plot C) and a grassland mitigation area at the north western corner of Plot D.

8.32. The reptile mitigation will include refugees and mounds and the grassland mitigation area will have a meadow mix grass seeding over existing grass sward.

8.33. Beyond the eastern and southern boundaries of the application site will be the Welsh Government's proposed Commercial Spine Road 2 and 3. Separating the application site and the Commercial Spine Road are proposed drainage swales, which will also connect into the proposed new swale between the application side and Plot D. Whilst these swales are for drainage purposes they provide green and blue infrastructure buffer and off-set and separation from the road and adjacent land proposed for housing to the south of the Commercial Spine Road.

8.34. In addition to the proposed landscaping treatment (blue and green infrastructure) proposed as part of enabling works to be implemented by CHEL, the Application Proposals will also seek to provide hedgerows planted on the southern and south western boundary facing the Commercial Spine Road 3 and further tree planting on the northern and north western boundaries adjacent to the Millennium Greenway Sustrans cycleway.

8.35. The majority of the screen planting around the boundaries is proposed to be carried out as part of Phase 1, will develop thereafter to provide some screening and softening of the

elevations particularly for views from the Sustrans Route 5 around the North of the site. As well as providing screening this will also add biodiversity value.

Figure 11. 7 BCA Landscape Concept Plan, as per External Features Plan received August 2021

Pollution

8.36. Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The Proposed Development shall aim to minimise the above impacts, both at the design stage and on-site.

Ozone depletion

8.37. CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling, they should be CFC and HCFC-free.

Internal pollutants

8.38. Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as off gassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

8.39. VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall paneling, particleboard, fiberboard) and furniture made with these pressed wood products.

8.40. 'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. These 'eco-friendly' paints are made from organic plant sources and also powdered milk based products.

8.41. The design team should seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

Green Transport

8.42. The transport of people is the second largest source of CO2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, and at the same time, the effects of climate change are becoming more severe; there will be greater pressure to control CO2 emissions from transport and sites without good access to public transport will be at much greater risk from these controls.

Site Location and Public Transport

8.43. The Proposed Development is located in Garden City, Flintshire. There is currently a bus stop and train station close to the site, improving the potential of the development's public transportation capabilities.

9. Potential Residual Effects

9.1. This section of the Paper describes the potential residual effects after the mitigation measures. These measures aim at reducing the energy use of the Proposed Development and the associated carbon emissions deriving during the construction and operational phase of the building.

Potential Residual Effects – Construction Phase

9.2. The overall impacts of the proposal during the construction phase are highlighted in the table below, analysed in more detail in the relevant Technical Papers (i.e Noise, Air Quality):

Nature of Impact	Receptor	Environmental Impact	Significance of Effect	Confidence Level	Mitigation	Residual Significance of Effect
Increased energy demand	Local	Minor Negative	Negligible / Minor Adverse	High	Design and install highly efficient mechanical and electrical services systems	Negligible/Minor Adverse
Increased carbon emissions	Local	Minor Negative	Negligible / Minor Adverse	High		Negligible/Minor Adverse
Noise generated	Local	Minor Negative	Negligible / Minor Adverse	High	Introduce measures of noise attenuation	Negligible/Minor Adverse

Table 11. 15 Residual Significance of Effect - Construction Phase

Potential Residual Effects – Operational Phase

9.3. The overall impacts of the proposal during the operational phase are highlighted in the table below, analysed in more detail in the relevant Technical Papers (i.e Noise, Air Quality):

Nature of Impact	**Receptor**	**Environmental Impact**	**Significance of Effect**	**Confidence Level**	**Mitigation**	**Residual Significance of Effect**
Increased energy demand	Local	Minor Negative	Negligible / Minor Adverse	High	Design and install highly efficient mechanical and electrical services systems	Negligible / Minor Adverse
Increased carbon emissions	Local	Minor Negative	Negligible / Minor Adverse	High		Negligible / Minor Adverse
Noise generated	Local	Minor Negative	Negligible / Minor Adverse	High	Introduce measures of noise attenuation	Negligible / Minor Adverse

Table 11. 16 Residual Significance of Effect - Operational Phase

10. Additive Impacts (Cumulative Impacts and their Effects)

10.1. For the purposes of this ES we define the additive cumulative effects as:

"Those that result from additive impacts (cumulative) caused by other existing and/or approved projects together with the project itself "

10.2. The developments that are likely to have a cumulative impact when considered with the Proposed Development have been agreed with the Local Authority during the preparation of this ES (a full list is included within Section 9 of the ES Part 1 Report). The following table includes the agreed list of cumulative developments that have been assessed in respect of the Energy Technical Paper.

	Possible Cumulative Development	**Details**	**Status**	**Justification for Cumulative**
1	Airfields (former RAF Sealand) Site (Northern Gateway) LPA ref: 049320 and last varied S73 application LPA ref: 061125. Applicant: Crag Hill Estates Ltd.	Outline application for the redevelopment of a strategic brownfield site for an employment led mixed use development with new accesses and associated infrastructure including flood defences and landscaping. The Net Cumulative Development associated with the Airfields site after deducting the floor space (124,344m²) taken up by the Proposed ICT Paper Mill Facility (B2, B8, ancillary B1a) and operational Amazon development (ref: 060222) is as follows: Development comprises: Residential (C3): 689 units Retail (A1): 4,646m² Office (B1a): 6,533m² B2 /B8 Employment: 60,044m² Car Dealership (Sui generis): 7,779m² **net Total floorspace: 689 units / 79,002m²**	LPA ref: 049320 Planning permission granted by Flintshire County Council in January 2013. The last varied S73 application was granted on the 26 April 2021 (ref: 061125) to remove conditions 26, 28, 30, 34 and 44 and vary condition 13. Development expected to come forward over the next 0-5 years.	Impact of daylight availability should be checked. Increase of energy demand should consider impact on local distribution network.
2	Former Corus Garden City Site (Northern Gateway) Applicant: PGNGL Outline (LPA ref: 054758) / S73	Employment-led mixed-use development, incorporating Logistics and Technology Park (B1, B2, B8) with residential (C3), local retail centre (A1), hotel (C1), training and skills centre (C2, D1), new parkland; conversion of buildings, demolition of barns; and associated infrastructure comprising construction of accesses, roads, footpaths / cycle paths, earthworks and flood mitigation / drainage	Outline planning permission granted by Flintshire County Council in May 2014. The last permission to be granted under a S73 application was approved in June 2020 (ref: 059635) was for	Impact of daylight availability should be checked. Increase of energy demand should consider impact on local distribution network.

	application (LPA ref: 059635)	works at Northern Gateway, Land off Welsh Road, Deeside. Development comprises: Residential (C3): 770 units Retail (A1): 2500m² Office (B1a): 3300m² Light industrial uses (B1b, B1c): 7400m² Hotel Uses (C1): 3000m² Training and skills centre (C2, D1): 4000m² Logistics Park (B2, B8, ancillary B1a): 120000m² **Total floorspace: 770 units / 140,200m²**	removal of conditions 6, 8, 11 and 32 and variation of conditions 7, 31, 36 and 44. Development expected to come forward over the next 0-10 years.	

Table 11. 17 Cumulative impact assessment

10.3. Both Construction and Operational phases should be considered and the short, medium and long term impacts assessed.

Short Term

10.4. There could be an impact regarding the energy network at both local and national scale, as there could be an additional demand for both regulated and unregulated energy use. Potential impact in neighboring properties in terms of microclimate (wind, solar etc)

Medium Term

10.5. There could be an impact regarding the energy network at both local and national scale, as there could be an additional demand for both regulated and unregulated energy use. Decarbonization of the grid and diversification of it should be taken into consideration.

Long Term

10.6. The design has to consider its potential climatic impact over the local environmental and on a global scale. This should include resilient technologies which can adapt to future climatic scenarios.

10.7. Based on the relevant Technical Report as described above, the development is not expected to present any significant cumulative impacts, please refer to these reports for further details.

