WilkinsonEyre

STANHOPE

aFIaa

Gresham St Paul's
Sustainability Study - Carbon Footprint Profile

July 2020

mace waterman cantillon alinea

INTRODUCTION

Gresham St Paul's is an excellent quality c. 20 year old building in the City of London that has been occupied throughout its life as office space. It has come to the end of its tenancy and therefore is undergoing an extensive refurbishment and extension project to return it to the market as a 'new' product, repositioned to achieve optimum long-term market returns.

This study compares, at a high level, the embodied and operational carbon footprint of Gresham St Paul's. It equates 'the project' refurbishment with a minimal option of keeping the existing building 'ticking over' and operational, and a knockdown and new build version of 'the project' i.e. delivering the same end product by starting from scratch.

This assessment is timely given the greater focus on embodied carbon internationally, and in the specific London development context, where c. 20 year old existing buildings are generally built to a logical structural grid, with 'current' methods of building, are regularly coming to the end of long (15-20 year) institutional lease/s and need re-thinking to extend their economic life.

This Carbon Footprint Profile has been undertaken by Stanhope & the extended Design & Construction Team on behalf of the client AFIAA. This process has seen a vast array of data introduced into an equation that calculates total carbon; embodied within the material, in the process of demolition & construction, and operation of the building. The outcomes of this analysis have been compared collectively, with cross-referencing between silos of information to accurately substantiate the eventual figures.

CONTRIBUTORS

AFIAA	Client
Stanhope	Development Manager
Mace	Construction Contractor
Waterman	Building Services & Structures
Cantilon	Engineers Demolition Contractor
Alinea	Quantity Surveyor
WilkinsonEyre	Architect

WHOLE LIFE NET ZERO CARBON POLICY CONTEXT

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

SUSTAINABLE DEVELOPMENT GOALS

1.5º - 2.0º Limit
[to Global Warming]

Legislation/Political

Climate Change Act 2008

The UK Low Carbon Transition Plan
National strategy for climate and energy

CCC Net Zero May 2019

New London Plan 2019

Investment Risk Management

Three Global Groupings of major Financial Institutions responding to Climate Change

TCFD – Task Force on Climate-related Financial Disclosures

wbcsd – World Business Council for Sustainable Development

PRI – Principles for Responsible Investment

Standards

breeam 2018

LEED V4

RIBA Plan of Work 2019

UK GBC Net Zero 2019

Assessment Methodology

BS EN 15978
EU and UK Standard

RICS
Professional Statement
Whole Life Carbon Assessment

"The Task Force Report's widespread adoption will ensure that the effects of climate change become routinely considered in business and investment decisions. "

"…every real estate asset owner, and investor must now recognise they have a clear fiduciary duty to understand and actively manage ESG and climate-related risks as a routine component of their business thinking.."

GLOBAL INITIATIVES	GOVERNMENTAL & REGULATORY	SOCIETY & INDUSTRY

RATIONALE

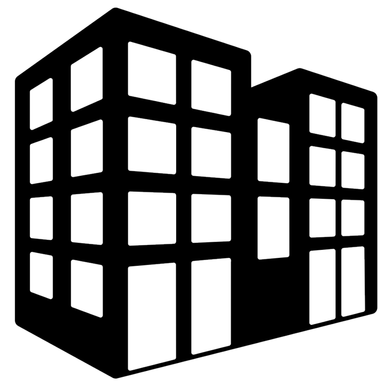
1. Consider the environmental impact of Gresham St Paul's in the context of Climate Change & the ever present Climate Crisis.
2. Understand the embodied & operational carbon footprint of Gresham St Paul's.
3. Compare three plausible scenarios; Existing, Refurbishment (the Project) & New Build.
4. Review the key building components included in the Whole Life Cycle carbon study.

In line with minimum requirements set by best-practice guidance by RICS, these include:

- Sub-Structure, including piling, retaining walls, ground and basement slabs;
- Superstructure, including frame, floors, core, external facade
- In addition to RICS guidelines MEP, partitions, and ceilings included.

