

STUDIO-II END-OF-YEAR SHOW

REUSE AND DECONSTRUCTION:

DECARBONIZATION ON
COLUMBIA UNIVERSITY'S
MANHATTANVILLE CAMPUS



INTERVIEWEES & COLLABORATORS

NYC GOVERNMENT

Gizem Karagoz, *NYC Economic Development Corporation*

Will DiMaggio, *Mayor's Office of Climate & Environmental Justice*

Say Sanchez Osorio, *Mayor's Office of Climate & Environmental Justice*

Terri Matthews, *Town+Gown NYC*

CU FACILITIES & OPERATIONS

Sharon Colburn, *Real Estate*

Sergio Neissen, *Manhattanville Development Group*

Daniel Cole, *Manhattanville Development Group*

Gregory Lempin, *Manhattanville Development Group*

Ye Liu, *Manhattanville Development Group*

Adam Courtney, *Energy management*

Migda Colón-Dieppa, *Planning & Capital Project Management*

Megan Auguste, *Planning & Capital Project Management*

GSAPP

Amelyn Ng, *GSAPP*

James E. Churchill, *GSAPP*

NONPROFITS, PROFESSIONAL ORGANIZATIONS, & COMMERCIAL OPERATIONS

Allison Arlotta, *RECLAIM NYC*

Alissa Westervelt, *RECLAIM NYC*

Mikhail Haramati, *Natural Resources Defense Council*

Brad Benke, *Carbon Leadership Forum*

Aurora Jensen, *Carbon Leadership Forum*

Bria Donohue, *AIANY*

Lauren Alger, *STV*

JJ Beasley, *Walter P. Moore*

Alan Solomon, *Sawkill Lumber*

Liz Zink, *Tri-Lox*

Alexander Bender, *Tri-Lox*

Angel Ayón, *Save Harlem Now!*

Valerie Jo Bradley, *Save Harlem Now!*

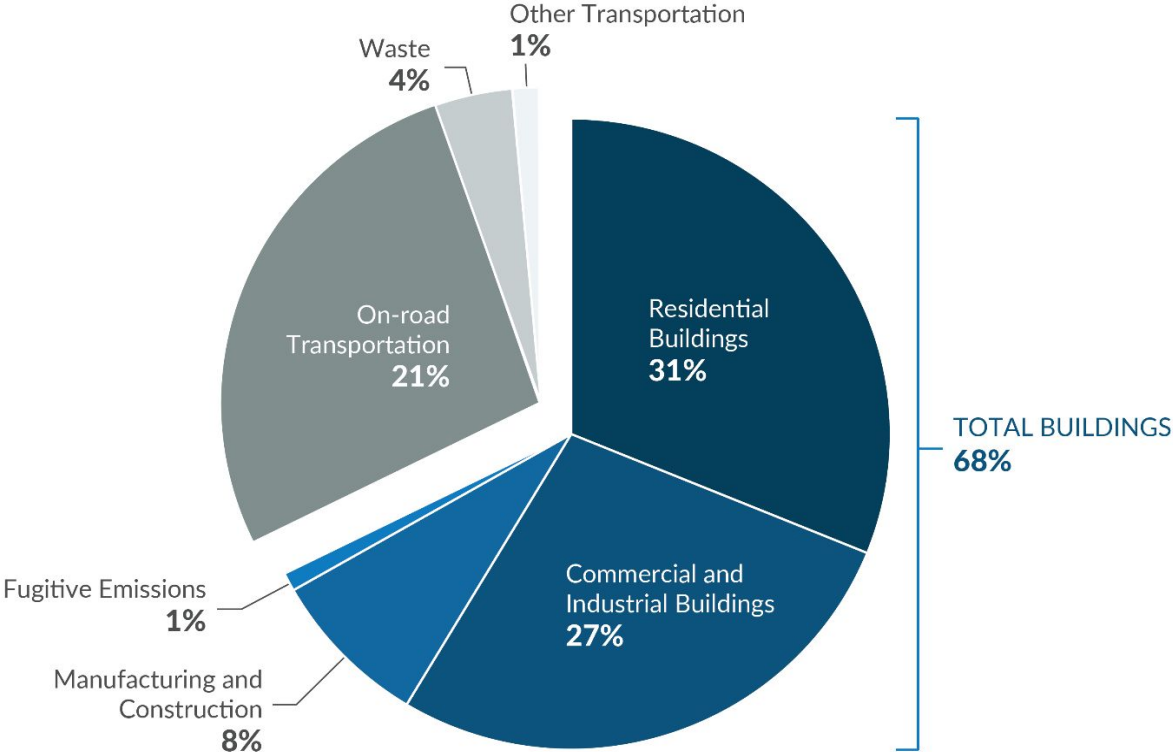
Claudette Brady, *Save Harlem Now!*

Jill Hanson, *Save Harlem Now!*

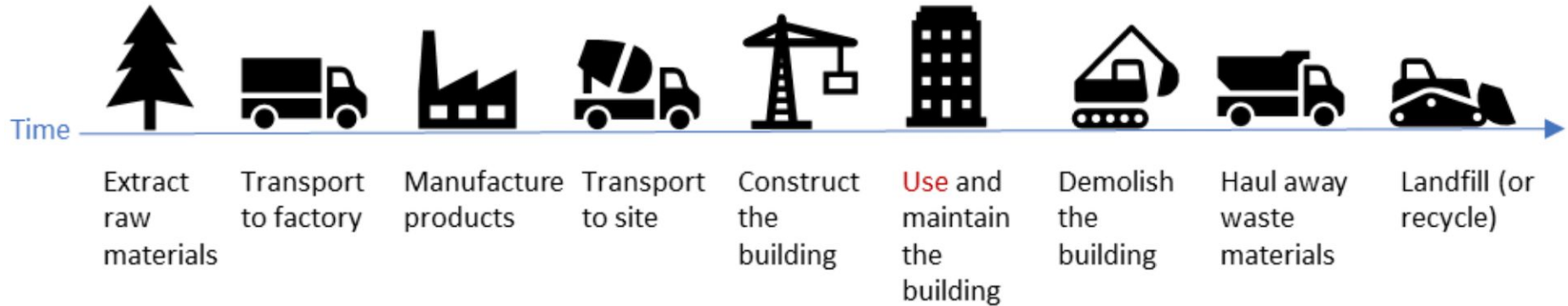
Roberta Washington, *Save Harlem Now!*

Lori Ferriss, *Built Buildings Lab*

EMISSIONS BY SECTOR



LIFE CYCLE OF A BUILDING



C40knowledgehub.org

STAGES OF A BUILDING'S LIFE

OPERATIONAL VS EMBODIED



Extract
raw
materials



**MINING/ DIGGING
CLAY**



Transport
to factory



**TRANSPORTING
CLAY TO FACTORY**



Manufacture
products



**BRICK
MANUFACTURING**

OPERATIONAL CARBON

2024 Studio II Columbia HP GSAPP



Transport
to site



**TRANSPORTING
BRICK TO SITE**



Construct
the
building



INSTALLING BRICK

EMBODIED CARBON

2024 Studio II Columbia HP GSAPP

OPERATIONAL VS EMBODIED



OPERATIONAL CARBON - COLUMBIA UNIVERSITY STEAM LOOP SYSTEM

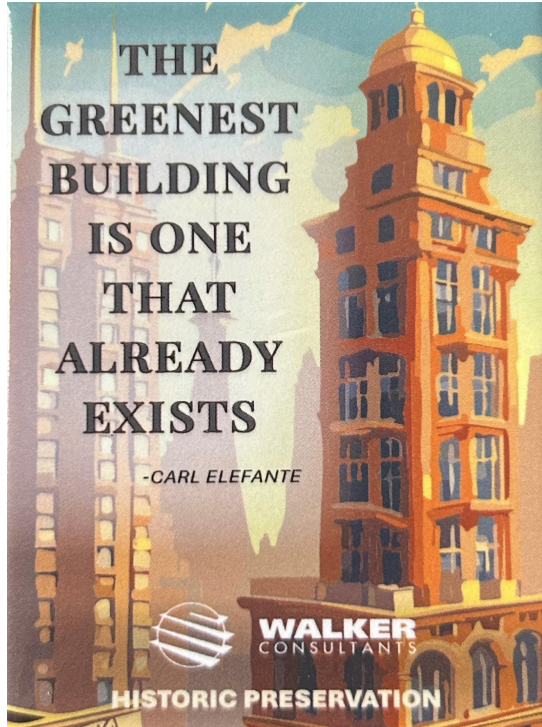
Columbia University Operations



EMBODIED CARBON - CONSTRUCTION OF COLUMBIA BUSINESS SCHOOL

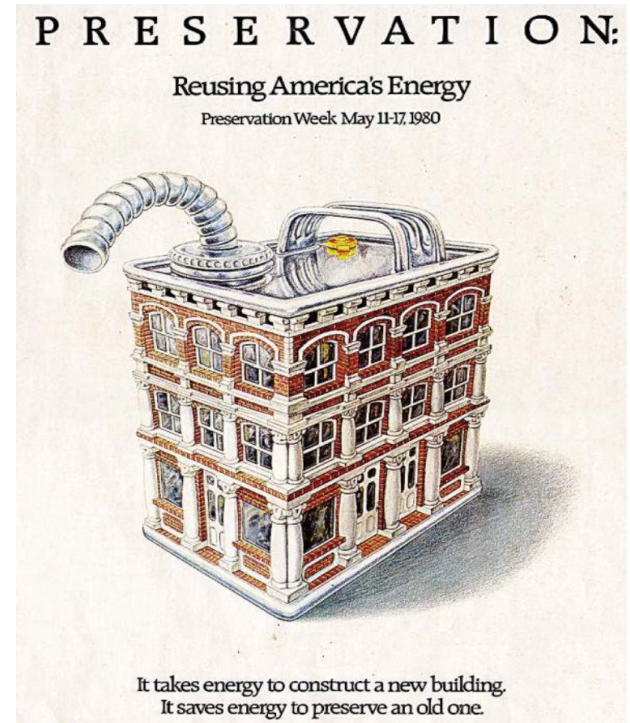
Field Condition Blog

CHALLENGING CURRENT PRESERVATION PARADIGMS



GREEN BUILDING

Walker Consultants.



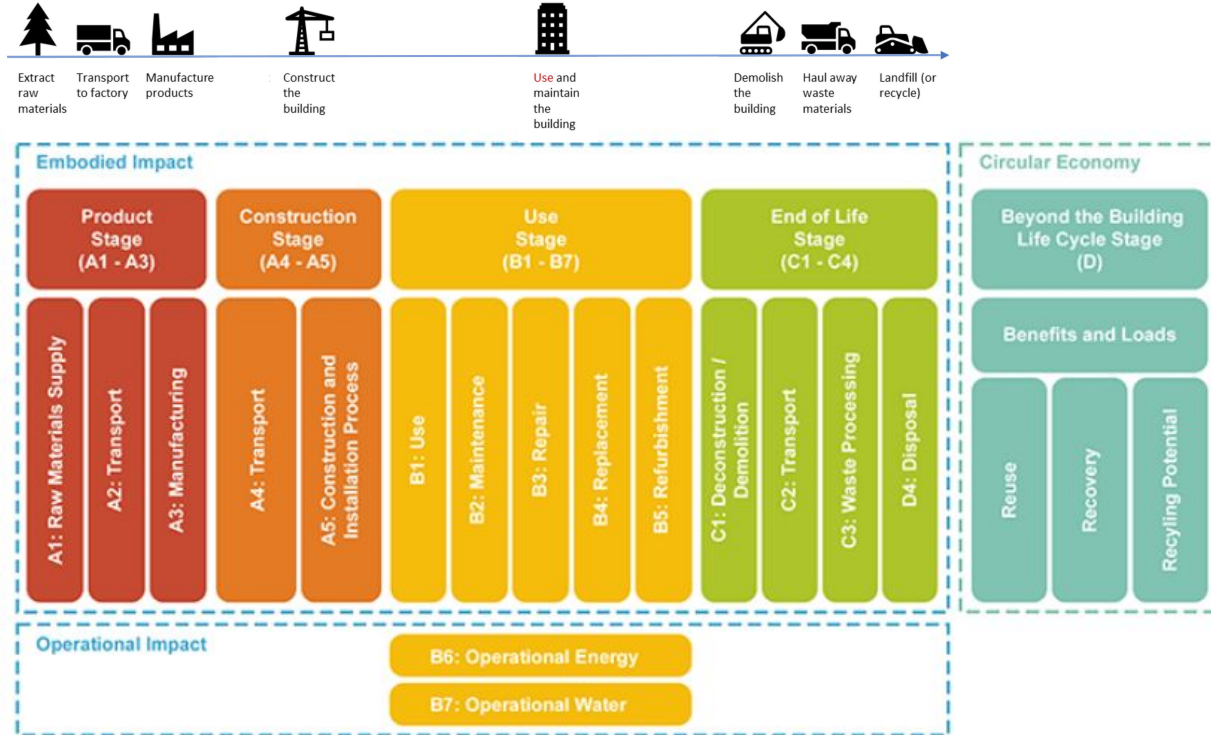
Green building.

National Trust for Historic Preservation

POLICY REVIEW

WHAT IS A LIFE CYCLE ASSESSMENT?