11. Conclusion

11.1. This Paper considers the energy demand and subsequent carbon emissions at both construction and operational phases of the Proposed Development. The potential environmental impacts have been mitigated to minor adverse. The following measures have been incorporated in the design:

- Fabric build-up that seeks to optimise insulation and protection from outdoor conditions;
- High-performing glazing with low solar heat transmittance shall be installed throughout the development, enhancing solar heat gain control throughout the year;
- Application of a natural ventilation strategy wherever possible, minimising the use of mechanical ventilation;
- The development shall use low energy lighting throughout, reducing energy consumption and internal gains.

11.2. The construction and erection of this Proposed Development could have the following environmental effects:

- Increased energy use due to the demand of construction activities;
- Increased carbon emissions associated with energy use;
- Increased air pollutants (e.g NOx) to be emitted via construction and vehicles.

11.3. The potential effects due to the operational use of the Proposed Development are listed below:

- Increased energy demand;
- Increased carbon emissions associated with energy use;
- Potential noise from factories' activities and process.

11.4. The energy hierarchy that has been followed, is based on the following steps:

- Reduce energy demand;
- Use energy efficiently;
- Renewable energy generation;
- Minimise carbon impact of other energy generation;
- Minimise extraction of carbon intensive energy materials.

11.5. It is important to mention that this report assesses the office building and the admin areas of the industrial building. It does not assess the process areas of the building, however this is dependent on the progression of the design at later stages and whether specific conditioning

requirements are to be set out going forward. On the basis that the current design does not provide heating, cooling or ventilation to non-office or admin areas and therefore have been excluded from this assessment.

11.6. The MEP strategy is based on assumptions, as at this stage there is no consultant appointed. The fabric properties are based on the architect's specifications and shall be reviewed at later stages, as the design progresses. The values used in the energy model are subject to change depending on the progression of the MEP strategy, but are currently based on reasonable assumptions.

11.7. As per the Energy and Sustainability Statement, appended in this document, the combination of the passive design measures, energy efficient systems and renewable energy technologies could result in a 10.5% reduction in CO2 emissions over the Target Emissions Rate (TER). This achieves compliance with Policy EWP3 of Flintshire's Unitary Development Plan, which requires 10% reduction in CO2 emissions to be achieved via renewable energy technologies.

11.8. It is worth mentioning that a series of additional sustainable measures are featured in this Proposed Development. These include:

- All insulation materials used within the Proposed Development should be selected to be CFC free both in manufacture and through their composition;
- Building materials, where possible, should be sourced locally to reduce transportation pollution & support the local economy;
- All timber should be purchased from responsible forest sources;
- Recycling facilities should be provided on site for construction and operational waste;
- Water use should be reduced by the specification of water efficient taps, shower heads, dual flush toilets and low water use appliances;
- The construction site should be managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution. A Site Waste Management Plan (SWMP) should be produced for the works.

11.9. In conclusion the Paper confirms there will be negligble to minor adverse residual impacts following mitigation and all cumulative development is not expected to present any significant cumulative impacts.

12. Reference List

12.1. The following documents have been used to conduct the necessary energy studies and produce this report:

- Welsh Approved Document Part L2A (2016);
- Planning Policy Wales (February 2021);
- Flintshire Unitary Development Plan (2000-2015).

12.2. Other documents that have been consulted at this stage include:

- Technical Advice Note 12 (March 2016);
- Flintshire's Supplementary Planning Guidance Note No.20 (January 2017);
- Flintshire's Supplementary Planning Guidance Note No.21 (January 2017);
- Flintshire's Strategic Environmental Assessment and Sustainability Appraisal (March 2015);
- Flintshire Local Development Plan (September 2019);
- National Development Framework 2020-2040 (August 2019).

Appendix 11.1: BRUKL Documents

BRUKL Output Document

Compliance with Wales Building Regulations Part L 2014

Llywodraeth Cymru Welsh Government

Project name

ICT Paper Mill As designed

Date: Wed Aug 25 10:16:40 2021

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated BER and BPEC for the building must not exceed the targets

Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	13.8
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	15.4
Building Primary Energy Consumption (BPEC), kWh/m^2.annum	87.02
Target Primary Energy Consumption (TPEC), kWh/m^2.annum	93.83
Do the building's emissions and primary energy consumption exceed the targets?	BER =< TER BPEC =< TPEC

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.27	0.27	L00000AE:Surf[2]
Floor	0.25	0.25	0.25	L00000AE:Surf[0]
Roof	0.25	0.18	0.18	L0000029:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.5	1.5	L00000AE:Surf[1]
Personnel doors	2.2	1.5	1.5	L0000072:Surf[1]
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

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	8695.2	8695.2
External area [m²]	12816.7	12816.7
Weather	CAR	CAR
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	4477.31	4456.35
Average U-value [W/m²K]	0.35	0.35
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
15	**B1 Offices and Workshop businesses**
85	**B2 to B7 General Industrial and Special Industrial Groups**
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: 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	9.81	13.96
Cooling	0.69	0.58
Auxiliary	4.34	3.12
Lighting	14.99	25.12
Hot water	4.77	5.24
Equipment*	37.47	37.47
TOTAL**	**34.59**	**48.01**

* Energy used by equipment does not count towards the total for consumption or 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	7.3	6.36
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]	52.25	56.54
Primary energy* [kWh/m²]	87.02	93.83
Total emissions [kg/m²]	13.8	15.4

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

Appendix 11.2: Criterion 3

Zone	Actual Solar Gain (kWh)	Benchmark Solar Gain (kWh)	Status
L00_Off_Cafe 000	1422.57	1389.09	Fail
L00_Off_Office 009	1641.04	1142.21	Fail
L00_Off_Office 010	4976.3	4053.65	Fail
L00_Off_Reception 012	1828.87	468.48	Fail
L00_Off_Reception 013	8040.57	3878.81	Fail
L01_Off_Copying 017	823	586.15	Fail
L01_Off_Office 024	1957.63	1172.16	Fail
L01_Off_Office 025	1899.69	1164.64	Fail
L01_Off_Office 029	1923.35	1156.39	Fail
L01_Off_Office 030	2402.22	1451.51	Fail
L00_	0	1128.96	Pass
L00_Finished Goods	0	33171.24	Pass
L00_Infirmary 001	0	876.97	Pass
L00_MCC Trafo	0	4179.03	Pass
L00_NIO	0	33203.95	Pass
L00_Off_Circulation 001	0.24	970.1	Pass
L00_Off_Circulation 002	0	351.53	Pass
L00_Off_Circulation 003	0	676.34	Pass
L00_Off_Copying 004	736.49	982.47	Pass
L00_Off_Meeting 005	741.41	1478.19	Pass
L00_Off_Office 006	1477.68	1478.19	Pass
L00_Off_Office 007	8595.37	9569.35	Pass
L00_Off_Office 008	1348.87	2175.75	Pass
L00_Off_Office 011	1177.18	2207.61	Pass
L00_Off_WC 014	660.51	1176.97	Pass
L00_Oils 001	0	3994.65	Pass
L00_Refectory 001	0	876.97	Pass
L00_Team Leader 001	0	1753.93	Pass
L00_Workshop 001	187.23	7989.3	Pass
L00_Workshop 002	0	9937.68	Pass
L01_CoffeeRoom 001	0	949.79	Pass
L01_CV Dept Manager 001	550.52	1028.17	Pass
L01_Eating 065	166.45	940.52	Pass
L01_Eating 066	177.17	940.54	Pass
L01_Eating 067	270.94	940.52	Pass