5. Understand the impact during phases of Construction, Operation and Demolition.

METRICS



Whole life emissions per unit of floor area (kgCO2e/m2)

Yearly emissions per building occupant (kgCO2e/person)

TIMELINES

CONTENTS

SCOPE AND ASSUMPTIONS

The scope of the assessment was set in alignment with industry-best guidance contained in the "Whole life carbon assessment for the built environment" published by RICS (2017). The minimum requirements for whole life carbon assessment are as follows:

LIFE STAGES
We considered the following Life Stages in the analysis - in line with RICS guidance (minimum requirements):

[A1–A3] Product stage

[A4-A5] Construction process stage

[B4] Replacement stage

[B6] Operational energy use

Additionally, we accounted for the CO2e emissions resulting from partial (Scenario B) or full Demolition (Scenario C) - which belong to the Stage [C1-C4] End of Life. These appear meaningful for the scope of the study.

BUILDING COMPONENTS
We considered the following Building Components in the analysis - in line with RICS guidance (minimum requirements):

1. Substructure

2. Superstructure, including:

- Frame, upper floors, roof, stairs and ramps.

- External walls and windows

- Internal walls and partitions (plus internal ceilings)

Additionally, we accounted for emission associated with building services/MEP equipment. These were estimated at high level, based on floor areas.

SCENARIO A: EXISTING

Description

The scope of works in this scenario is limited to cosmetic improvements to the common and office areas, as it is feasible to extend the life of the building because it has been well maintained. The mechanical and electrical systems however are coming to the end of their design life, and must be replaced in order to bring the building back to use.

Area:
NIA=14,595m^2 GIA=19,530m^2 GEA=20,235m^2

SCENARIO B: REFURBISHMENT

Description

This scenario, offers a significant increase in the net lettable area of the building. The atria and corners at levels 5, 6 and 7 are infilled, levels 8, 9 are remodelled and an additional 10th floor is added to increase capacity. The building is positioned and sold in the market "as new" despite the primary structure and majority of the envelope being retained.