OVERVIEW AND DEFINITION



LIFE CYCLE STAGES AND THEIR SYSTEM BOUNDARIES

PENDING NEW YORK STATE POLICY

BILLS ACTIVE IN THE 2025-26 LEGISLATIVE SESSION



GUIDANCE BUT NO DECONSTRUCTION REGULATION



EXISTING GUIDANCE

EARLY RESEARCH FOR LOW CARBON MATERIALS

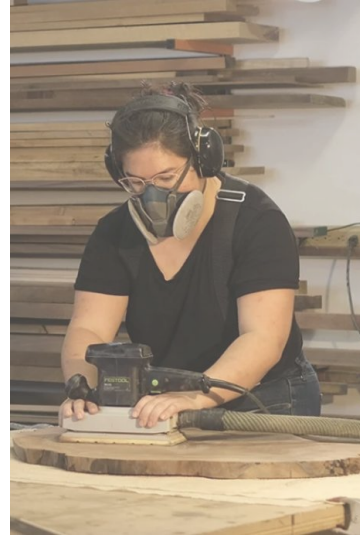
NYC / EDC



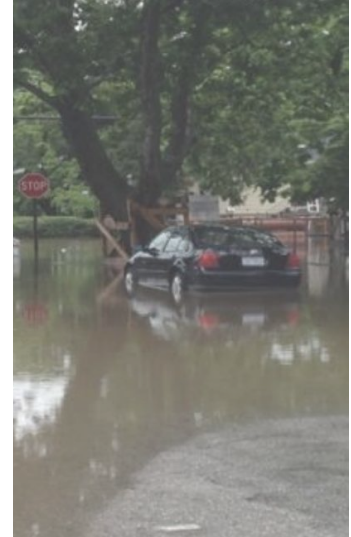
**NYC MASS
TIMBER STUDIO**



**GOTHAM
FOUNDRY**



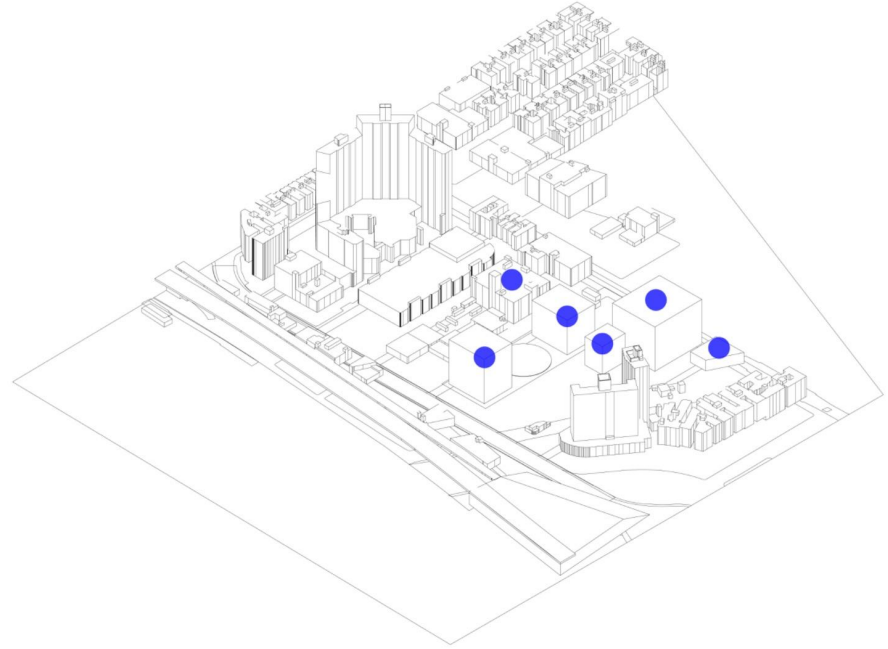
BATWorks



**NYC
DDC** **TOWN
+GOWN:
NYC**

LEED AS THE DEFAULT STANDARD FOR PLAN 2030

Columbia requires all projects on Morningside and Manhattanville campus to be either **LEED Silver** or **LEED Gold**.



LEED CERTIFIED BUILDINGS ON MANHATTANVILLE CAMPUS
SCALE AND MASSING GROUP

PATTERNS OF CHANGE

ANALYSIS PERSPECTIVES

TRANSFORMATIONS VISIBLE IN ALL AREAS



LAND USE AND DEMOGRAPHICS

Google Earth, 2024



SCALE AND MASSING

Lenny Pridatko, 2024



STREETSCAPE CHARACTER AND CONSTITUTION

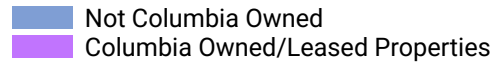
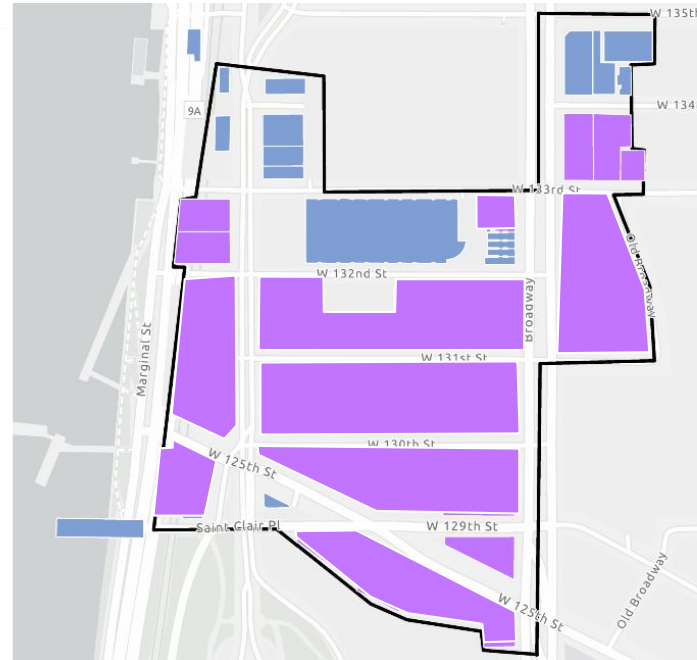
New York Public Library, 1910



DEMOLITION AND REPLACEMENT

Nathan Kensinger, 2011

OWNERSHIP SHOWS COLUMBIA'S INFLUENCE



COLUMBIA'S OWNERSHIP TODAY

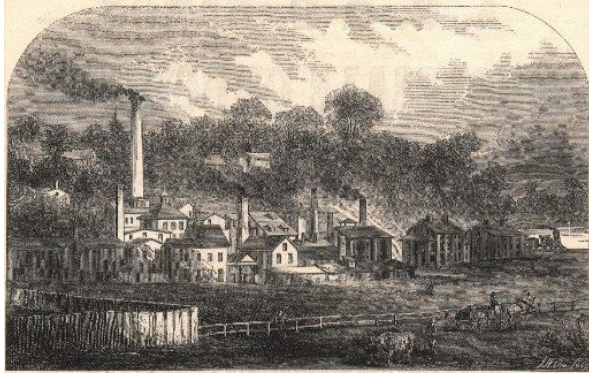
Map by Anna Behringer



MANHATTANVILLE 2007 (PRIOR TO COLUMBIA'S REDEVELOPMENT)