L01_Italians Office 001	778.15	1270.09	Pass
L01_Laboratory 001	872.59	1790.32	Pass
L01_Meeting Room 002	1110.7	1814.42	Pass
L01_MeetingRoom 001	0	1482.79	Pass
L01_NIO	0	33734.79	Pass
L01_Off_Circulation 015	0	512.57	Pass
L01_Off_Circulation 016	0	689.86	Pass
L01_Off_Meeting 019	261.33	728.96	Pass
L01_Off_Meeting 020	503.45	728.96	Pass
L01_Off_Meeting 021	2457.37	3610.93	Pass
L01_Off_Meeting 022	499.1	1172.16	Pass
L01_Off_Meeting 023	0	586.08	Pass
L01_Off_Office 026	2698.57	3037.65	Pass
L01_Off_Office 027	1000.92	1172.16	Pass
L01_Off_Office 028	4708.08	5659.21	Pass
L01_Off_Office 031	1795.41	2470.44	Pass
L01_Off_Reception 032	0	142.83	Pass
L01_Off_WC 033	678.35	1256.33	Pass
L01_Quality Office	593.3	967.69	Pass
L01_Specialist&Safety Office 001	741.19	1209.61	Pass
L02_Meeting 112	1045.33	1834.69	Pass
L02_Meeting 113	1019.45	1834.66	Pass
L02_Meeting 114	1673.39	1834.69	Pass
L02_Meeting_room 115	0	974.71	Pass
L02_Meeting_room 116	0	974.72	Pass
L02_Meeting_room 117	0	974.71	Pass
L02_Office 118	1361.79	1451.53	Pass
L02_Office 119	1232.14	1318.21	Pass
L02_Office 120	686.31	1317.17	Pass
L02_Office 121	766.84	1318.23	Pass
L02_Office 122	753.03	1305.31	Pass
L02_Office 123	841.09	1449.4	Pass
L02_Office 124	1087.3	1317.19	Pass
L02_Office 125	1360.62	1449.4	Pass
L02_Office 126	839.28	1451.53	Pass
L02_Office 127	690.82	1317.19	Pass
L02_Office 128	857.93	1451.53	Pass

L02_Office 129	857.46	1449.4	Pass
L02_Office 130	758.02	1305.31	Pass
L02_Office 131	777.27	1318.21	Pass
L02_Office 132	1203.16	1305.31	Pass
L02_Printer 133	0	278.21	Pass
L02_Printer 134	0	278.21	Pass
L02_Printer 135	0	278.21	Pass

Appendix 11.3 Energy and Sustainability Statement

Paper Mill Facility, Plot C Airfields, Northern Gateway

Energy & Sustainability Statement
Industrie Cartarie Tronchetti UK Limited

Job No:	1022988
Doc Ref:	1022988-RPT-SY-001
Revision:	D
Revision Date:	10 September 2021

Project title	Paper Mill Facility, Plot C Airfields, Northern Gateway	**Job Number**
Report title	Energy & Sustainability Statement to support the Property Development Grant	1022988

Document Revision History

Revision Ref	Issue Date	Purpose of issue / description of revision
—	11 October 2019	Draft issue for comments
A	13 November 2020	Revised Client details
B	02 September 2021	Updated design and location
C	08 September 2021	Incorporating comments
D	10 September 2021	Incorporating comments

Document Validation (latest issue)

10/09/2021	10/09/2021	10/09/2021
X	X Nuno Correia	X
Principal author	Checked by	Verified by
Signed by: Krania, Angeliki	Signed by: Correia, Nuno	Signed by: Kumari, Kavita

Executive Summary

This Energy & Sustainability Statement has been prepared in support of the planning application for the ICT Paper Mill, on plot C of Airfields. The purpose of this statement is to outline the energy and sustainability performance which will be applied to the Paper Mill, which is intended to replicate ICT's other Paper Mills in Europe all designed to improve environmental performance to a high standard. ICT are not seeking formal BREEAM accreditation for this project, however, ICT is mindful of its environmental impact and responsibilities. This statement will demonstrate how these design measures will meet the energy and sustainability targets, as set by the Flintshire County Council (FCC).

The principal objectives are to reduce the site's contribution to the cause of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and by providing some of the requirement by renewable/sustainable means. Issues such as water and waste, biodiversity, etc. have also been addressed in the Paper.

The following measures have been incorporated in the design:

- Fabric build-up that seeks to optimise insulation and protection from outdoor conditions;
- High-performing glazing with low solar heat transmittance will be installed throughout the development, enhancing solar heat gain control throughout the year;
- Application of a natural ventilation strategy wherever possible, minimising the use of mechanical ventilation and cooling;
- The development will use low energy lighting throughout, reducing energy consumption and internal gains.

The energy hierarchy that has been followed, is based on the following steps:

- Reduce energy demand;
- Use energy efficiently;
- Renewable energy generation;
- Minimise carbon impact of other energy generation;
- Minimise extraction of carbon intensive energy materials.

The MEP strategy is based on assumptions, as at this stage there is no consultant appointed. The fabric properties have been based on the architect's specifications. The values used in the energy model are subject to change depending on the progression of the MEP strategy, but are currently based on reasonable assumptions. The results presented in this report are subject to change should there be any updates to the design parameters as the project progresses.

The combination of the passive design measures, energy efficient systems and renewable energy technologies could result in a **10.5%** reduction in CO_2 emissions over the Target Emissions Rate (TER). This achieves compliance with Policy EWP3 of Flintshire's Unitary Development Plan, which requires 10% reduction in CO_2 emissions to be achieved via low and zero carbon technologies.

A range of additional sustainable design measures are featured in this development. These include:

- All insulation materials used within the proposed development will be selected to be CFC free both in manufacture and through their composition;
- Building materials, where possible, will be sourced locally to reduce transportation pollution & support the local economy;
- All timber will be purchased from responsible forest sources;
- Recycling facilities will be provided on site for construction and operational waste;
- Water use will be reduced by the specification of water efficient taps, shower heads, dual flush toilets and low water use appliances;
- The construction site will be managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution. A Site Waste Management Plan (SWMP) will be produced for the works.

In summary, ICT have historically developed very sustainable sites across Europe and are endeavouring to do the same on this Welsh site at Northern Gateway. A high-level review of the initiatives proposed by ICT indicates that the measures applied, the energy, water and waste, are likely to exceed the requirement for BREEAM and the BREEAM New Construction 2018 Industrial Building criteria.

It is important to mention that this report assesses the office building and the admin areas of the industrial building. It does not assess the process areas of the building, however this is dependent on the progression of the design at later stages and whether specific conditioning requirements could be set out going forward. Furthermore, we understand that the current design does not provide heating, cooling or ventilation to non-office or admin areas and therefore have been excluded from this assessment.

Contents

1.0

Introduction

1.0 Introduction

This Energy and Sustainability Statement has been prepared to accompany the planning application for the proposed ICT Paper Mill project. It aims to meet the energy requirements of the National Development Framework (NDF) and the Flintshire County Council (FCC).

This report outlines the proposed energy and sustainability strategy for the proposed development. Each of the proposed initiatives has been assessed on the relative sustainability potential and suitability to the site.

The principal objectives are to reduce the site's contribution to the cause of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and by providing some of the requirement by renewable/sustainable means. Issues such as water and waste, biodiversity, etc. have also been addressed in the present report.

1.1 Description of Development

The proposed ICT Paper Mill project is located in the North of Wales, within the local authority area of Flintshire. The site is located on the western edge of Garden City a village within the Sealand area of Flintshire. The proposed project features primarily manufacturing and production areas with a smaller ancillary office building, which add up to a floor area in exceedance of 120,000 m².

Figure 1: Proposed site location

1.2 Process areas of the development

The process areas of the development have been excluded from the current assessment. As Part L2A states:

"Industrial sites, workshops and non-residential agricultural buildings with low energy demand are exempt from the energy efficiency requirements. The low energy demand relates only to the energy used by fixed heating or cooling systems and not to energy required for or created by process needs.

Examples of such buildings that are low energy demand are as follows:

a. buildings or parts of buildings where the space is not generally heated, other than by process heat, or cooled;

b. buildings or parts of buildings that require heating or cooling only for short periods each year, such as during critical periods in the production cycle (e.g. plant germination, egg hatching) or in very severe weather conditions."

At this point, as per the above, only the office/admin areas of the industrial building have been assessed along with the office building (assessed areas highlighted in red below). This is subject to approval at later stages of the design, through engagement with building control. If the design changes, meaning that there is space conditioning provided to the process or storage areas of the development, the results detailed in this report will need to be updated to reflect the changes.