Area:
NIA=15,801m^2 GIA=22,450m^2 GEA=23,210m^2

SCENARIO C: NEW BUILD

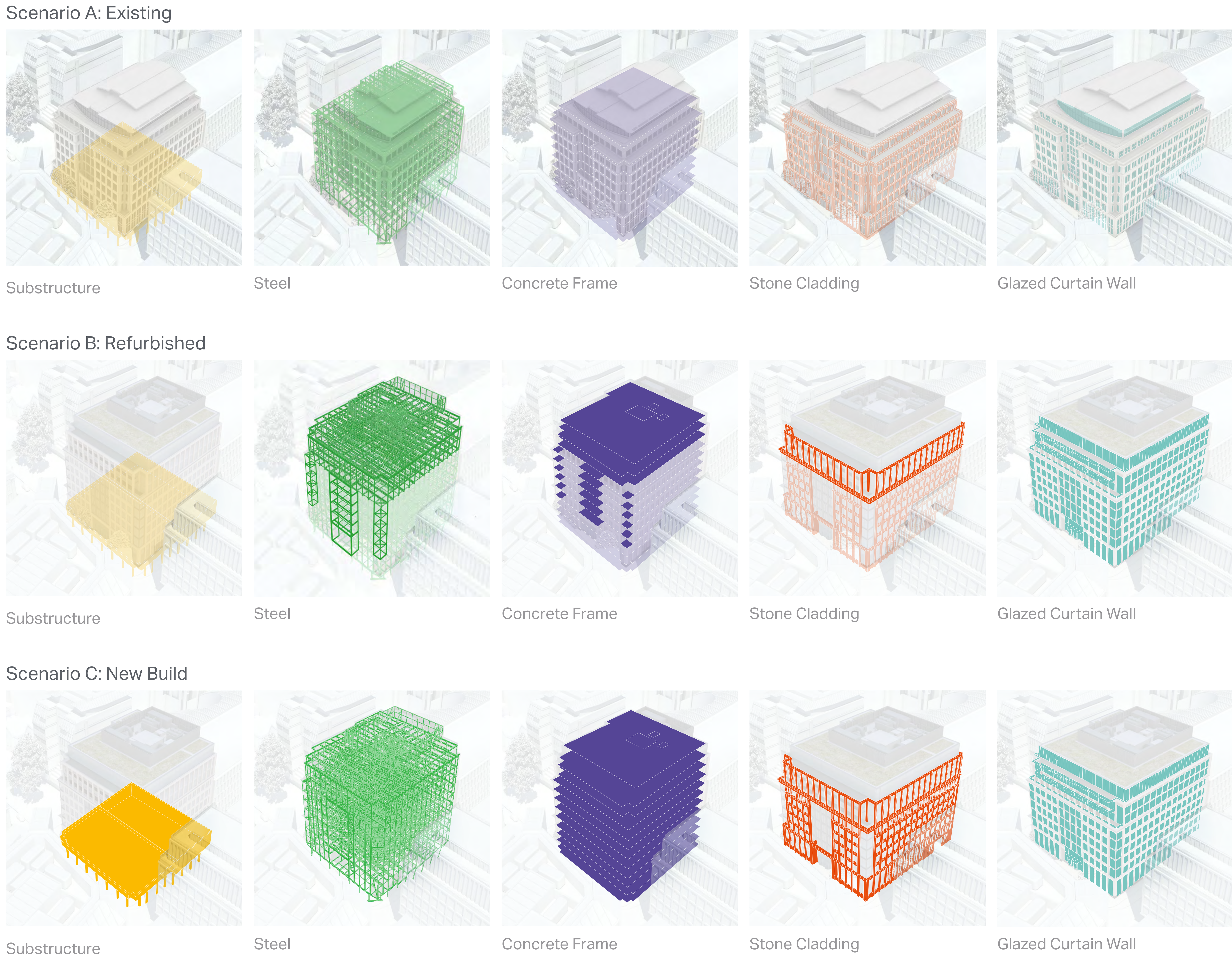
Description

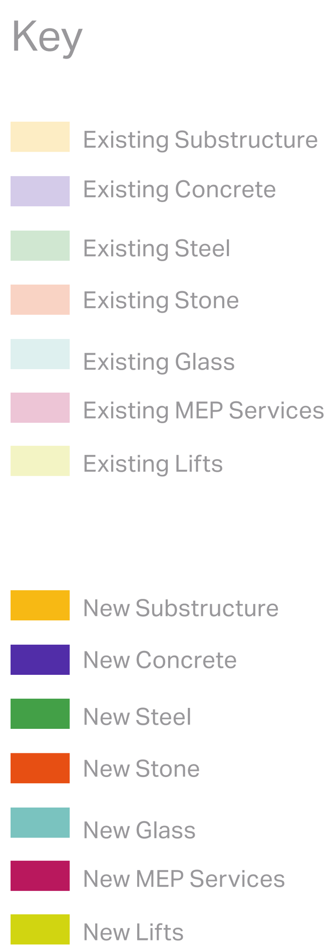
This scenario demolishes the existing building and replaces it with a new build version of the refurbishment.

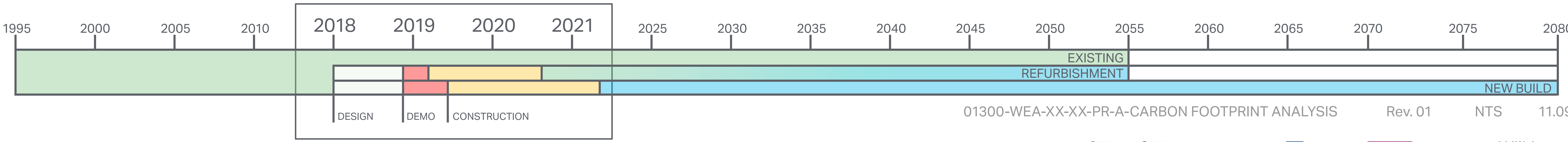
Area:
NIA=15,801m^2 GIA=22,450m^2 GEA=23,210m^2