Columbia Spectator

LAND USE: INDUSTRIAL, MANUFACTURING, AND INFRASTRUCTURE



MANHATTANVILLE PAINT AND COLORWORKS c.1850
Collection of Eric K. Washington

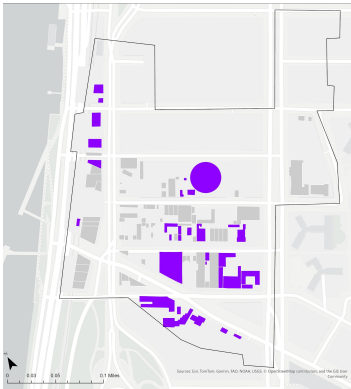


WEBER MCLOUGHLIN CO
NYC Municipal Archives

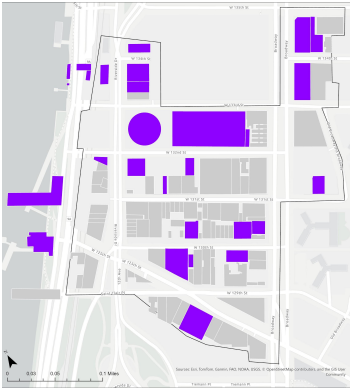


MTA BUS DEPOT
Photo by Zhi Yang

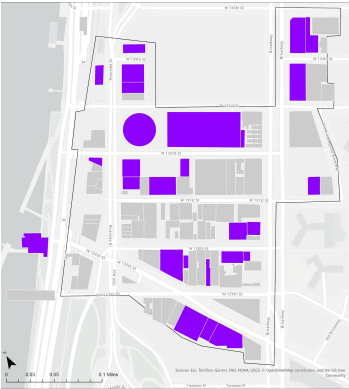
LAND USE: INDUSTRIAL, MANUFACTURING, AND INFRASTRUCTURE



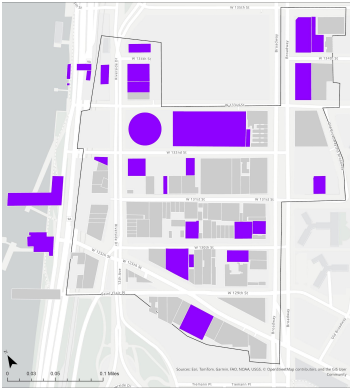
1894



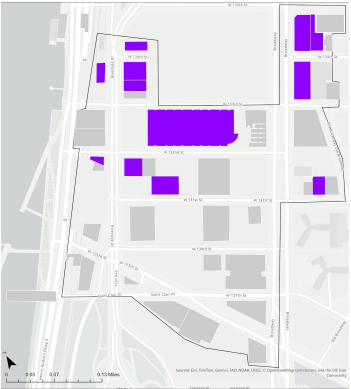
1934



1953

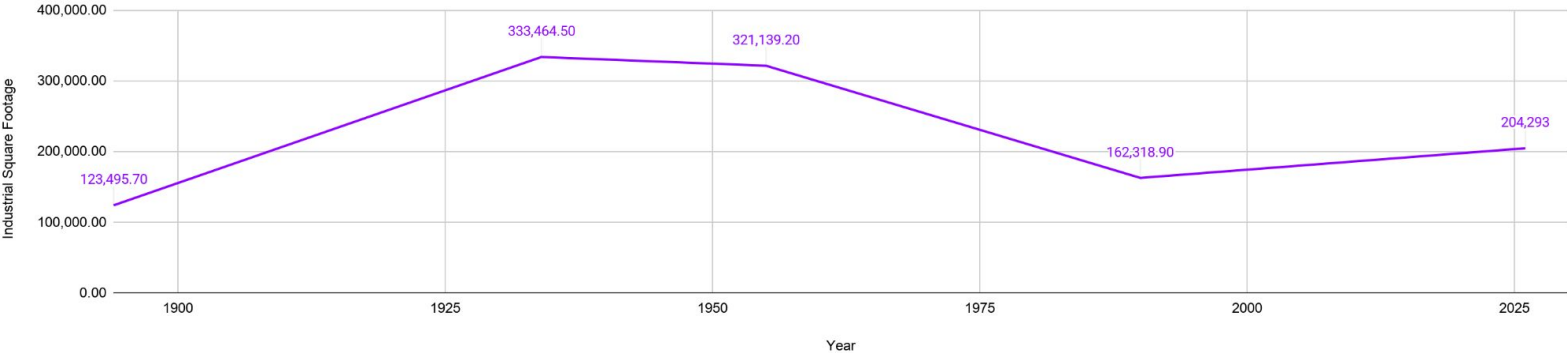


1990

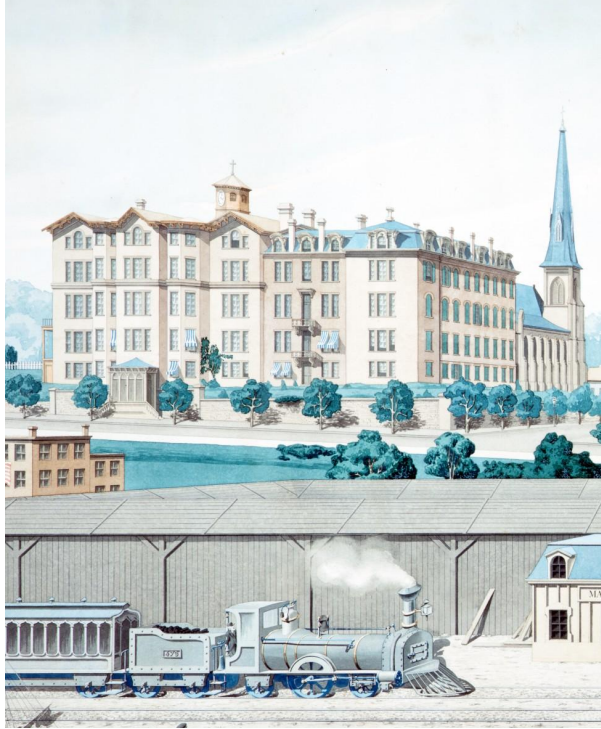


2026

Industrial Square Footage 1894-2026



LAND USE: INSTITUTIONAL, EDUCATIONAL, AND PUBLIC



MANHATTAN COLLEGE AND CHURCH

Edward W.C. Arnold Collection of New York Prints



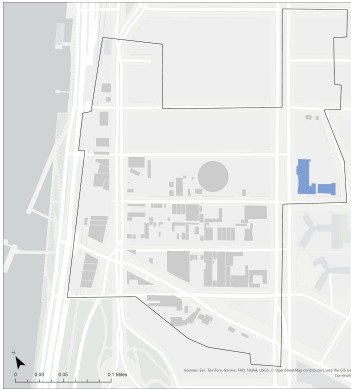
STUDEBAKER BUILDING

Jim Henderson, 2011

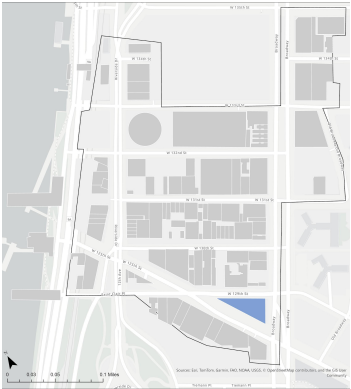


JEROME L. GREENE SCIENCE CENTER

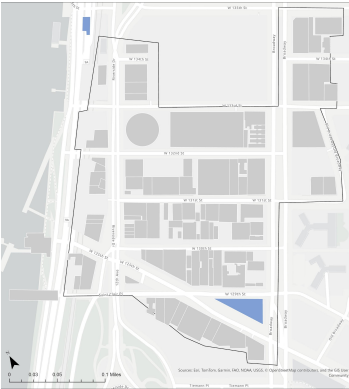
LAND USE: INSTITUTIONAL, EDUCATIONAL, AND PUBLIC



1894



1934



1953

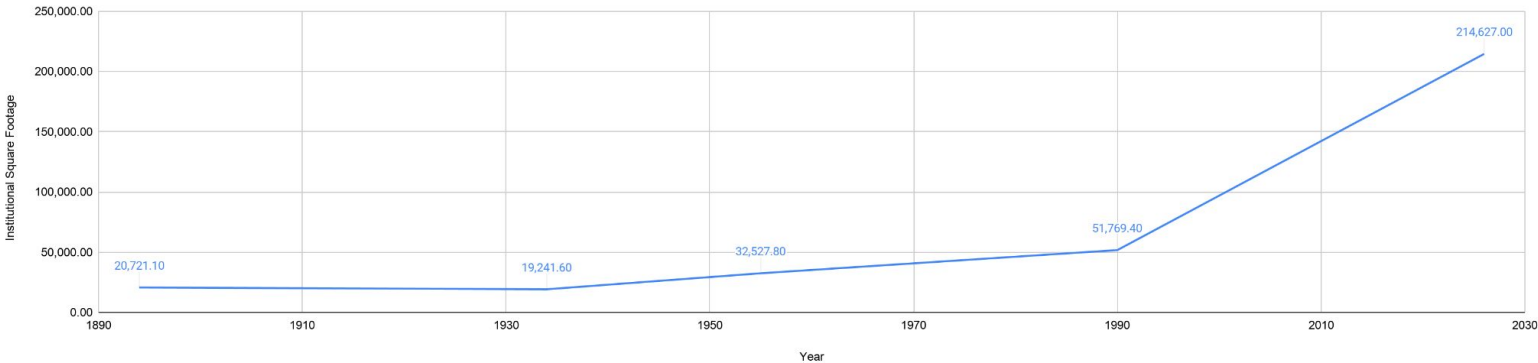


1990



2026

Institutional Square Footage 1894-2026



LAND USE: RESIDENTIAL



ROW OF TENEMENTS

New York City Municipal Archives, c.1940



560 RIVERSIDE DRIVE

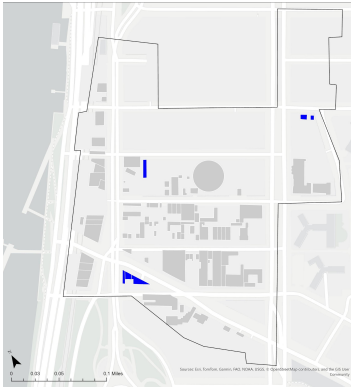
Columbia Residential



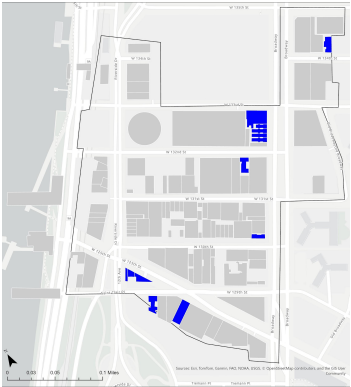
600 W 125 ST

Renzo Piano Building Workshop

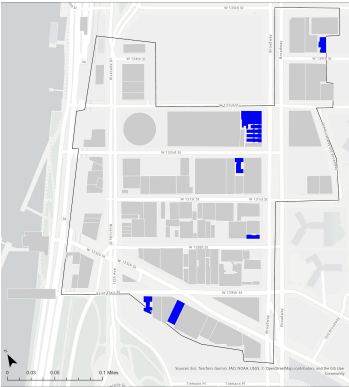
LAND USE: RESIDENTIAL



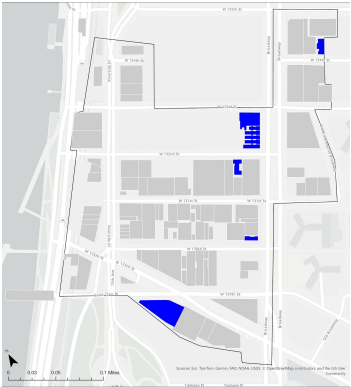
1894



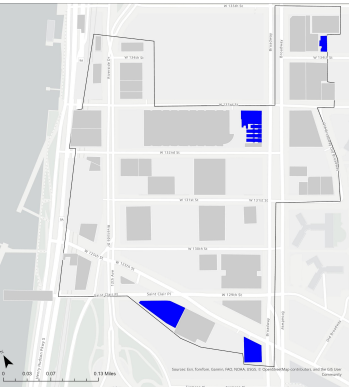
1934



1953

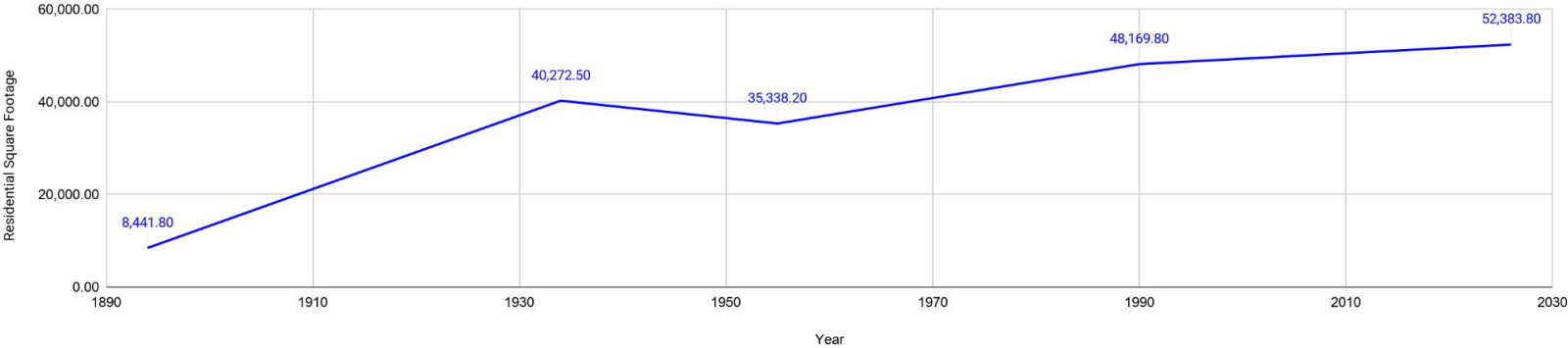


1990

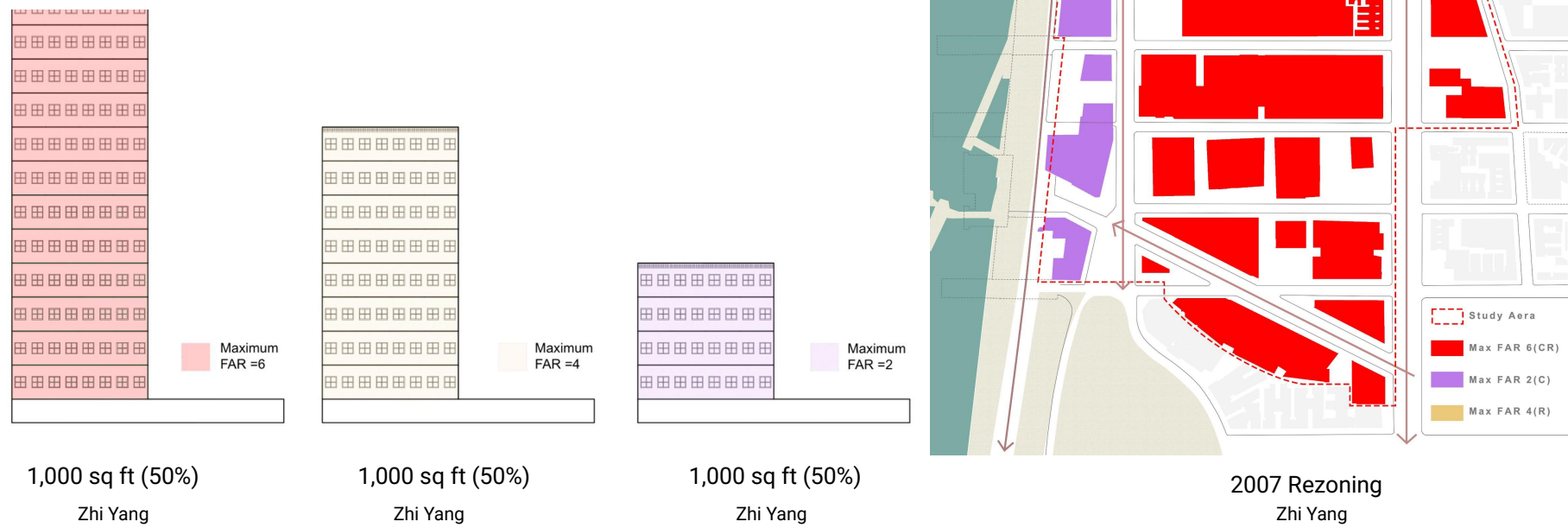


2026

Residential Square Footage 1894-2026



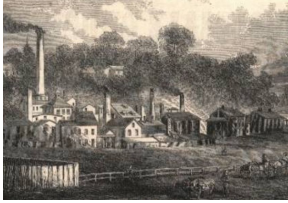
2007 REZONING INCREASES ALLOWABLE FAR



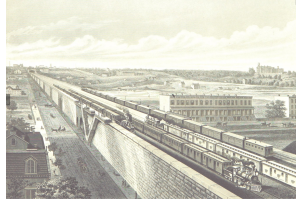
TIMELINE OF MASSING BREAKTHROUGHS

SCALE AND MASSING

Before 1890: Most houses and factories
lower than the height of the valley



1920-40:
More Viaducts and Higher Industrial Buildings



1890

1930
Elevated Railroad & Parkway

Studebaker, Nash...

1960

2000

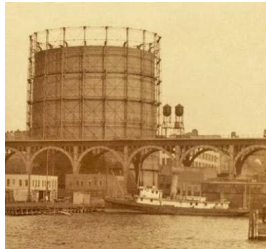
2002: Columbia
Manhattanville Plan



1890

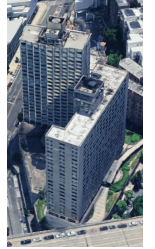
1900

Around 1900: Early Viaducts and Gas Tanks



Riverside & Broadway Viaducts Con Edison Gas Tanks

1950-1980: High Rise Housing Projects

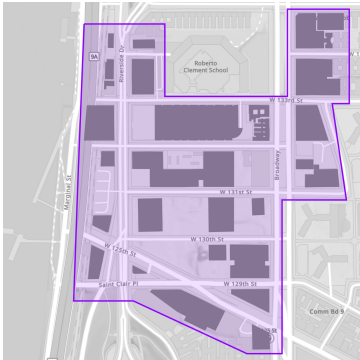
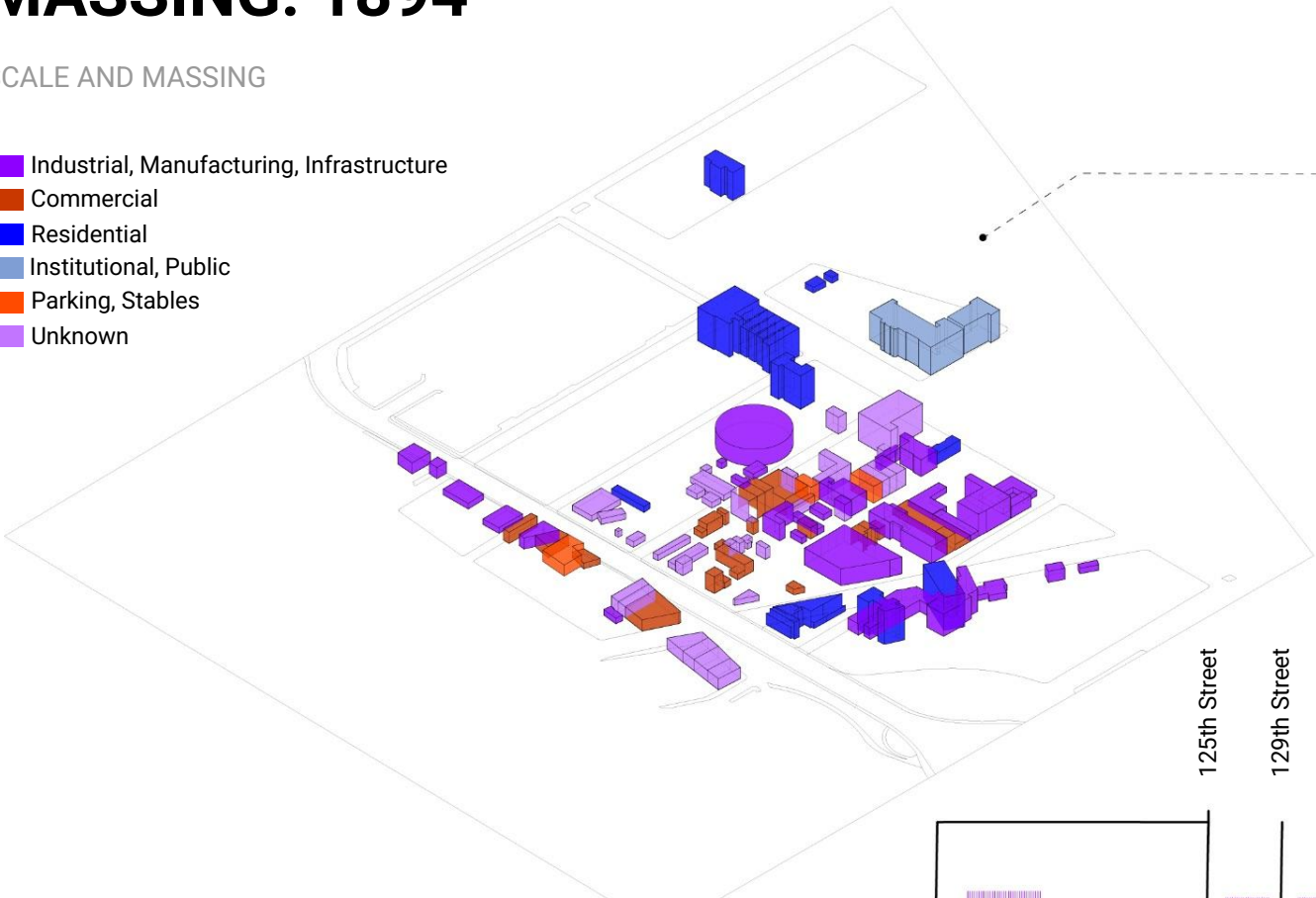