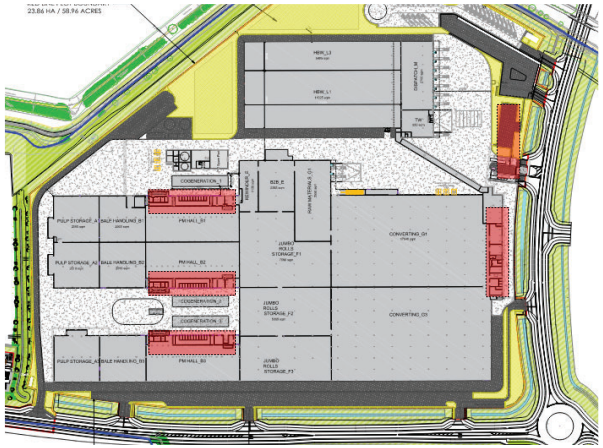


Figure 2: Proposed site plan (assessed areas in red)

2.0

Planning Policy

2.0 Planning Policy

2.1 National Policy

2.1.1 Planning Policy Wales (February 2021)

Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. PPW, the TANs1, MTANs2 and policy clarification letters comprise national planning policy.

The primary objective of PPW is to ensure that the planning system contributes towards the delivery of sustainable development and improves the social, economic, environmental and cultural well-being of Wales, as required by the Planning (Wales) Act 2015, the Well-being of Future Generations (Wales) Act 2015 and other key legislation and resultant duties such as the Socio-economic Duty. A well functioning planning system is fundamental for sustainable development and achieving sustainable places.

Welsh Government planning policy recognizes an energy hierarchy. The Welsh Government expects all new development to mitigate the causes of climate change in accordance with the energy hierarchy for planning, as set out in the following energy policies. Reducing energy demand and increasing energy efficiency, through the location and design of new development, will assist in meeting energy demand with renewable and low carbon sources. This is particularly important in supporting the electrification of energy use, such as the growing use of electric vehicles and heat pumps. All aspects of the energy hierarchy have their part to play, simultaneously, in helping meet decarbonization and renewable energy targets.

The Welsh Government has set targets for the generation of renewable energy:

- for Wales to generate 70% of its electricity consumption from renewable energy by 2030;
- for one Gigawatt of renewable energy capacity in Wales to be locally owned by 2030; and
- for new energy projects to have at least an element of local ownership.

Sustainable building design principles should be integral to the design of new development. Development proposals should:

- mitigate the causes of climate change, by minimising carbon and other greenhouse gas emissions associated with the development's location, design, construction, use and eventual demolition;
- include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change

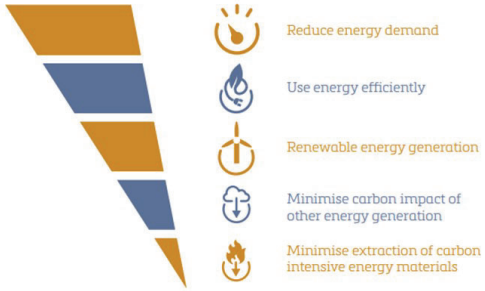


Figure 3:Energy Hierarchy for planning

2.2 Local Policy

2.2.1 Flintshire Unitary Development Plan (2000 – 2015)

This document is the 'adopted' version of the Unitary Development Plan for Flintshire for the 15-year period 2000 to 2015 (There is a new draft plan out for consultation, but still not adopted). The aim of the Plan is to provide a framework for making rational and consistent decisions on planning applications, and to guide development to appropriate locations. The preparation of the Plan has allowed local people, businesses and others with an interest in the County, an opportunity to shape the communities and environment of the future. It identifies land for new housing, employment, retailing and other forms of development and sets out general policies to control new development, changes in the use of land or buildings, and to protect the environment from insensitive change. The Plan also sets out the basis to bring about sustainable development.

There are a series of policies detailed in this document which directly relate with the energy performance of the proposed developments. These are documented below.

EWP1 Sustainable Energy Generation

The generation of clean and sustainable energy is critical to addressing global warming and minimising the long-term impact of climate change upon the global and local environment. The objectives of the emerging Energy Policy for Wales are to reduce energy consumption and to facilitate the expansion of renewable energy. Ultimately such objectives will be to reduce the need for finite resources, reduce greenhouse gas emissions and to encourage the development of a low carbon energy economy.

EWP2 Energy Efficiency in New Development

In all new development the Council must be satisfied that sufficient steps have been taken in the siting, aspect, form and design of new buildings to minimise the wasteful consumption of energy and resources both in the construction and use of buildings.

EWP3 Renewable Energy in New Development

All major new residential and non-residential (>1,000m²) developments will be required to incorporate renewable energy production equipment on site to reduce predicted carbon emissions by a minimum of 10% except where:

- it would not be viable given the type of development, its location and design;
- it would have an adverse effect on amenity which would outweigh the benefits of the technology; or
- it is not possible to incorporate renewable energy production to achieve the full 10%.

Examples of renewable energy technologies are passive solar design, solar water heating, photovoltaic cells, wind turbines, geothermal/water heat pumps, combined heat and power schemes and community heating schemes.

3.0

Energy Hierarchy

3.0 Energy Hierarchy

The MEP strategy is based on assumptions as at this stage there is no consultant appointed. The values used in the energy model are subject to change depending on the progression of the MEP strategy, but are currently based on reasonable assumptions.

The strategy has been developed to reduce the building's annual energy consumption, whilst providing energy in the least carbon intensive manner, to reduce the development's annual CO_2 footprint.

The initial focus is on passive building measures such as high levels of insulation, reduced thermal bridging, and air tightness, followed by energy efficiency. In order to achieve this, a "Steps to Low Carbon" methodology has been applied.

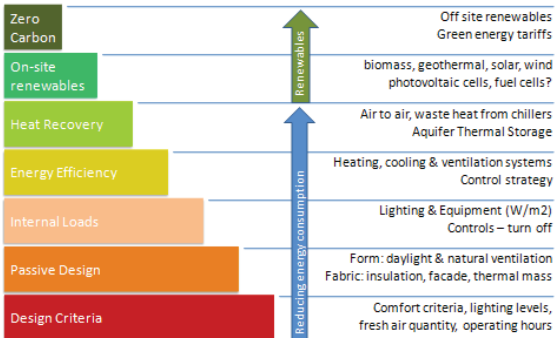


Figure 4: Steps to Low Carbon

3.1 Reduce Energy Demand

Substantial reductions in energy usage for the scheme were achieved through the consideration of the passive elements of the design, along with improved occupant comfort. The aim was to optimise the passive building elements and hence reduce the energy consumption associated with the mechanical systems. This has been balanced between a range of requirements and factors such as site constraints, acoustic and daylight considerations.

Passive Solar Design – Day Lighting vs. Solar Heat Gains

Maintaining adequate levels of natural light but at the same time limiting the solar heat gains inside the building has been an essential part of the project's design philosophy. Selecting appropriate Visible Light Transmittance (VLT) and solar heat transmittance coefficient value (g-value) for the glazing, helped minimise the heating and cooling demand of the building and at the same time secured adequate levels of natural daylight for the occupants.

Building Envelope

Improving the thermal insulation standards beyond the minimum Building Regulation standards helped reduce the annual CO_2 emissions associated with the building's heating and cooling systems, by limiting the heat loss through the building's fabric. The details of the building fabric are outlined on the table below, in accordance with the architect's specifications. These will be re-evaluated at later stages of the design.