CARBON FOOTPRINT ANALYSIS

COMPONENT	A EXISTING (tn CO_2e)	B REFURB. (tn CO_2e)	C NEW BUILD (tn CO_2e)	LIFE CYCLE
SUB-STRUCTURE	1815	-	+ 1815	60 years
Piles, Pile Caps & Ground Beams, Concrete, Steel Reinforcement			+ Sub-Structure A	
SUPERSTRUCTURE | FRAME	2927	+ 1519	+ 4447	60 years
Retained 1 to 9 - Demo Grd to 9th - Roof Concrete, Steel Reinforcement, Steel Profiles		+ New Structure 1-9	+ Structure A + Structure B	
SUPERSTRUCTURE | FACADE	891	+ 87	+ 978	30 years
Glazed Curtain Wall Stone Cladding				
SUPERSTRUCTURE | INTERNAL	1430	+ 1687	+ 1765	30 years
Dry-wall partitions Suspended Ceilings				
BUILDING SERVICES / MEP	329	+ 377	+ 706	20 years
DEMOLITION & RE-CONSTRUCTION	-	+ 334	+ 546	-
OPERATIONAL ENERGY	934	806	806	yearly
regulated + unregulated (yearly)				







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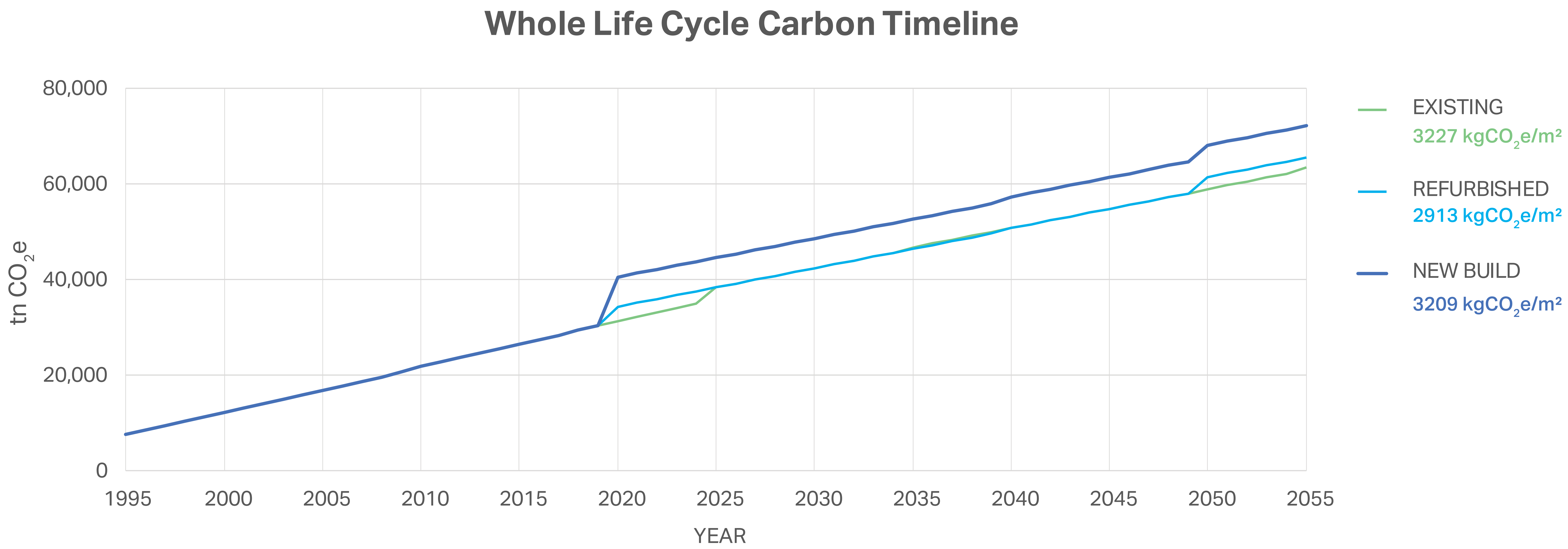
CONCLUSION

Whole-Life Cycle Carbon Analysis



Graph Explanation

This graph charts the data representing the cumulative CO2e emissions resulting from the three scenarios (A - Existing, B - Refurbishment, C - New Build). This is shown over the 60 years reference period 1995-2055.