NYCHA Houses &
Columbia's 560 Riverside Drive

MASSING: 1894

SCALE AND MASSING

- Industrial, Manufacturing, Infrastructure
- Commercial
- Residential
- Institutional, Public
- Parking, Stables
- Unknown



125th Street

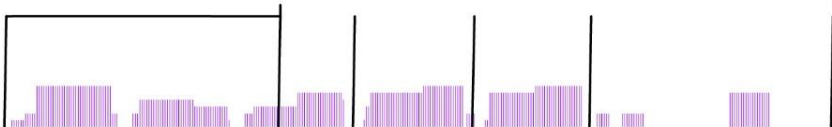
129th Street

130th Street

131st Street

133rd Street

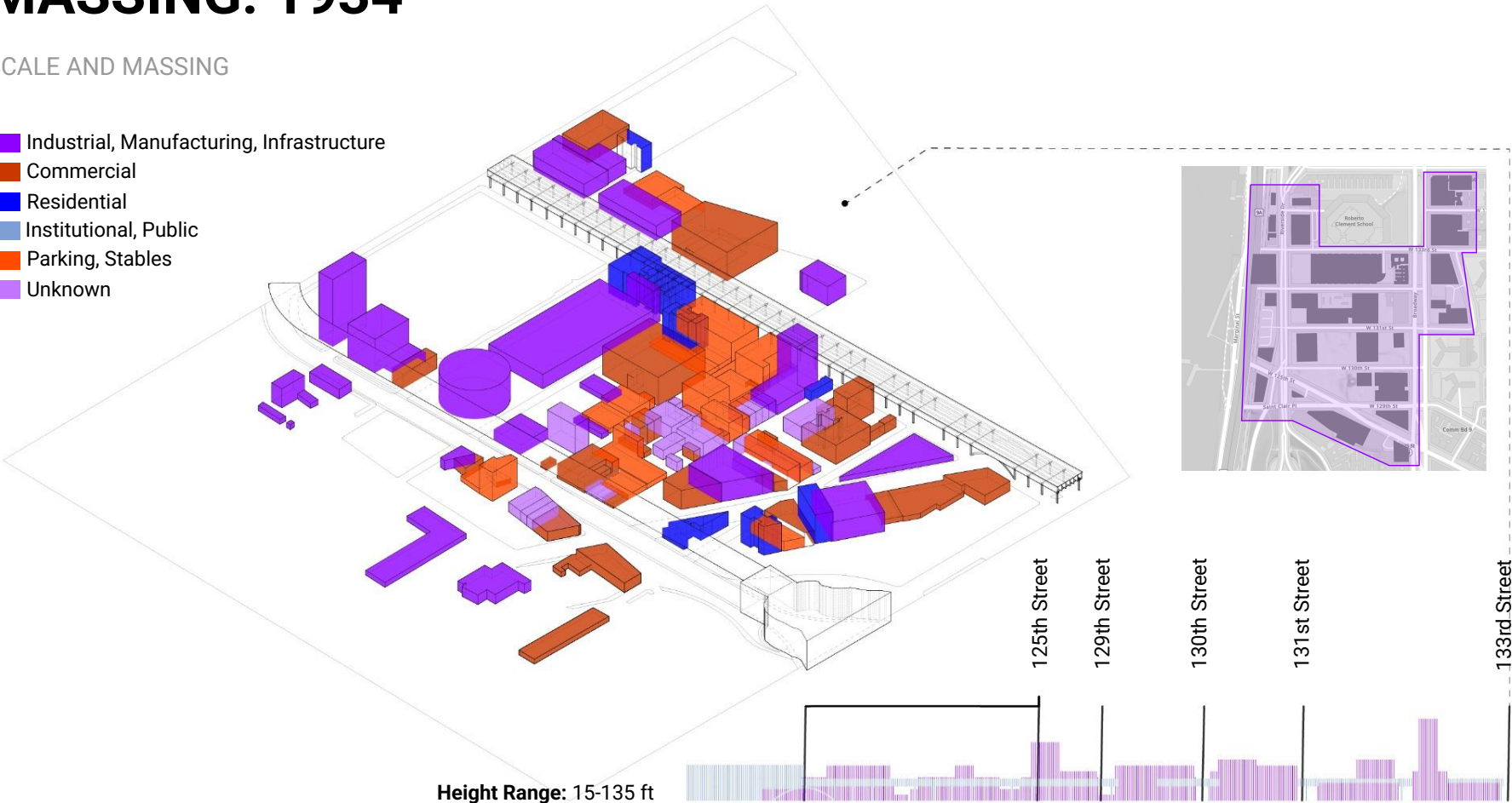
Height Range: 15-75 ft



MASSING: 1934

SCALE AND MASSING

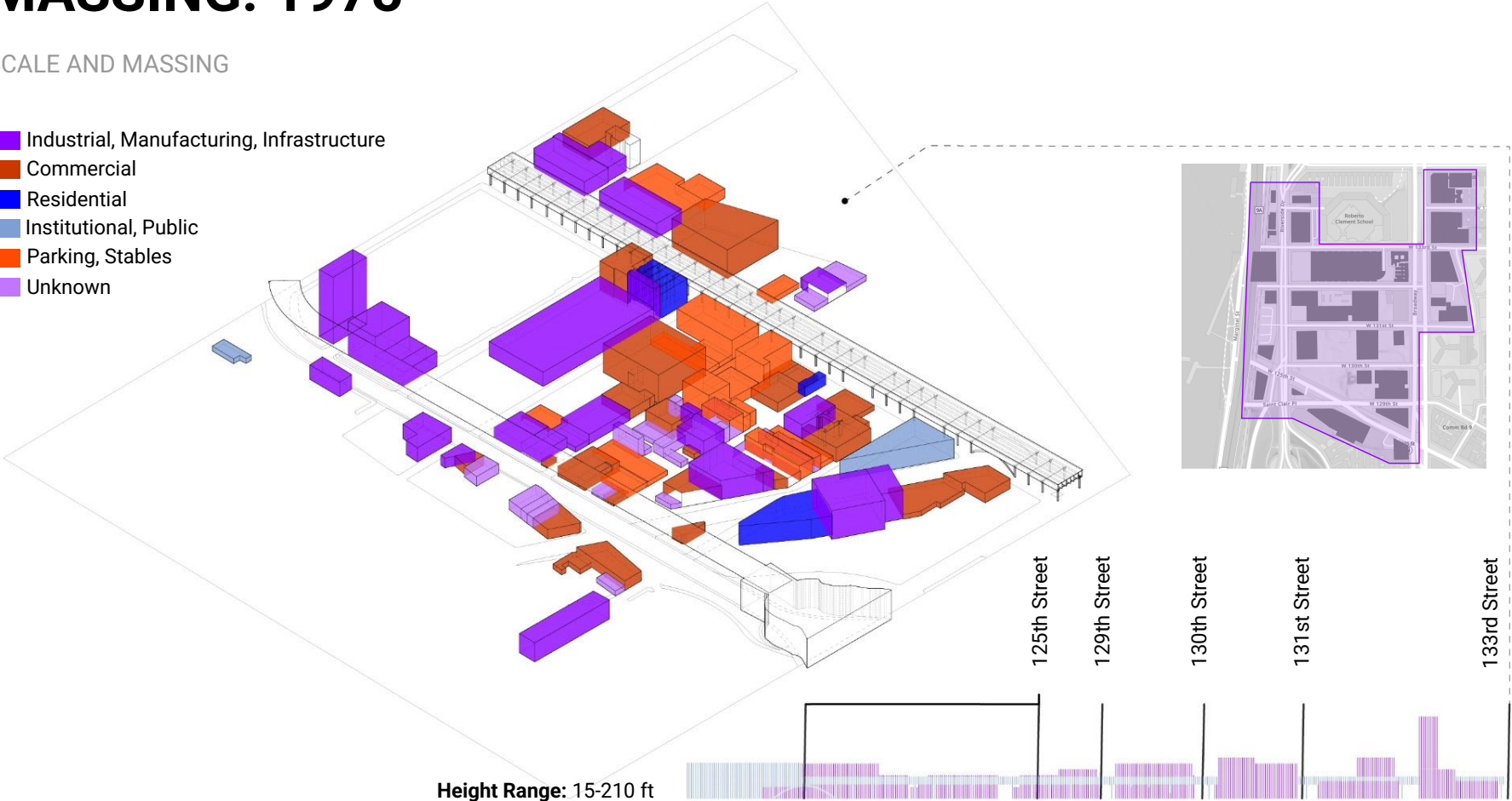
- Industrial, Manufacturing, Infrastructure
- Commercial
- Residential
- Institutional, Public
- Parking, Stables
- Unknown



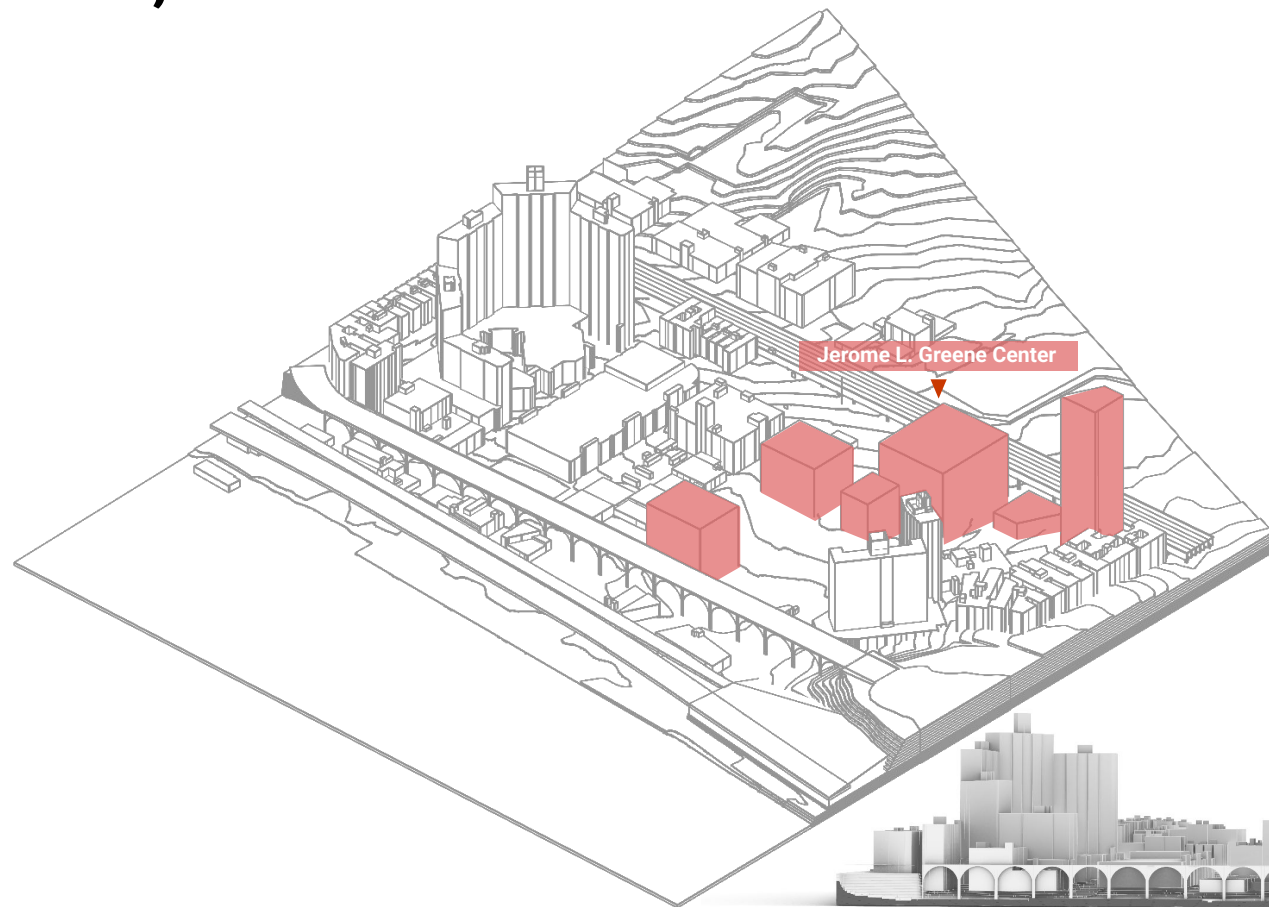
MASSING: 1975

SCALE AND MASSING

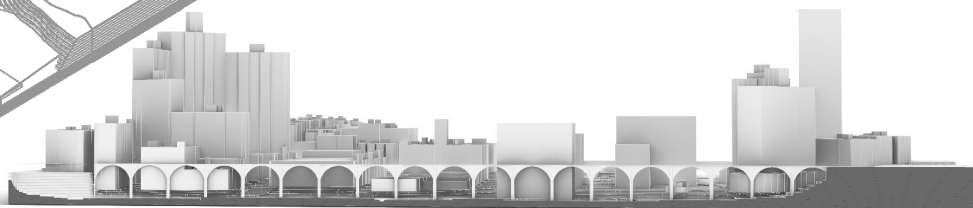
- Industrial, Manufacturing, Infrastructure
- Commercial
- Residential
- Institutional, Public
- Parking, Stables
- Unknown