Element	Design	Regulations (Part L2A)
Ground floor average U-value	0.25 W/m²K	0.25 W/m²K
Ground floor average U-value (office)	0.22 W/m²K	0.25 W/m²K
External wall average U-value	0.27 W/m²K	0.35 W/m²K
Roof average U-value	0.18 W/m²K	0.25 W/m²K
Door U-value	1.50 W/m²K	2.20 W/m²K
Window U-value (including frame)	1.50 W/m²K	2.20 W/m²K
Window total solar transmission	0.40	-
Window visible light transmittance	0.70	-
Skylight U-value (including frame)	1.30 W/m²K	2.20 W/m²K
Skylight total solar transmission	0.55	-
Skylight visible light transmittance	0.70	-
Air permeability @ 50 Pascals	3 m³/hr/m²	10 m³/hr/m²

Table 3.1: Fabric details

Thermal Bridging

Linear thermal bridge Ψ values if not considered carefully will have a high conductivity which will require a greater enhancement of the other elements of the building envelope to compensate. Where this is not possible, all architectural details will be produced to a high quality, close to the construction details listed on the Energy Trust website.

Air Permeability

An air pressure test will be carried out in order to determine the air leakage rates and take any remedial actions to improve it. A significantly improved rate (as specified in table 3.1) will be targeted for the development in comparison with the Building Regulation minimum standards for new buildings, as it will help in lowering energy demand.

High level of air tightness will be achieved by prefabrication of a number of key building components under factory conditions, robust detailing of junctions and good building practices on site.

3.2 Use Energy Efficiently

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice, the following principles will be adopted throughout the proposed development where possible.

Low-Energy Lighting

Installing efficient low energy light fittings internally and externally can significantly reduce a building's overall lighting load hence lowering its annual CO_2 emissions. To reduce the energy consumption associated with artificial lighting, internal lighting fittings will be energy efficient with high luminous efficacies of at least 110 lumens/Watt.

Daylight dimming is applied to all perimeter offices and meeting rooms, along with presence occupancy sensors. Parasitic power associated with these controls is at a maximum 0.10 W/m² for each type of sensor mentioned above.

HVAC System Plant Efficiencies

The design team will specify all equipment and plant to exceed the minimum requirements of Non-Domestic Building Services Compliance Guide. This provides guidance on the means of complying with the requirements of Part L2A of the Building Regulations for conventional space heating systems, hot water systems and cooling systems.

Element	Efficiency
VRF heating	400%
VRF cooling	450%
Electric radiators	100%
DHW (Point of use)	100%
Mechanical Ventilation Specific Fan Power	1.10 W/l/s
MVHR (Thermal wheel)	80%

Table 3.2: HVAC efficiencies

Variable Speed Pumps and Drives

All pumps should be specified with variable-speed drives, which will reduce their energy consumption by more than two-thirds compared with equivalent non-variable speed alternatives, by only supplying the required flow rate to meet the demand.

Controls

The heating systems will be appropriately zoned, allowing fast local response to changes in loads. Appropriate lighting controls, including timers, occupancy controls and dimming shall be specified where applicable for all internal lighting.

Energy Metering

Metering of the energy uses within the development separately, will help the building users identify areas of increased consumption and highlight potential energy-saving measures for the future, hence reducing the associated annual CO_2 emissions from these systems. Metering will allow the FM Teams to identify where leaks and/or faults are causing excess energy consumption to occur. For the proposed development, all energy supplies will be metered by end energy use, with energy display devices located in a visible place to enable building users to monitor and therefore take actions to reduce their CO_2 emissions.

3.3 Renewable Energy Generation

3.3.1 District Heating Schemes / Combined Heat & Power (CHP)

There are no planned district heating schemes in close proximity to the site, to facilitate a current or future connection. In addition, the current conditioning strategy of the buildings is not based on a water system therefore district heating schemes have not been included in this assessment.

For the same reason that has been noted above (current non water-based strategy) a CHP system has been disregarded at this stage, as it would not be applicable in such a development.

The potential of the 'HyNet North West' initiative, aimed at decarbonizing the industrial district through carbon capture, was considered. However, given that this is a long time project, it is understood that this will be not applicable for the ICT Paper Mill Proposed Development.

3.3.2 Air Source Heat Pumps

Air source heat pumps exchange heat between the outside air and a building to provide space heating in winter and cooling in the summer months. The efficiency of these systems is inherently linked to the ambient air temperatures.

Heat pumps supply more energy than they consume, by extracting heat from their surroundings. Heat pump systems can supply as much as 4kW of heat output for just 1kW of electrical energy input.

To enable the development to be net zero carbon, heat pumps will be used throughout for the provision of heating, cooling and hot water in dedicated areas of the scheme. Full details of the MEP strategy are to be confirmed in later stages of the design.

3.3.3 GSHP (Ground Source Heat Pumps)

Ground source heat pumps require either horizontal trenches or vertical boreholes to be excavated in order to accommodate piles or loops. GSHPs only work when there is a relatively balanced heating and cooling load. The proposed building has a far larger heating than cooling demand. Over time, this would result in the abstraction of heat permenantly from the ground, reducing the ground temperature to a point whereby the seasonal efficiency of the heat pumps drops off to a point where they are no more efficient than direct electric heating.

For this reason, ground source heat pumps have not been considered for the ICT Paper Mill project.

3.3.4 Biomass Heating

Biomass boilers are no longer recommended for inner city and urban deployment due to concerns related to air quality. Even with comprehensive treatment of exhaust gases, biomass boilers will exhaust more local pollutants than gas fired CHP units and high efficiency boilers.

Additionally, biomass boilers require significant space for storage and delivery of fuel. Therefore, biomass boilers have not been considered feasible for the proposed development.

3.3.5 Wind Turbines

The output from wind turbines is highly sensitive to wind speed. Hence it is essential that turbines should be sited away from obstructions, with a clear exposure or fetch for the prevailing wind.

The urban location of the site coupled with the adjacent buildings will result in a turbulent flow regime across the site. As such it is not proposed to include wind turbines as part of the development.

3.3.6 Photovoltaic Panels

Photovoltaic solar cells convert solar energy directly into electricity. The cells consist of two layers of silicon with a chemical layer between. The incoming solar energy charges the electrons held within the chemical. The energised electrons move through the cell into a wire creating an electrical current.

The advantage of photovoltaic cells is once they are installed, they require minimal maintenance over their operational life and have no primary fuel requirements.

In this instance, given the large available roof space and the lack of overshadowing from neighbouring buildings, photovoltaic panels have been included in the assessment. The specifications that have been assumed at this stage are documented on the following table. These have been decided so that the development achieves the 10% reduction, as set out by Flintshire's UDP.

Category	Value
Area	360 m²
Azimuth	180°
Inclination	30°
Panel efficiency	19%
Inverter efficiency	90%

Table 3.3: PV panel specifications

As the MEP strategy is based on assumptions, should these change later on in the design the required PV area will also be subject to update.

3.3.7 Solar Thermal

Solar thermal collectors utilise solar radiation to heat water for use in buildings. The optimum orientation for a solar collector in the UK is a south facing surface, tilted at an angle of 30º from the horizontal.

Solar collectors are typically designed to meet a development's base heat load, associated with its domestic hot water requirements. This usually equates to 60-70% of the total DHW annual load, with the natural gas-fired boilers meeting the remainder of the load.

Solar thermal collectors have been discarded at this stage, as available roof space has been favoured for PV panels.

4.0

Energy performance

4.0 Energy Performance

4.1 Steps followed

Reduce Energy Demand

The proposed development will be well insulated ensuring that heat losses are kept to a minimum with enhanced U-values in the building envelope exceeding Building Regulations standards. This will reduce any potential heat losses via conduction.

Use Energy Efficiently

After assessing the contribution of the passive elements to the overall energy balance, the aim is to further reduce CO_2 emissions by selecting efficient mechanical and electrical systems and efficient controls to manage the energy used during operation. On the basis of good practice, the following principles will be adopted throughout the proposed development where possible.

Renewable energy generation

Air source heat pumps will be used throughout for the provision of heating, cooling and hot water in dedicated areas of the scheme. Full details of the MEP strategy are to be confirmed in later stages of the design.

In this instance, given the large available roof space and the lack of overshadowing from neighbouring buildings, photovoltaic panels have been included in the assessment. The specifications that have been assumed at this stage are documented on the following table. These have been decided so that the development achieves the 10% reduction, as set out by Flintshire's UDP.