Both constant annual emissions due to energy usage from building and the spikes associated with replacement cycles (or demolition and reconstruction of certain components) are reported in the year of occurrence, in line with the expected lifespan set by RICS.

Conclusion

The graph illustrates that Scenario A (Existing) results in the lowest total emissions (tn CO2e) throughout a 60 year lifecycle.

The Refurbishment option (Scenario B) is associated a small spike due to the materials required to extend the structure to support the additonal floor space and to refurbish the facade. The total carbon footprint over 60 years is ultimately very similar to that of Scenario A.

Scenario C (New Build) shows a dramatic spikes in emission associated with the complete demolition and re-construction. The total CO2e emissions over the 60-year period are compromised by this, however the long term operational efficiencies of the new building (including past 2055) would improve the environmental impact of this scenario.

Importantly, when emissions are considered per unti of gross floor area (kgCO2e/m2) in line with the industry best-practice), Scenario B outperforms Scenario A and C over the lifecycle. This makes Refurbishment the best performing most carbon-efficient option.

All data and outcomes should be understood and considered in-conjunction without equating the internal atmospheric conditions, cost or revenue implications of maintaining the building/s in its existing or proposed state.

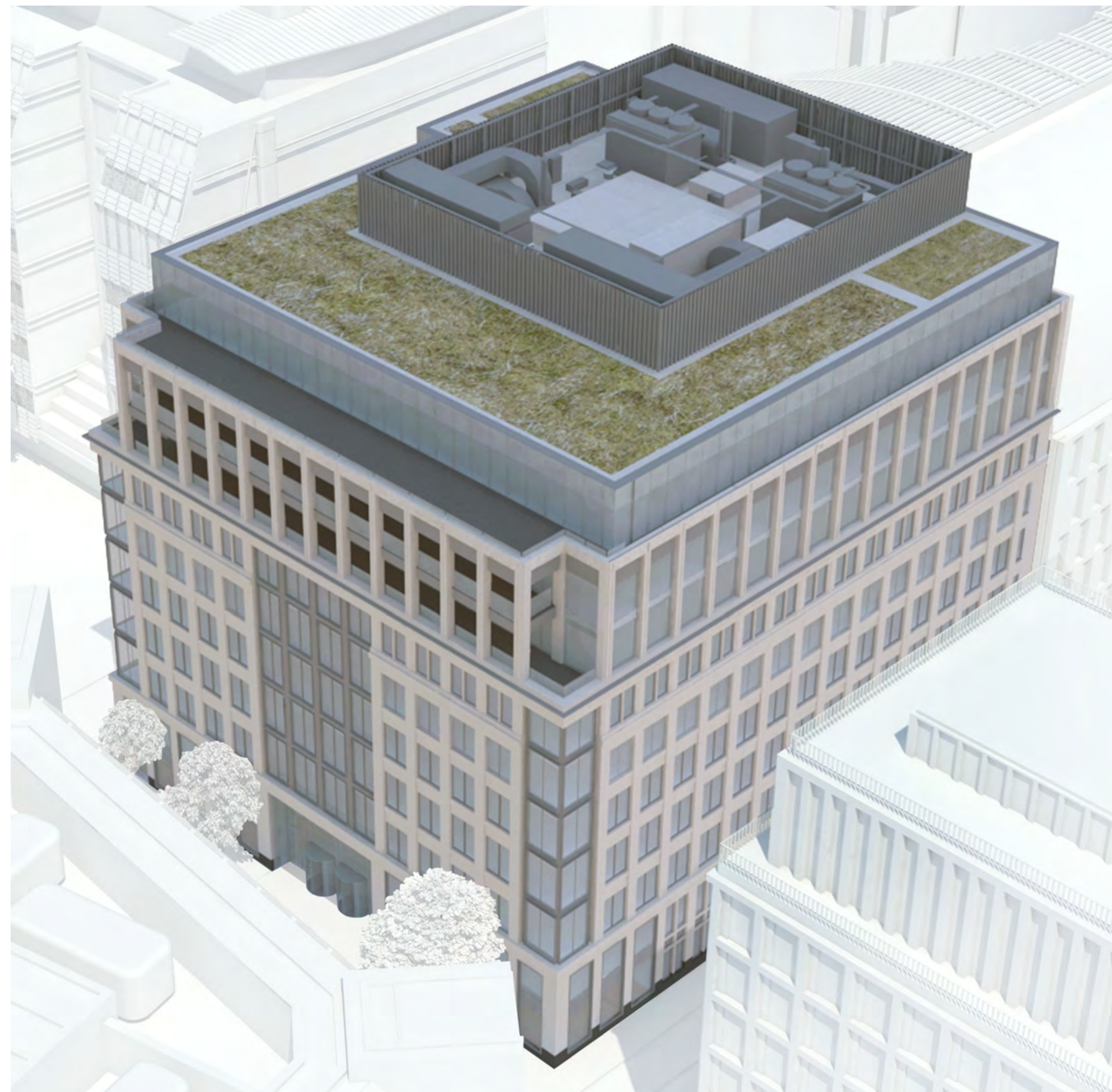
CONCLUSION

SCENARIO A
EXISTING

NIA: 14,595
GIA: 19,530