2026, COLUMBIA MANHATTANVILLE CAMPUS



Height Range: 15-400 ft



Study Area Over Time: Over 5x Growth

1894



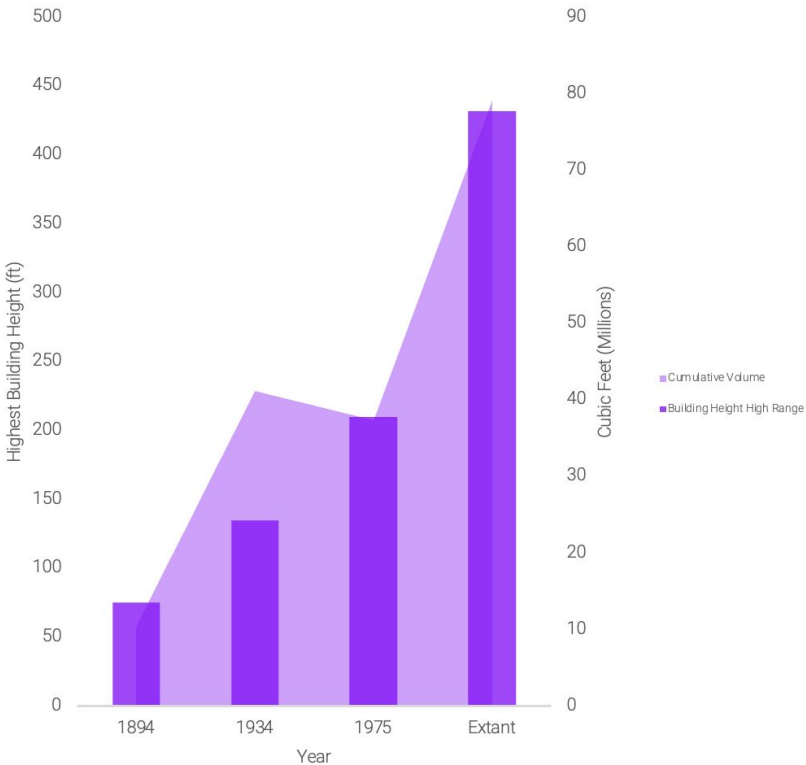
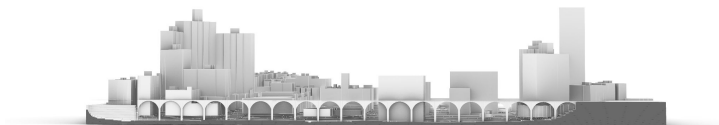
1908