4.2 Performance of the development

After all stages of the energy hierarchy have been applied, the development is demonstrating a 10.5**%** area-weighted improvement over the TER, achieved via PVs, thus complying with Policy EWP3 of Flintshire's Unitary Development Plan. The following tables and figures indicate the performance that is achieved.

It is important to mention that this report assesses the office building and the admin areas of the industrial building. It does not assess the process areas of the building; however, this is dependent on the progression of the design at later stages and whether specific conditioning requirements could be set out going forward. Furthermore, we understand that the current design does not provide heating, cooling or ventilation to non-office or admin areas and therefore have been excluded from this assessment.

A number of spaces are currently falling marginally short of the solar gain criteria in Part L building regulations. It is worth noting that the current modelling was based on a number of assumptions regarding glazing ratios and elevation design. Therefore, it is recommended that mitigation measures (eg. glazing ratio coordination, solar control glazing, external shading, internal blinds) are considered at subsequent design stages.

Carbon emissions		
Category	**TER (kgCO2/m²)**	**BER (kgCO2/m²)**
Heating	3.0	5.0
DHW	1.1	2.4
Cooling	0.3	0.4
Auxiliary	1.6	2.2
Lighting	12.8	7.6
Renewables	-3.30	-3.8
Total emissions	15.4	13.8
Percentage reduction		10.5%

Table 4.1: Carbon emissions

Energy consumption		
Category	**TER (kWh/m²)**	**BER (kWh /m²)**
Heating	14.0	9.8
DHW	5.2	4.8
Cooling	0.6	0.7
Auxiliary	3.1	4.3
Lighting	25.1	15.0
Renewables	-6.4	-7.3
Total energy	41.7	27.3
Percentage reduction		34.5%

Table 4.2: Energy consumption

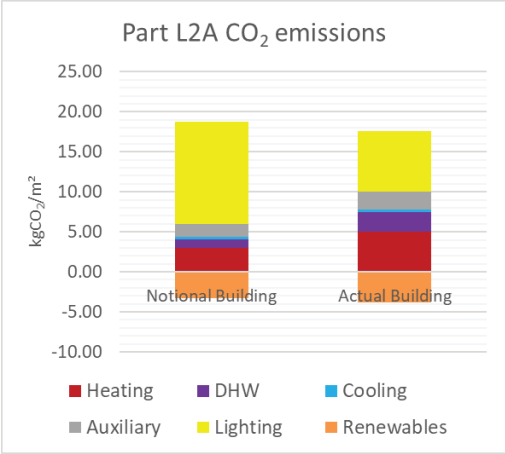


Figure 5: Carbon emissions comparison (SAP2012 emission factors)

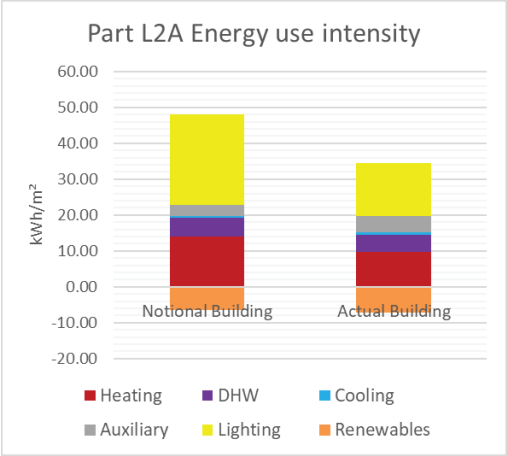


Figure 6: Energy consumption comparison

5.0

Sustainability

5.0 Sustainability

The following sections outline the sustainable features of the proposed ICT Paper Mill project development. These consider the broad environmental concerns of climate change, pollution, impact on occupants and the wider community. This is balanced with the need for a high quality, safe and healthy internal environment. These standards go beyond the requirements of the Building Regulations.

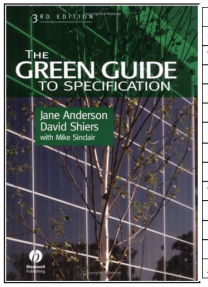
5.1 Materials

Building and construction activities worldwide consume 3 billion tons of raw material each year, which account for approximately 50% of total global consumption. Using green/sustainable building materials and products promotes conservation of dwindling non-renewable resources. In addition, integrating sustainable building materials into building projects can help reduce the environmental impacts associated with the extraction, transport, processing, fabrication, installation, reuse, recycling, and disposal of these source materials.

The aim for the ICT Paper Mill project will be for its overall environmental impact to be minimised through the specification of sustainable materials.

5.1.1 Environmental Impact of Materials

New materials with low overall environmental impact will be chosen and advice from the Green Guide to Specification will be taken into consideration for the selection. The Green Guide rates the environmental impact of different materials and components, taking into account factors like toxicity, ozone depletion, ease of recycling, waste disposal etc. Where viable, at least 80% (by area) of the new main elements in the building, fabric & building services insulation should be specified to achieve the best performing “A” and “A+” ratings from the Green Guide.



Environmental Issue
Climate Change*
Water extraction
Mineral extraction
Stratospheric ozone depletion*
Human toxicity
Ecotoxicity to freshwater
Higher level nuclear waste
Ecotoxicity to land
Waste disposal
Fossil fuel depletion
Eutrophication*
Photochemical ozone creation*
Acidification*

Figure 7: The 13 Environmental issues assessed by the Green Guide

5.1.2 Sustainable Timber

Any timber used for basic or finishing building elements in the scheme will be sourced from responsibly managed and sustainable forests or plantations. Such timber products are the only truly renewable construction material in common use and growing trees also absorb and sequester CO_2. Forests can also provide the habitat for a wide variety of plant and animal life, preserving important ecology and promoting biodiversity.

5.1.3 Locally Sustainable Materials

A building that is truly sustainable must be constructed using locally sourced, sustainable materials i.e. materials that can be supplied without any adverse effect on the environment. Therefore, where practical, materials should be sourced from local suppliers, reducing the environmental impacts and CO_2 emissions associated with transportation.

5.1.4 Recycled Materials

Scope for increased recycling will be incorporated by specifying recycled materials where possible and ensuring that even where new materials are used, as much as possible can be recycled at the end of the buildings’ life.

Specifying materials with a high-recycled content is also another method of saving processing or manufacturing energy. The recycled content of a material can be described as either post-consumer or post-industrial to indicate at what point in the life cycle a material is reclaimed

5.2 Water Conservation

Water consumption in the UK has risen by 70% over the last 30 years. Trying to meet the increasing demand by locating new sources of water supply is both expensive and damaging to the environment. Therefore, the design team have focused on reducing the demand for water and managing the existing resources.

The Building Regulations propose a limit on flow rates for sanitary ware fittings that will be used to inform the architect’s product selection of water fittings.

5.2.1 Demand Reduction and Water Efficiency

The aim is to minimise internal and external potable water use within the development. This can be achieved by considering:

Dual Flush Cisterns on WC’s - These units have the ability to provide a single flush of 4L and/or a full flush of 6L.

Flow Restrictors to Taps - Flow restrictors reduce the volume of water discharging from the tap. Spray taps have a similar effect and are recommended to reduce both hot and cold-water consumption. Low flow taps in one of the above forms will be installed in all areas. The use of aerating taps means that the perceived pressure of a shower is the same as a standard flow model, however water consumption can be decreased by over 30%.

Water Meters - In 1995 approximately 33,200 million litres of water a day were extracted in England and Wales, this increased to 44,130 million litres/day in 2001, and much of this was for domestic water supply. To reduce this figure, accurate information on usage is required for management of a building’s consumption. Water meters will be specified on the main supply.

5.3 Sustainable urban drainage

The site’s drainage strategy will aim to reduce the impact of development on the natural drainage patterns, by retaining water on site by the incorporation of Sustainable Urban Drainage techniques (SUDs).

The Natural Wales Agency Flood Map indicates that the site is located within the “Low risk area”, indicating a low chance of flooding. For further details please refer to the flood risk assessment.