GEA: 20,235
Building occupancy: 1460

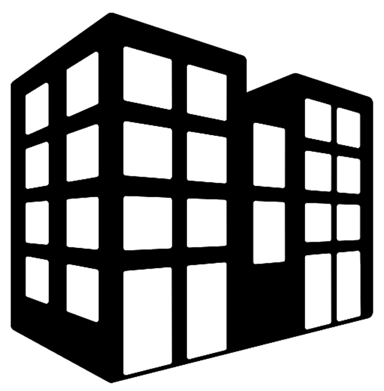
SCENARIO B
REFURBISHMENT

NIA: 15,801
GIA: 22,450
GEA: 23,210
Building occupancy: 1970



SCENARIO C
NEW BUILD

NIA: 15,801
GIA: 22,450
GEA: 23,210
Building occupancy: 1970



Total life-cycle emissions (1995-2055)

Scenario A	Scenario B	Scenario C
63,026 $tnCO_2e$	65,391 $tnCO_2e$	72,051 $tnCO_2e$
3227 $kgCO_2e/m^2$ GIA	2913 $kgCO_2e/m^2$ GIA	3209 $kgCO_2e/m^2$ GIA

Yearly emissions per occupant

Scenario A	Scenario B	Scenario C
719.5 $kgCO_2e$/person	553.2 $kgCO_2e$/person	609.6 $kgCO_2e$/person

NEXT STEPS
Response

1. High Level Review of the drawings and specifications

Deliverable: A written review of design choices, with an explanation of potential improvements and a presentation to the team.

2. Detailed analysis based on cost plan data plus drawings and specifications

Deliverable: Detailed Carbon 'Budget' including all cost plan elements providing an overall whole life carbon cost for the scheme ($KgCO_2$) plus an intensity figure ($KgCO_2/m^2$). The scope would include a detailed list of reduction options, together with associated $KgCO_2$ figures. (NB: Operational energy data by MEP Engineer).

3. Item 2 can be augmented with carbon budget updates taken at key project stages, during construction, and post Practical Completion with a final whole life carbon assessment and lessons learned.

4. Whole Life Carbon comparison between Garrard House and Finsbury Circus

5. Whole Life Carbon Policy and Delivery Strategy for all Stanhope Projects

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