1975



Extant



A SNAPSHOT OF CHANGE IN MANHATTANVILLE

THE PRESENT SITE OF JEROME L. GREENE OVER THE YEARS



TAX PHOTO OF SINCLAIR GASOLINE
[NYC tax photos](#), 1940



TAX PHOTO OF AMOCO
[NYC tax photos](#), 1980

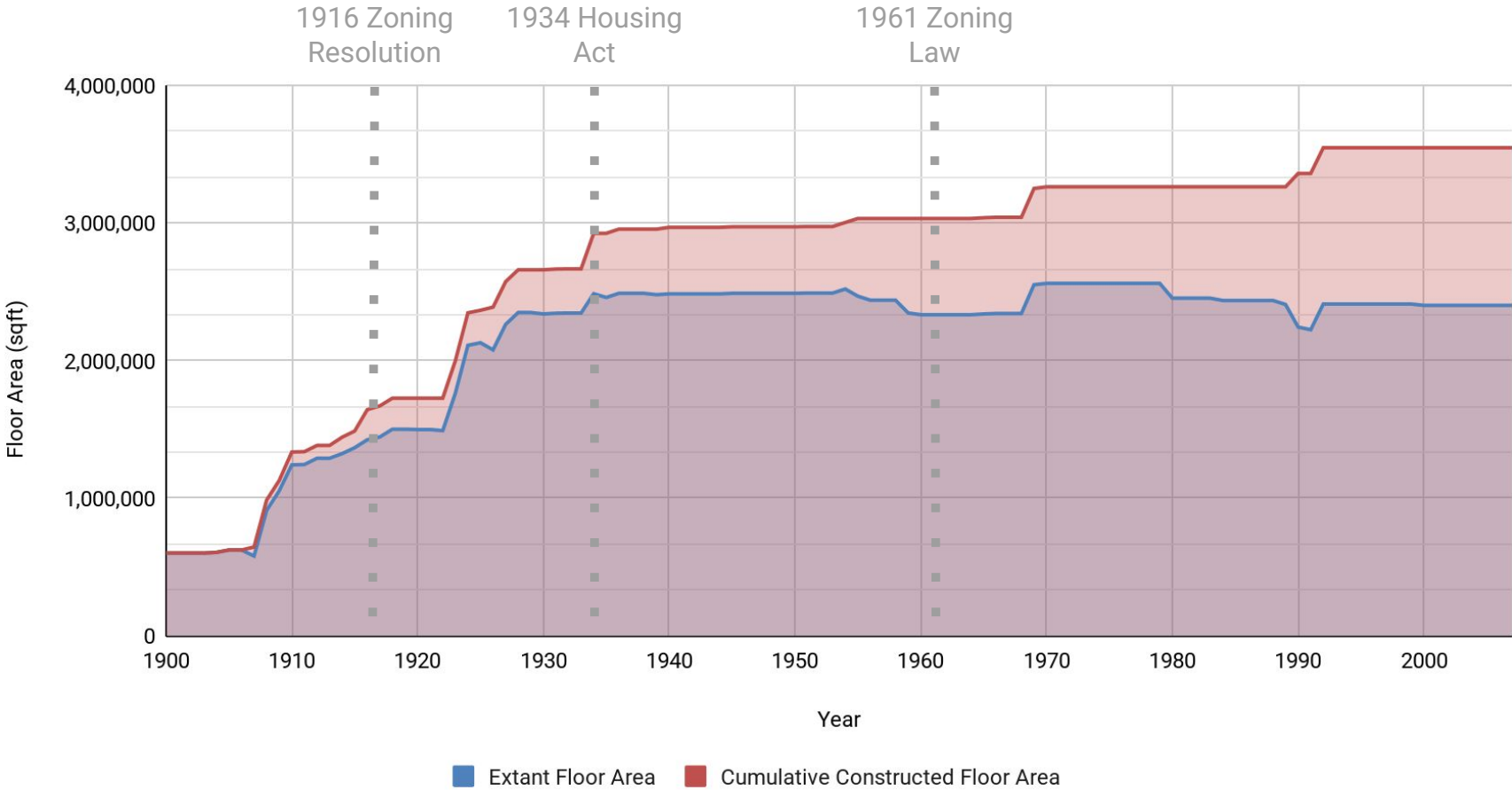


SCENE AFTER DEMOLITION FOR JLG
Nathan Kensinger, 2011

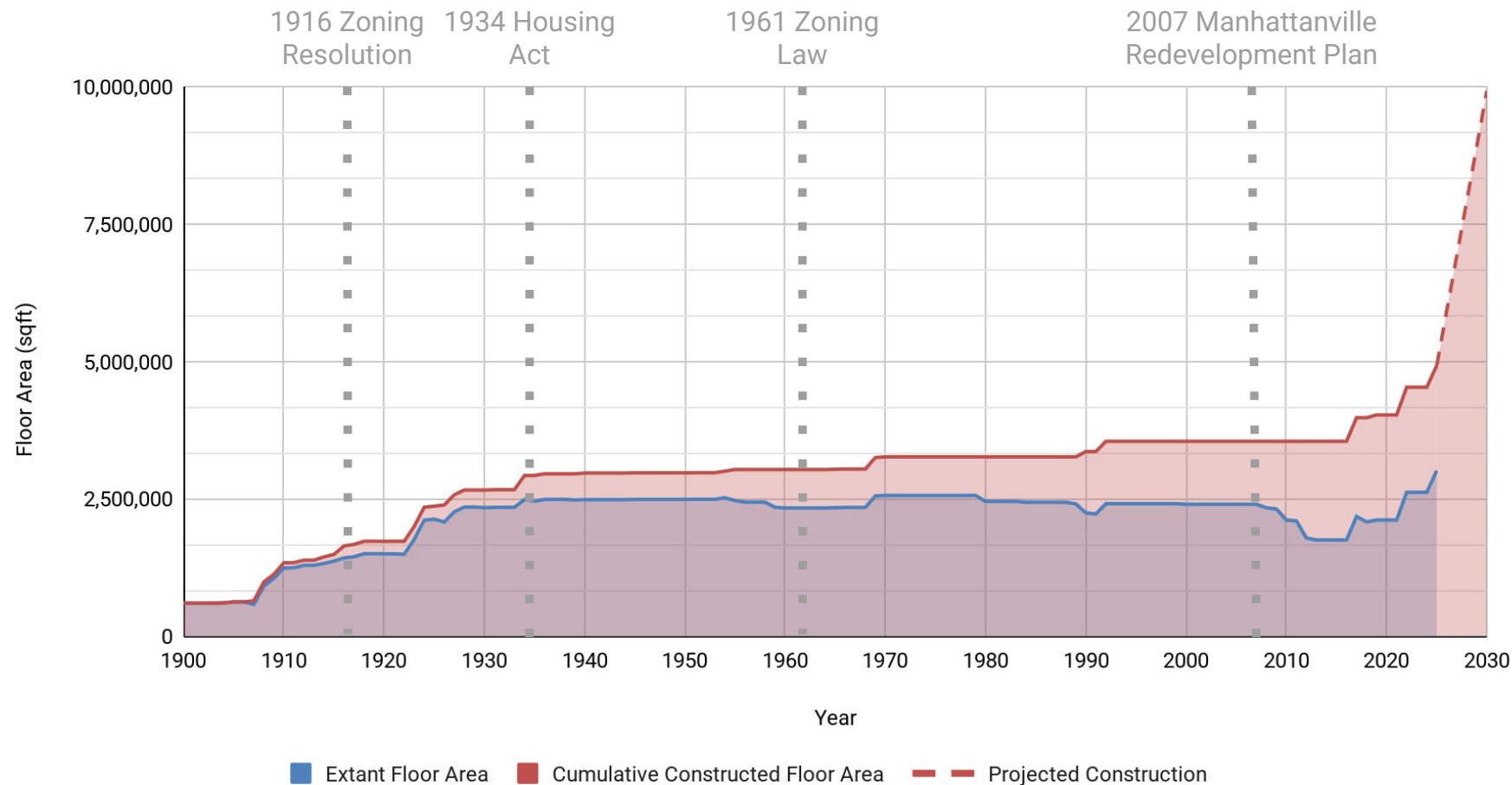


JEROME L. GREENE SCIENCE CENTER
Davis Brody Bond Design

Existing and Total Constructed Floor Area Prior to 2007 Redevelopment Plan

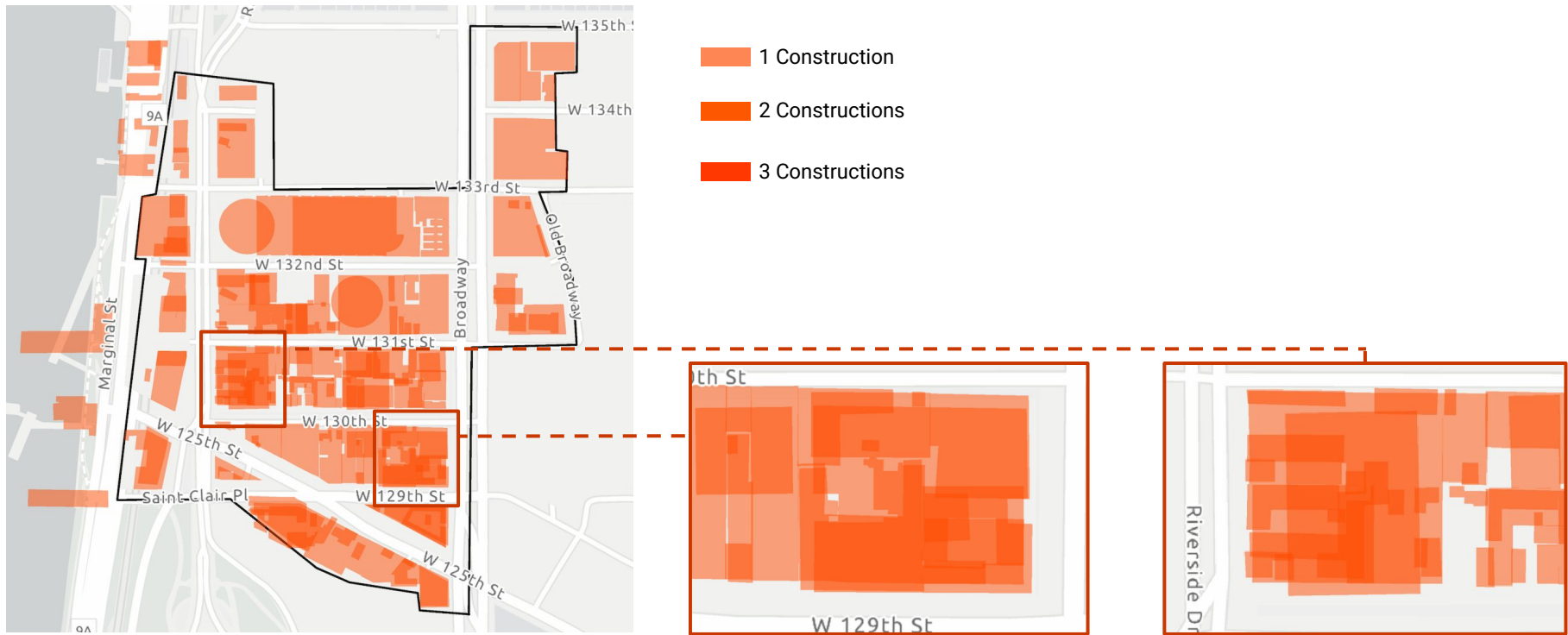


Projected Existing and Total Constructed Floor Area



REPETITION OF CONSTRUCTION AND DEMO

DEMOLITIONS AND CONSTRUCTIONS SHOWN VISUALLY



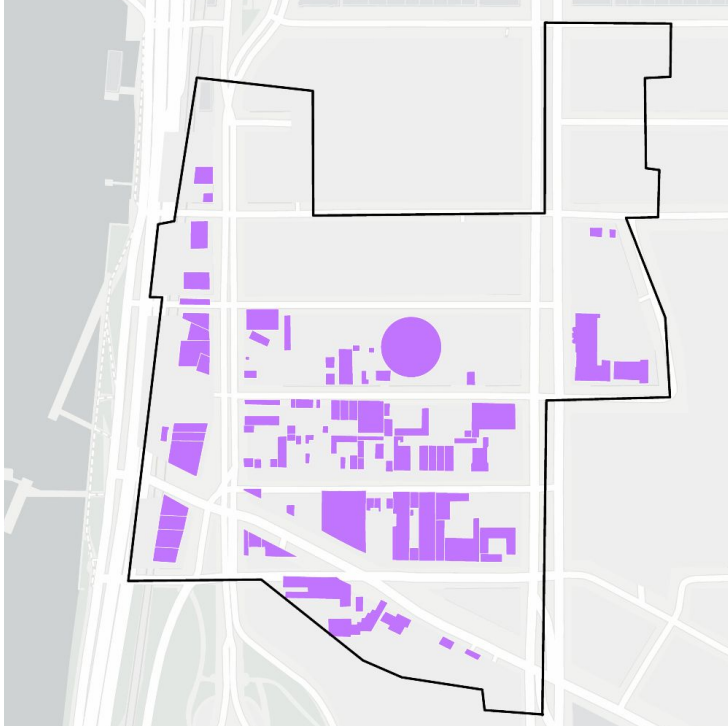
HEAT MAP: CONSTRUCTIONS & DEMOLITIONS

HEAT MAP: JLG FOOTPRINT

HEAT MAP: KRAVIS HALL

PATTERNS OF CONSTRUCTION AND DEMO

CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CONSTRUCTED BY 1894

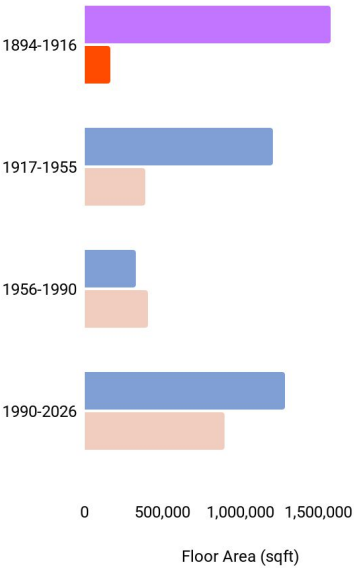
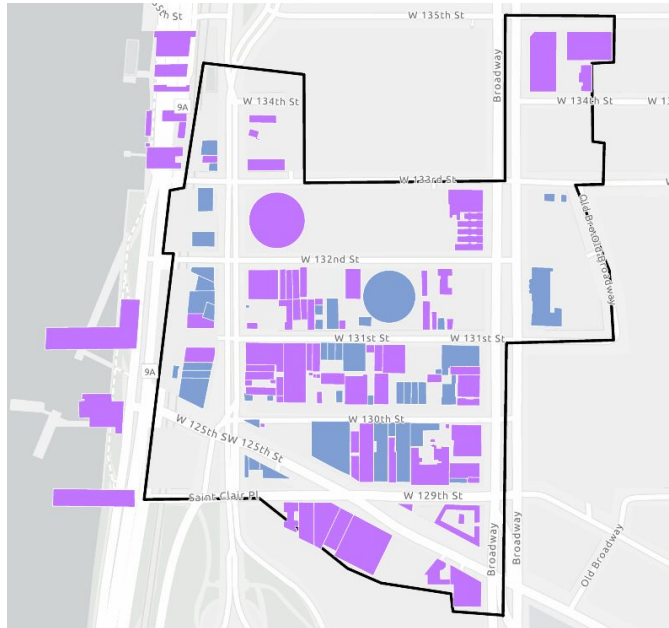
- Periods
 - 1894-1916
 - 1917-1955
 - 1956-1990
 - 1990-2026



CLAREMONT INN AND RIVERSIDE DRIVE FACING NORTH
Museum of the City of New York

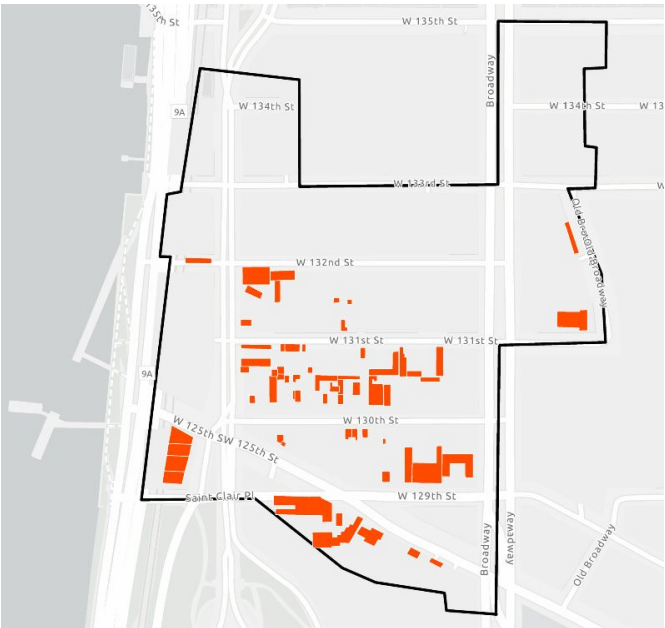
PATTERNS OF CONSTRUCTION AND DEMO: 1916

CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CONSTRUCTED BY 1916

FLOOR AREA DEMOLISHED AND
CONSTRUCTED BY PERIOD

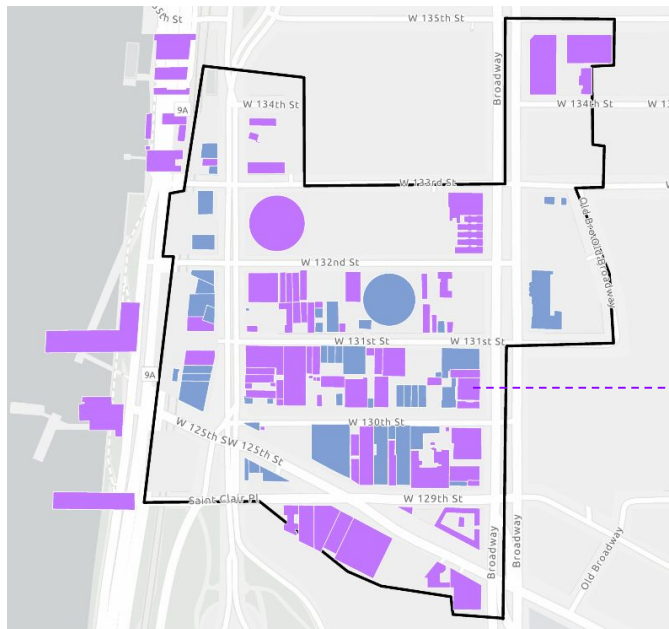


DEMOLISHED BY 1916

DEMOLISHED BY 1916

PATTERNS OF CONSTRUCTION AND DEMO: 1916

CHANGE OVER TIME THROUGH SNAPSHOT MAPS



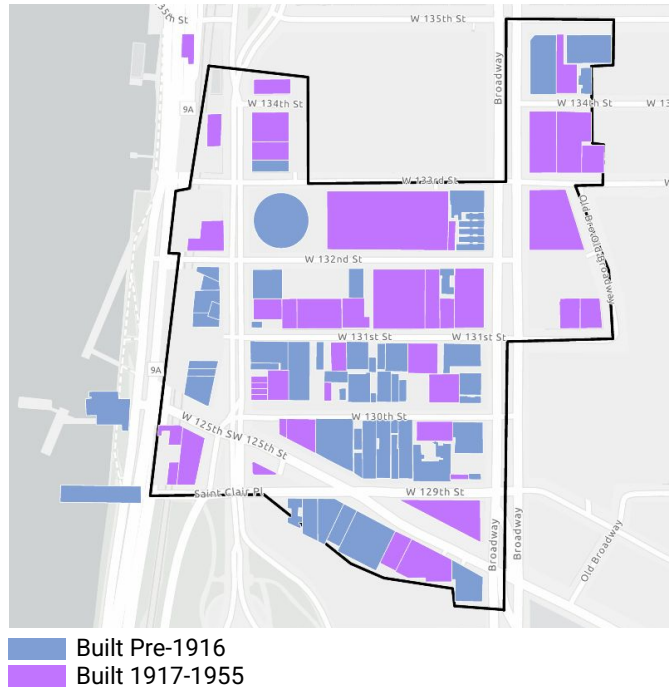
■ Built Pre-1894
■ Built 1894-1916

CONSTRUCTED BY 1916

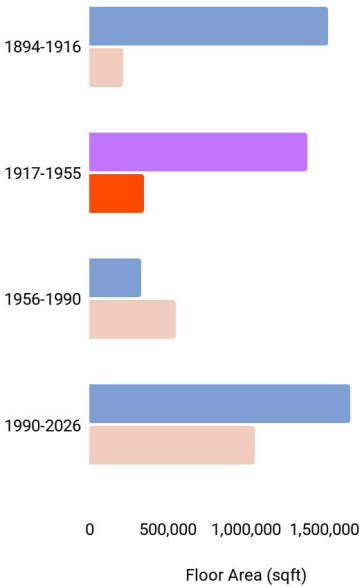


PATTERNS OF CONSTRUCTION AND DEMO: 1955

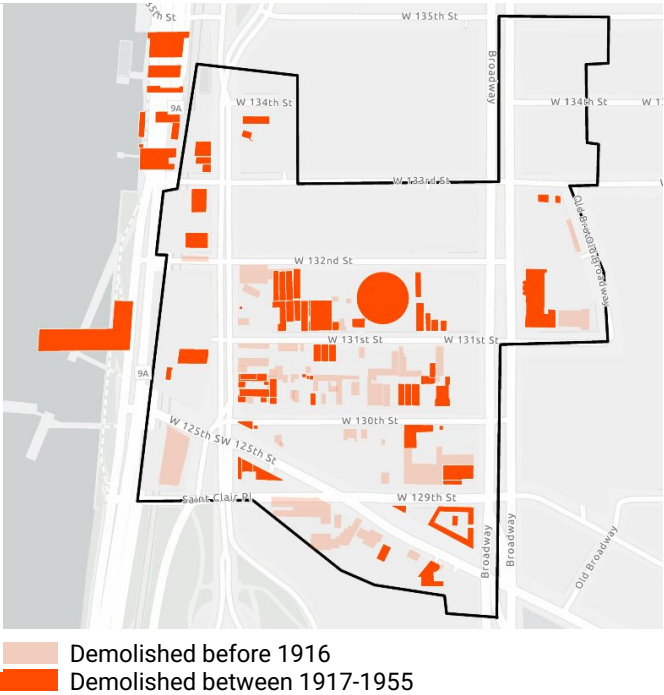
CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CONSTRUCTED BY 1955