Figure 8: Flood map for ICT Paper Mill project

5.4 Waste Management

Buildings and building sites produce a significant amount of waste annually. Most of the waste produced in the UK is disposed of in landfill sites and only a small percentage of it is recycled or reused.

5.4.1 Waste Targets

Under EU legislation the UK will have to ensure that less than a third of its waste is sent for burial in landfill sites by 2020 and the figure at present is about 80%. To achieve this, target a number of measures are implemented, including landfill tax, aiming to discourage disposal of waste to landfill. Good waste management is a key component of sustainable development. Reducing waste is an important means of:

- Reducing unnecessary expenditure;
- Reducing the amount of natural resources used for production of new materials;
- Reducing energy for waste disposal;
- Reducing levels of contamination and pollution arising from waste disposal.

The proposed development will minimise the impact of waste in the environment where possible.

5.4.2 Demolition & Construction

During the construction phase a large amount of waste material will be generated through construction, demolition and land clearing procedures. In building construction, the primary waste products in descending percentages are: wood, asphalt/concrete/masonry, drywall, roofing, metals, and paper products, depending on the ultimate construction proposed.

Prior to the commencement on site, a Site Waste Management Plan (SWMP) that complies with the requirements of current legislation and BREEAM will be prepared. This plan will identify the local waste haulers and recyclers, determine the local salvage material market, identify and clearly label site spaces for various waste material storage and require a reporting system that will quantify the results and set targets.

As a minimum, the SWMP will contain:

- The target benchmark for resource efficiency e.g. m^3 of waste per $100m^2$ or tonnes of waste per $100m^2$;
- Procedures and commitments for minimising non-hazardous waste in line with the benchmark;
- Procedures for minimising hazardous waste;
- Procedures for monitoring, measuring and reporting hazardous and non-hazardous site waste;
- Procedures for sorting, reusing and recycling construction waste into defined waste groups either on site or through a licensed external contractor;
- The name or job title of the individual responsible for implementing the above.
- Opportunities for introducing more reused or reusable materials/components will be explored during detailed design.

5.4.3 Waste Management & Reporting in Operation

The detailed design phases will identify the potential waste streams that the development will produce. As a minimum, plans will be formulated to handle the separation, collection, and storage of common recyclable materials such as paper, glass, plastics, and metals. The collection points will facilitate easy access for all users.

The main aim will be to recycle as much waste as possible; this will be achieved by making sure that waste recycling facilities are strategically placed in convenient locations.

A section will be included in the Building User Guide outlining the options for recycling on site and explaining the different waste streams for the end user.

It is recommended that area is set aside to securely locate the necessary waste disposal bins. The development will include waste disposal area in the ground floor with easy access for building users.

5.5 Environmental Management

5.5.1 Construction

Construction sites are responsible for significant impacts, especially at a local level. These arise from noise, potential sources of pollution and waste and other disturbances. Impacts such as increased energy and water use are also significant. Therefore, attention is being given to site-related parameters with the aim to protect and enhance the existing site and its ecology.

The aim is to have a construction site managed in an environmentally sound manner in terms of resource use, storage, waste management, pollution and good neighbourliness. To achieve this, there will be a commitment to comply with the Considerate Constructors Scheme. As a minimum, a score of greater than 35 of out 50 will be achieved with an aspiration to exceed 40, with no individual section achieving a score of less than 7.

Areas that can be taken into consideration in order to minimise the impact of the construction site on its surroundings and the global environment are as follows:

- Monitor, report and set targets for CO_2 or energy usage arising from site activities
- Monitor, report and set targets for CO_2 or energy usage arising from transport to and from site
- Monitor, report and set targets for water consumption arising from site activities
- Monitor construction waste on site, sorting and recycling construction waste where applicable
- Adopt best practice policies in respect of air and water pollution arising from site activities
- Operates an Environmental Management System
- Additionally, all timber used on site should be responsibly sourced

Figure 9: Construction site monitoring

5.6 Land Use and Ecology

The new development is proposed to include perimeter landscaping surrounding the buildings and site. This can help maintain and augment the existing biodiversity. The image below indicates the proposed landscaping concept plan, following competition of Phase 3. The project description in ES Part 1details the proposed landscaping. Strategic landscaping will be provided around sections of the boundary of the site as part of the separate landscaping work to be undertaken by the land owners CHEL as part of enabling works facilitate the development of Plot C. These works have been grounded approval as part of the application to discharge planning conditions (Ref: 061986) on the outline planning permission (Ref: 058990) and will include landscaping works which will include removal of self seeded trees to provide slope stability, replacement of trees and aquatica logical habitats. This will include provision of reptile mitigation area at the northern end of a beacon of the application site (Plot C) and a grassland mitigation area at the north western corner of Plot D.

The reptile mitigation will include refugees and mounds and the grassland mitigation area will have a meadow mix grass seeding over existing grass sward.

Beyond the eastern and southern boundaries of the application site will be the Welsh Government's proposed Commercial Spine Road 2 and 3. Separating the application site and the Commercial Spine Road are proposed drainage swales, which will also connect into the proposed new swale between the application side and Plot D. Whilst these swales are for drainage purposes they provide green and blue infrastructure buffer and off-set and separation from the road and adjacent land proposed for housing to the south of the Commercial Spine Road.

In addition to the proposed landscaping treatment (blue and green infrastructure) proposed as part of enabling works to be implemented by CHEL, the Application Proposals will also seek to provide hedgerows planted on the southern and south western boundary facing the Commercial Spine Road 3 and further tree planting on the northern and north western boundaries adjacent to the Millennium Greenway Sustrans cycleway.

The majority of the screen planting around the boundaries is proposed to be carried out as part of Phase 1, will develop thereafter to provide some screening and softening of the elevations particularly for views from the Sustrans Route 5 around the North of the site. As well as providing screening this will also add biodiversity value.

Figure 10: Proposed green areas

5.7 Pollution

Global concern for environmental pollution has risen in recent years, as concentrations of harmful pollutants in the atmosphere are increasing. Buildings have the potential to create major pollution both from their construction and operation, largely through pollution to the air (dust emissions, NOx emissions, ozone depletion and global warming) but also through pollution to watercourses and ground water. The proposed development will aim to minimise the above impacts, both at the design stage and on-site.

5.7.1 Ozone Depletion

CFCs and HCFCs, compounds commonly used in insulation materials and refrigerants, can cause long-term damage to the Earth's stratospheric ozone layer, exposing living organisms to harmful radiation from the sun. They also significantly increase global warming if they leak into the atmosphere. Following the Montreal Protocol, production and use of CFCs is no longer permitted and EC regulations will require phasing out of HCFCs by 2015. However, products that replace these gases are often still potent global warming contributors. Where refrigerants are used for air-conditioning and comfort cooling, they will be CFC and HCFC-free, and use refrigerants with low global warming potential.

5.7.2 Internal pollutants

Volatile organic compounds (VOCs) are emitted as gases (commonly referred to as off gassing) from certain solids or liquids. VOCs include a variety of chemicals, some of which are known to have short-term and long-term adverse health effects. Concentrations of many VOCs are consistently higher indoors (up to ten times higher) than outdoors.

VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials, furnishings, adhesives, Urea-formaldehyde foam insulation (UFFI), pressed wood products (hardwood plywood wall panelling, particleboard, fibreboard) and furniture made with these pressed wood products.

'No' or 'low' VOC paints are available from most standard mainstream paint manufacturers. These 'eco-friendly' paints are made from organic plant sources and also powdered milk based products.

The design team will seek to select internal finishes and fittings with low or no emissions of VOCs and comply with European best practice levels as a minimum.

5.8 Green Transport

The transport of people is the second largest source of CO_2 emissions in the UK after energy use in buildings and remains the main source of many local pollutants. Energy use and emissions from transport are growing at 4% per year, and at the same time, the effects of climate change are becoming more severe; there will be greater pressure to control CO_2 emissions from transport and sites without good access to public transport will be at much greater risk from these controls.