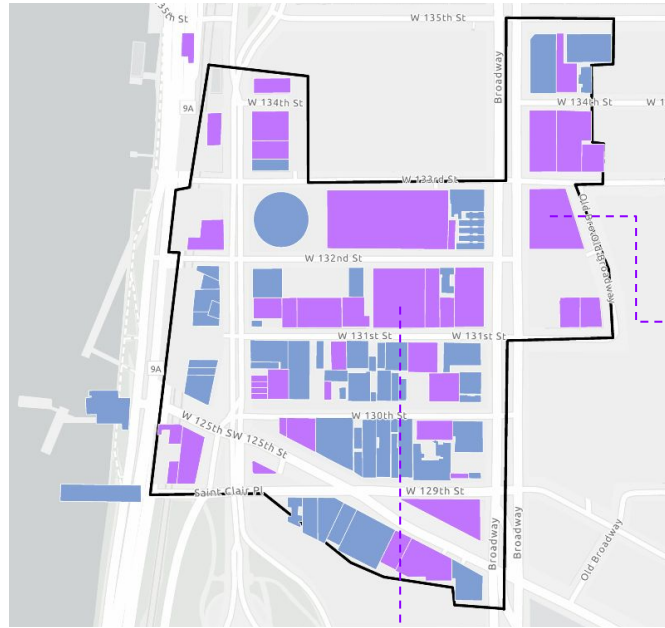
FLOOR AREA DEMOLISHED AND
CONSTRUCTED BY PERIOD



DEMOLISHED BY 1955

PATTERNS OF CONSTRUCTION AND DEMO: 1955

CHANGE OVER TIME THROUGH SNAPSHOT MAPS



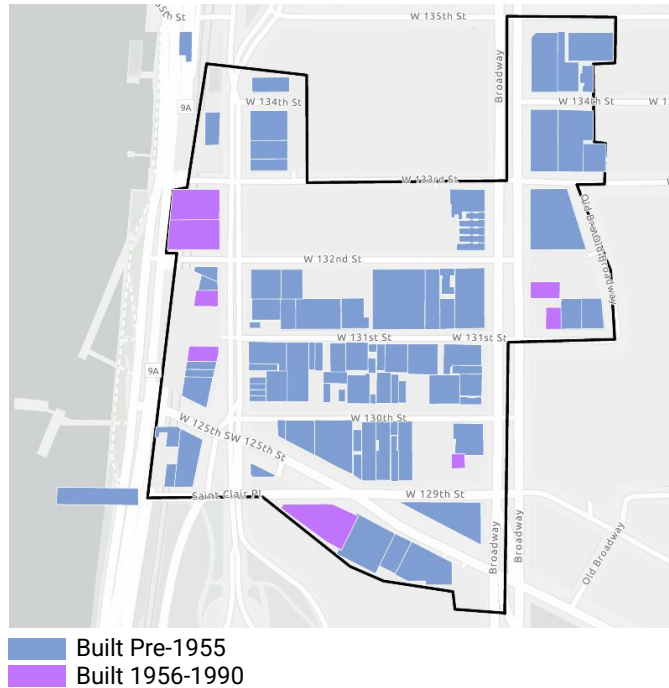
■ Built Pre-1916
■ Built 1917-1955

CONSTRUCTED BY 1955

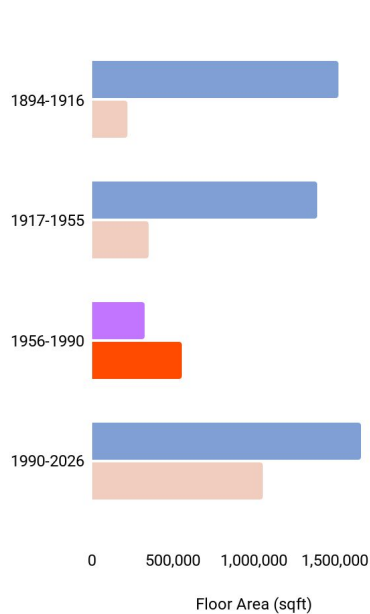


PATTERNS OF CONSTRUCTION AND DEMO: 1990

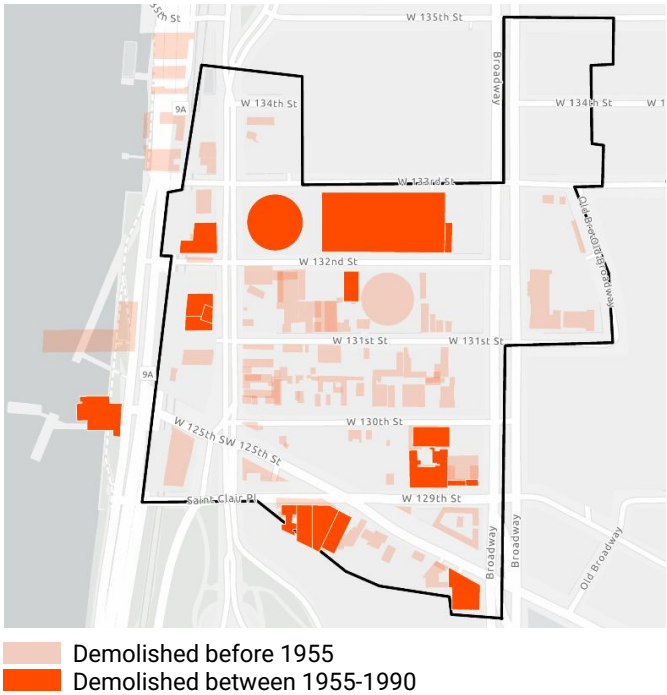
CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CONSTRUCTED BY 1990



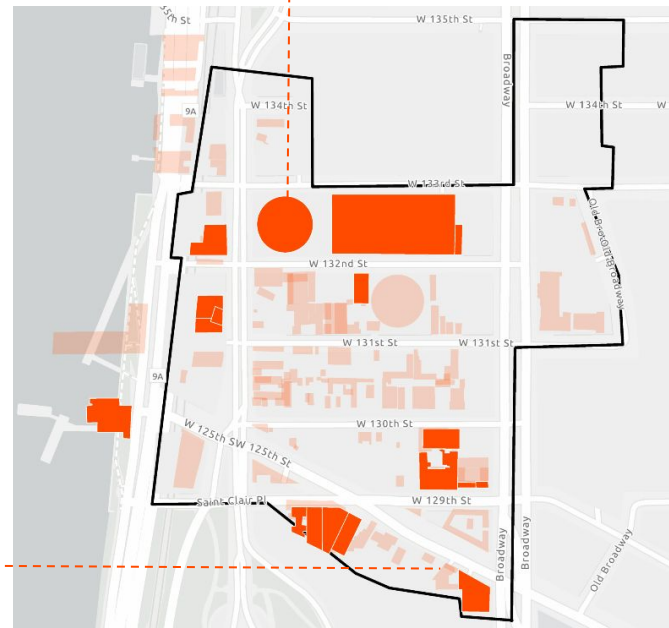
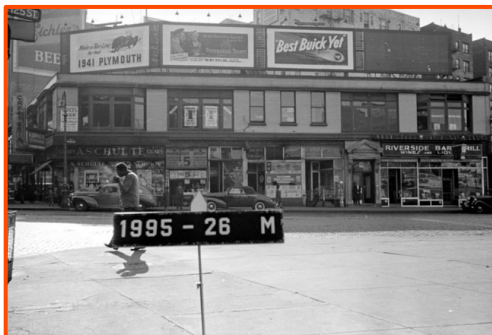
FLOOR AREA DEMOLISHED AND
CONSTRUCTED BY PERIOD



DEMOLISHED BY 1990

PATTERNS OF CONSTRUCTION AND DEMO: 1990

CHANGE OVER TIME THROUGH SNAPSHOT MAPS

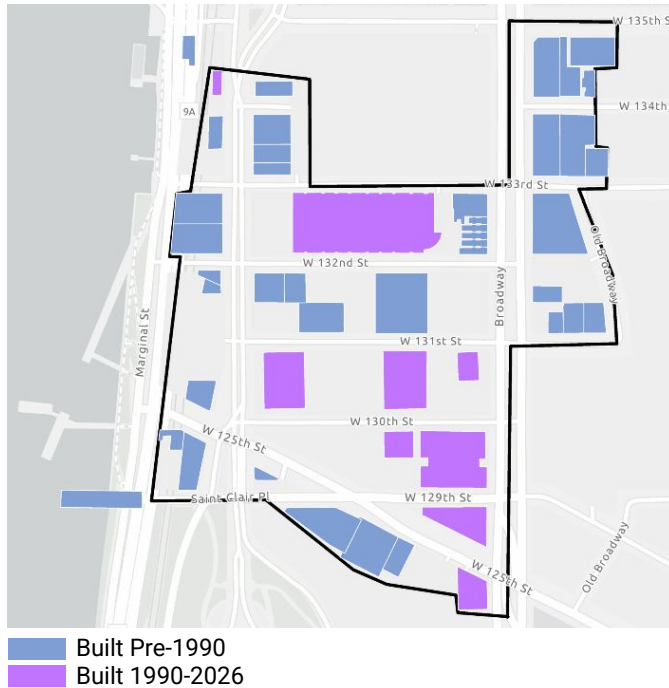


Demolished before 1955
Demolished between 1955-1990

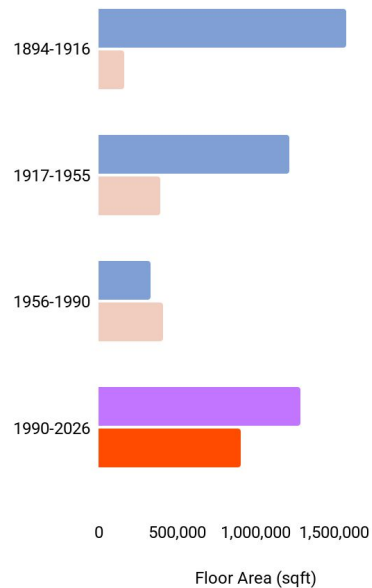
DEMOLISHED BY 1990

PATTERNS OF CONSTRUCTION AND DEMO: 2026

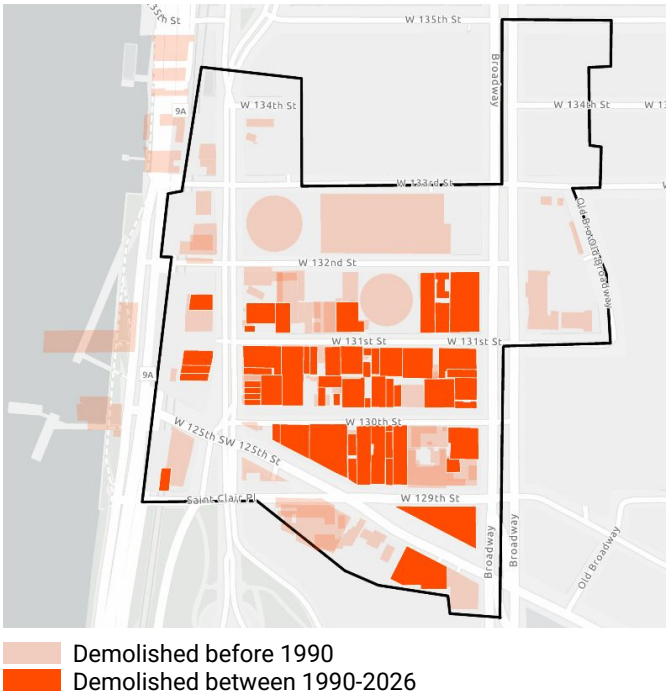
CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CONSTRUCTED BY 2026