5.8.1 Site Location & Public Transport

The development is located in a low-density area in Garden City, Flintshire. There is currently a bus stop and train station close to the site, improving the potential of the development's public transportation capabilities.

6.0

Conclusion

6.0 Conclusion

This Energy & Sustainability Statement has been prepared in support of the planning application for the ICT Paper Mill, on plot C of Airfields. The purpose of this statement is to outline the energy and sustainability performance which will be applied to the Paper Mill, which is intended to replicate ICT's other Paper Mills in Europe all designed to improve environmental performance to a high standard.

The principal objectives are to reduce the site's contribution to the cause of climate change by minimising the emissions of CO_2, by reducing the site's needs for energy and by providing some of the requirement by renewable/sustainable means. Issues such as water and waste, biodiversity, etc. have also been addressed in the Paper.

The following measures have been incorporated in the design:

- Fabric build-up that seeks to optimise insulation and protection from outdoor conditions;
- High-performing glazing with low solar heat transmittance will be installed throughout the development, enhancing solar heat gain control throughout the year;
- Application of a natural ventilation strategy wherever possible, minimising the use of mechanical ventilation and cooling;
- The development will use low energy lighting throughout, reducing energy consumption and internal gains.

The energy hierarchy that has been followed, is based on the following steps:

- Reduce energy demand;
- Use energy efficiently;
- Renewable energy generation;
- Minimise carbon impact of other energy generation;
- Minimise extraction of carbon intensive energy materials.

The combination of the passive design measures, energy efficient systems and renewable energy technologies could result in a **10.5%** reduction in CO_2 emissions over the Target Emissions Rate (TER). This achieves compliance with Policy EWP3 of Flintshire's Unitary Development Plan, which requires 10% reduction in CO_2 emissions to be achieved via low and zero carbon technologies.

It is worth noting that this report assesses the office building and the admin areas of the industrial building. It does not assess the process areas of the building. However, this is dependent on the progression of the design at later stages and whether specific conditioning requirements could be set out going forward. Furthermore, we understand that the current design does not provide heating, cooling or ventilation to non-office or admin areas and therefore have been excluded from this assessment.

Appendix A BRUKL Documents

BRUKL Output Document

Compliance with Wales Building Regulations Part L 2014

Llywodraeth Cymru Welsh Government

Project name

ICT Paper Mill — As designed

Date: Wed Aug 25 10:16:40 2021

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated BER and BPEC for the building must not exceed the targets

Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	13.8
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	15.4
Building Primary Energy Consumption (BPEC), $kWh/m^2.annum$	87.02
Target Primary Energy Consumption (TPEC), $kWh/m^2.annum$	93.83
Do the building's emissions and primary energy consumption exceed the targets?	BER =< TER BPEC =< TPEC

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

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.27	0.27	L00000AE:Surf[2]
Floor	0.25	0.25	0.25	L00000AE:Surf[0]
Roof	0.25	0.18	0.18	L0000029:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.5	1.5	L00000AE:Surf[1]
Personnel doors	2.2	1.5	1.5	L0000072:Surf[1]
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

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	8695.2	8695.2
External area [m^2]	12816.7	12816.7
Weather	CAR	CAR
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	4477.31	4456.35
Average U-value [W/m^2K]	0.35	0.35
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
15	**B1 Offices and Workshop businesses**
85	**B2 to B7 General Industrial and Special Industrial Groups**
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: 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/m^2]

	Actual	Notional
Heating	9.81	13.96
Cooling	0.69	0.58
Auxiliary	4.34	3.12
Lighting	14.99	25.12
Hot water	4.77	5.24
Equipment*	37.47	37.47
TOTAL**	**34.59**	**48.01**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	7.3	6.36
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	52.25	56.54
Primary energy* [kWh/m^2]	87.02	93.83
Total emissions [kg/m^2]	13.8	15.4

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

Appendix B Criterion 3

Zone	Actual Solar Gain (kWh)	Benchmark Solar Gain (kWh)	Status
L00_Off_Cafe 000	1422.57	1389.09	Fail
L00_Off_Office 009	1641.04	1142.21	Fail
L00_Off_Office 010	4976.3	4053.65	Fail
L00_Off_Reception 012	1828.87	468.48	Fail
L00_Off_Reception 013	8040.57	3878.81	Fail
L01_Off_Copying 017	823	586.15	Fail
L01_Off_Office 024	1957.63	1172.16	Fail
L01_Off_Office 025	1899.69	1164.64	Fail
L01_Off_Office 029	1923.35	1156.39	Fail
L01_Off_Office 030	2402.22	1451.51	Fail
L00_	0	1128.96	Pass
L00_Finished Goods	0	33171.24	Pass
L00_Infirmary 001	0	876.97	Pass
L00_MCC Trafo	0	4179.03	Pass
L00_NIO	0	33203.95	Pass
L00_Off_Circulation 001	0.24	970.1	Pass
L00_Off_Circulation 002	0	351.53	Pass
L00_Off_Circulation 003	0	676.34	Pass
L00_Off_Copying 004	736.49	982.47	Pass
L00_Off_Meeting 005	741.41	1478.19	Pass
L00_Off_Office 006	1477.68	1478.19	Pass
L00_Off_Office 007	8595.37	9569.35	Pass
L00_Off_Office 008	1348.87	2175.75	Pass
L00_Off_Office 011	1177.18	2207.61	Pass
L00_Off_WC 014	660.51	1176.97	Pass
L00_Oils 001	0	3994.65	Pass
L00_Refectory 001	0	876.97	Pass
L00_Team Leader 001	0	1753.93	Pass
L00_Workshop 001	187.23	7989.3	Pass
L00_Workshop 002	0	9937.68	Pass
L01_CoffeeRoom 001	0	949.79	Pass
L01_CV Dept Manager 001	550.52	1028.17	Pass
L01_Eating 065	166.45	940.52	Pass
L01_Eating 066	177.17	940.54	Pass
L01_Eating 067	270.94	940.52	Pass
L01_Italians Office 001	778.15	1270.09	Pass
L01_Laboratory 001	872.59	1790.32	Pass
L01_Meeting Room 002	1110.7	1814.42	Pass
L01_MeetingRoom 001	0	1482.79	Pass
L01_NIO	0	33734.79	Pass
L01_Off_Circulation 015	0	512.57	Pass
L01_Off_Circulation 016	0	689.86	Pass
L01_Off_Meeting 019	261.33	728.96	Pass
L01_Off_Meeting 020	503.45	728.96	Pass
L01_Off_Meeting 021	2457.37	3610.93	Pass
L01_Off_Meeting 022	499.1	1172.16	Pass
L01_Off_Meeting 023	0	586.08	Pass
L01_Off_Office 026	2698.57	3037.65	Pass
L01_Off_Office 027	1000.92	1172.16	Pass
L01_Off_Office 028	4708.08	5659.21	Pass
L01_Off_Office 031	1795.41	2470.44	Pass
L01_Off_Reception 032	0	142.83	Pass
L01_Off_WC 033	678.35	1256.33	Pass
L01_Quality Office	593.3	967.69	Pass
L01_Specialist&Safety Office 001	741.19	1209.61	Pass
L02_Meeting 112	1045.33	1834.69	Pass
L02_Meeting 113	1019.45	1834.66	Pass
L02_Meeting 114	1673.39	1834.69	Pass
L02_Meeting_room 115	0	974.71	Pass
L02_Meeting_room 116	0	974.72	Pass
L02_Meeting_room 117	0	974.71	Pass
L02_Office 118	1361.79	1451.53	Pass
L02_Office 119	1232.14	1318.21	Pass
L02_Office 120	686.31	1317.17	Pass
L02_Office 121	766.84	1318.23	Pass
L02_Office 122	753.03	1305.31	Pass
L02_Office 123	841.09	1449.4	Pass
L02_Office 124	1087.3	1317.19	Pass
L02_Office 125	1360.62	1449.4	Pass
L02_Office 126	839.28	1451.53	Pass
L02_Office 127	690.82	1317.19	Pass
L02_Office 128	857.93	1451.53	Pass

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