FLOOR AREA DEMOLISHED AND
CONSTRUCTED BY PERIOD

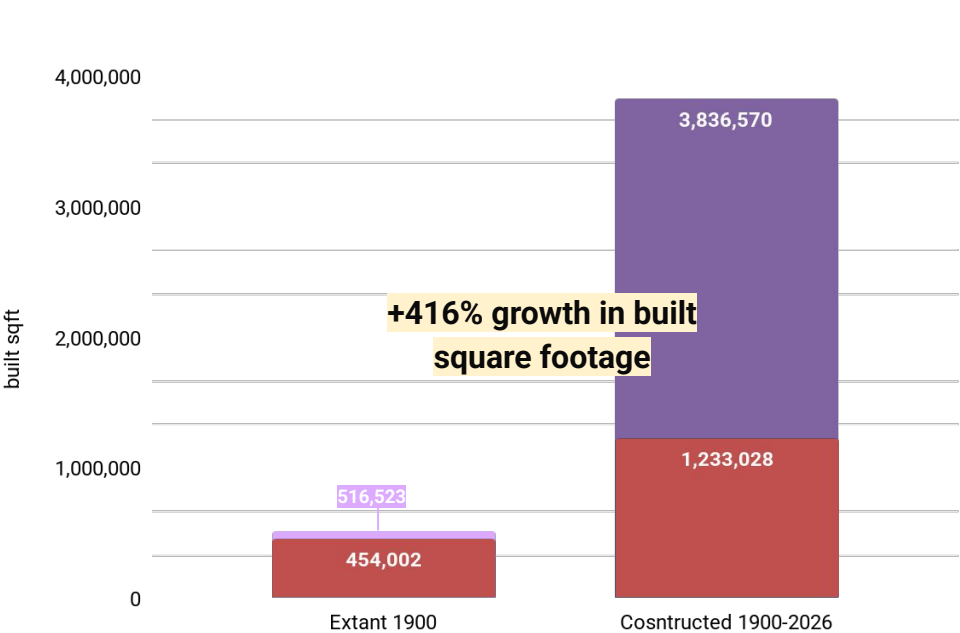


DEMOLISHED BY 2026

CHANGE OVER TIME THROUGH SNAPSHOT MAPS



CYCLES OF REUSE AND DEMOLITION

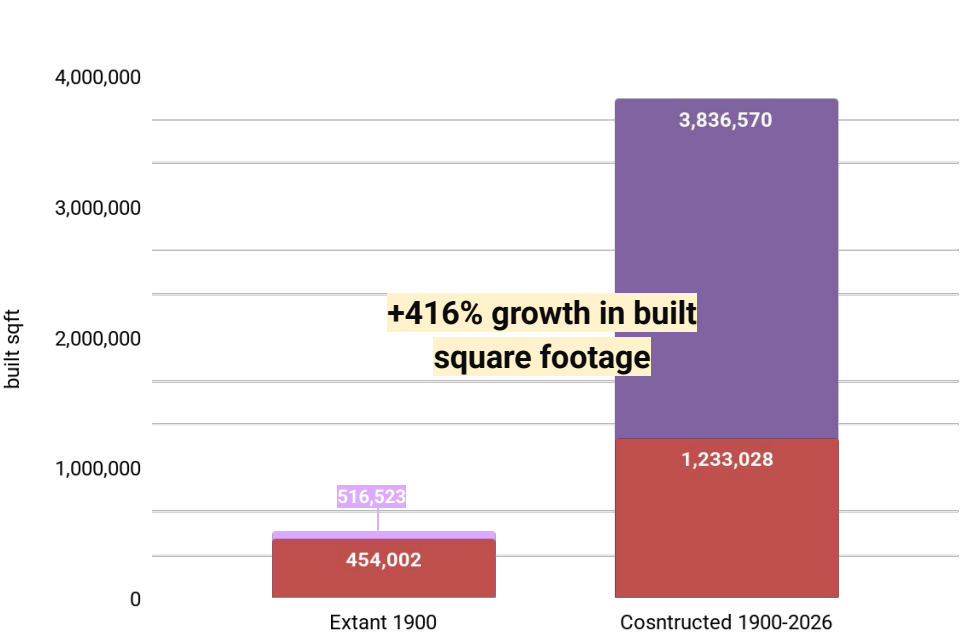


- built pre-1900
- built 1900-2026
- demolished 1900-2026

4,308,671

Total Built Square Footage in Study Area 1900-2026

CYCLES OF REUSE AND DEMOLITION



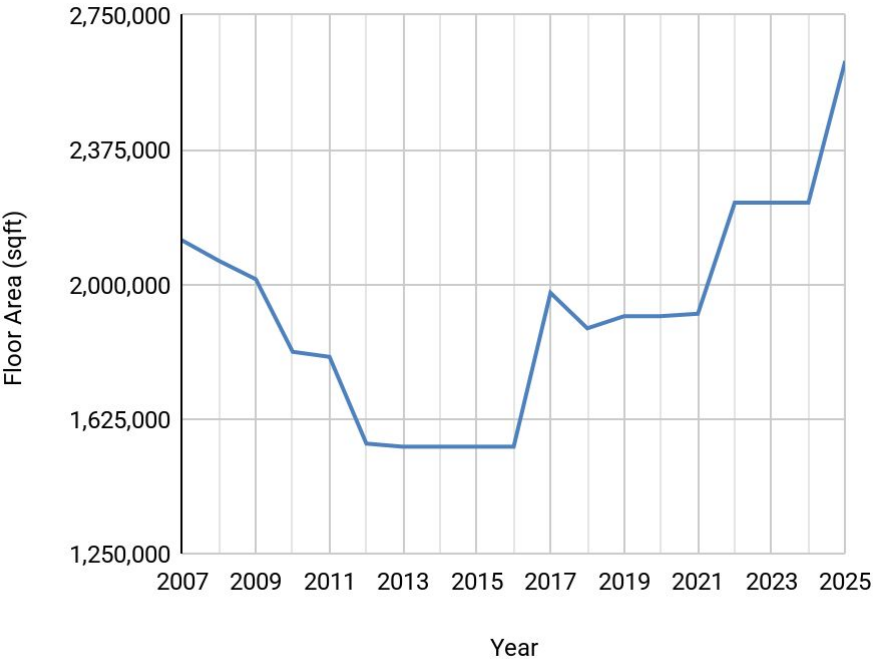
4,308,671

Total Built Square Footage in Study Area 1900-2026

2,666,064 in built square footage extant today

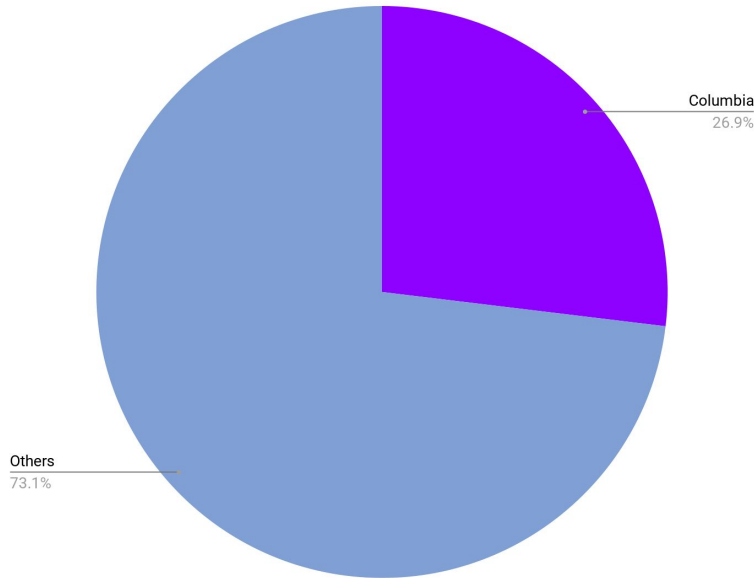
COLUMBIA'S MAJOR ROLE IN DEMOLITION

UNIVERSITY'S DEMOLITION HAS BEEN SIGNIFICANT



MANHATTANVILLE EXTANT FLOOR AREA
Data from class, graph by Jacob Kayen

Approximate Percentage of Square Feet Demolished by Demolition Agent
Post-1900



DEMOLITION ANALYSIS
Data from class, graph by Ben Gering

CASE STUDIES

LOCATION OF CASE STUDIES



CASE STUDIES IDENTIFIED



PRENTISS HALL, 2008.



NASH BUILDING, 2026.



STUDEBAKER BUILDING, 2007.



SHEFFIELD STABLES, 1903.



GIBB'S DINNER, 1920s.



LENFEST CENTER, 2017.



JLG CENTER, 2016.



TENEMENTS AND BELLMORE, 2026.

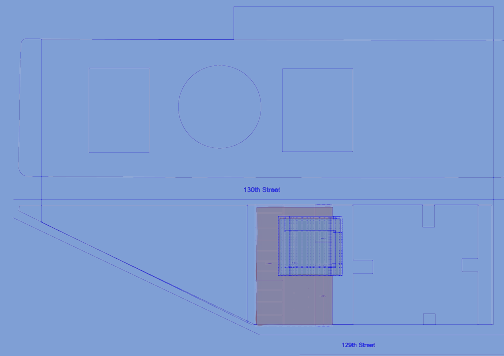
LENFEST CENTER FOR THE ARTS BUILDING

LENFEST CENTER FOR THE ARTS

+ 10K SQUARE FOOTAGE:

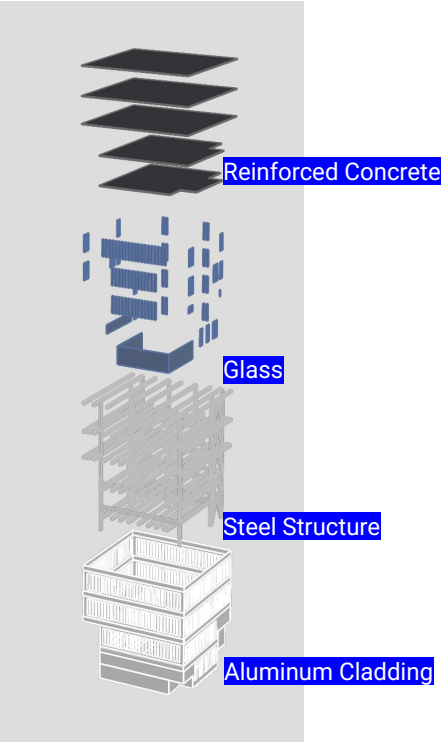
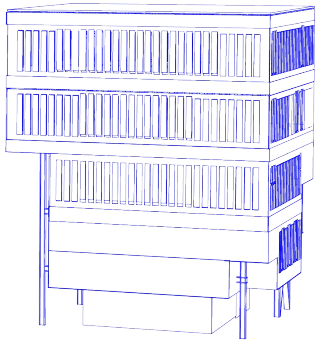


+3,121 tCO2e

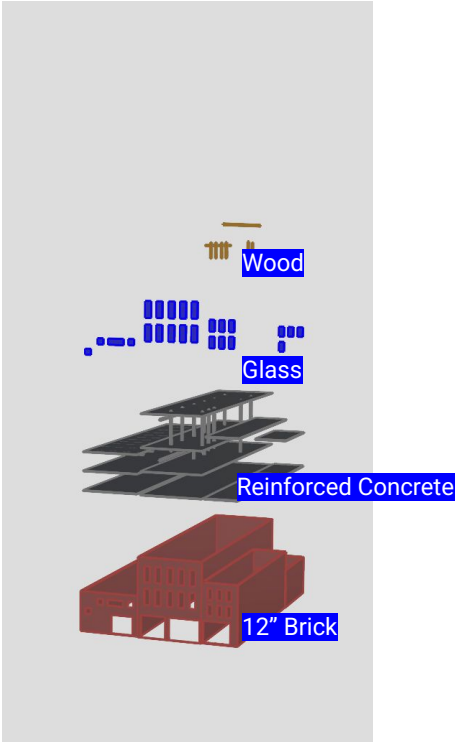
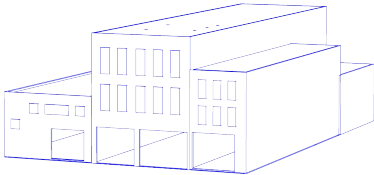


SIZE COMPARISON

64,165 Square Feet



52,595 Square Feet

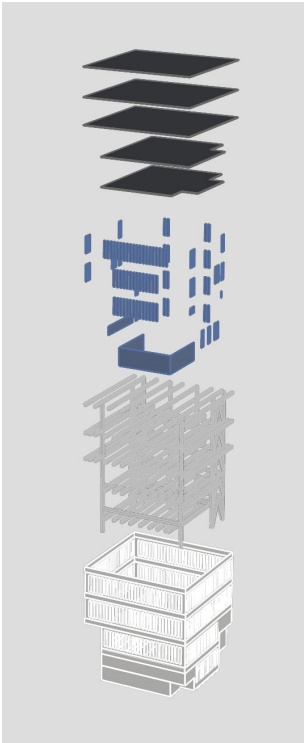


LENFEST EMBODIED CARBON CALCULATION

Material	Quantity (kg)	Embodied Carbon (tCO2e)
Concrete	1,657,585	259
Glass	12,895	2,102
Steel	1,243,774	2,164
Aluminum	50,316	284
Insulation	14,843	19
Total:		2,747

EMBODIED CARBON QUANTITY

From analysis of architectural drawings using Bluebeam by Jacob Kayen

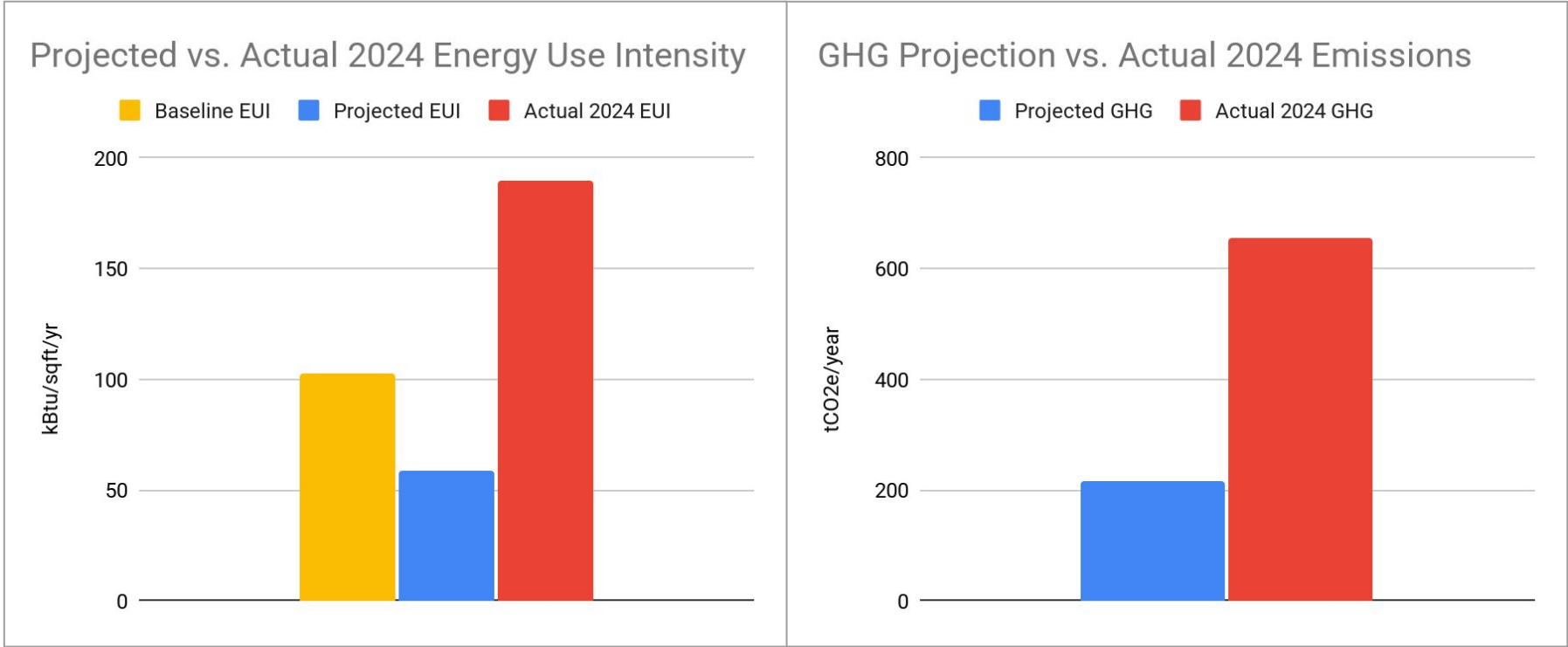


LENFEST BUILDING SYSTEMS

Model by Danielle Zhuo

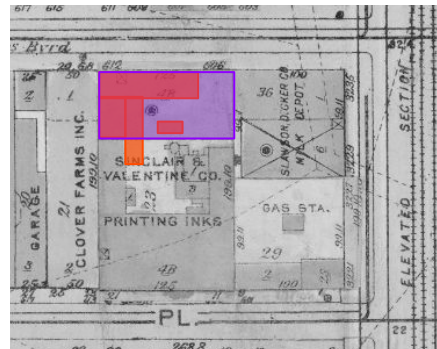
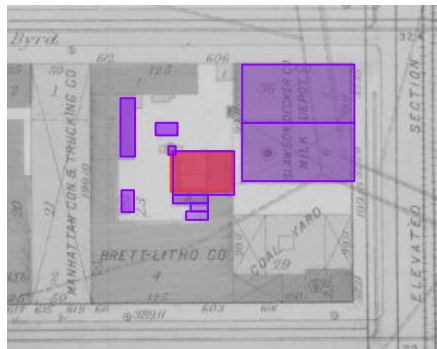
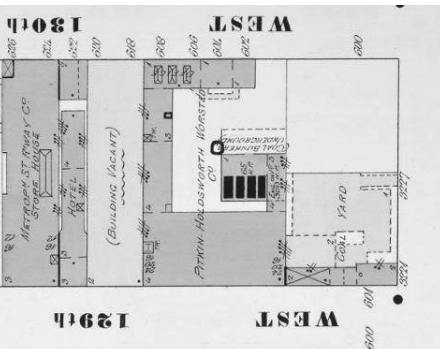
LEED: OPERATIONAL USE BY COST SAVINGS

PROJECTED PERFORMANCE DOES NOT GUARANTEE FUTURE RESULTS



JEROME L. GREENE SCIENCE CENTER BUILDING

A HISTORY OF DEVELOPMENT AND LOSS



1902

1916

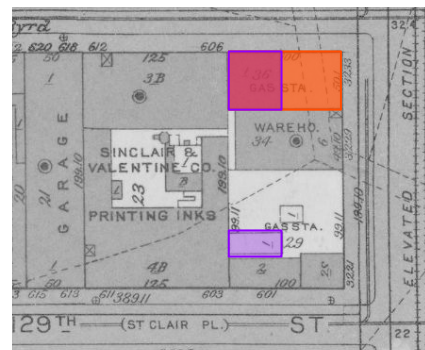
1923

1955

2011

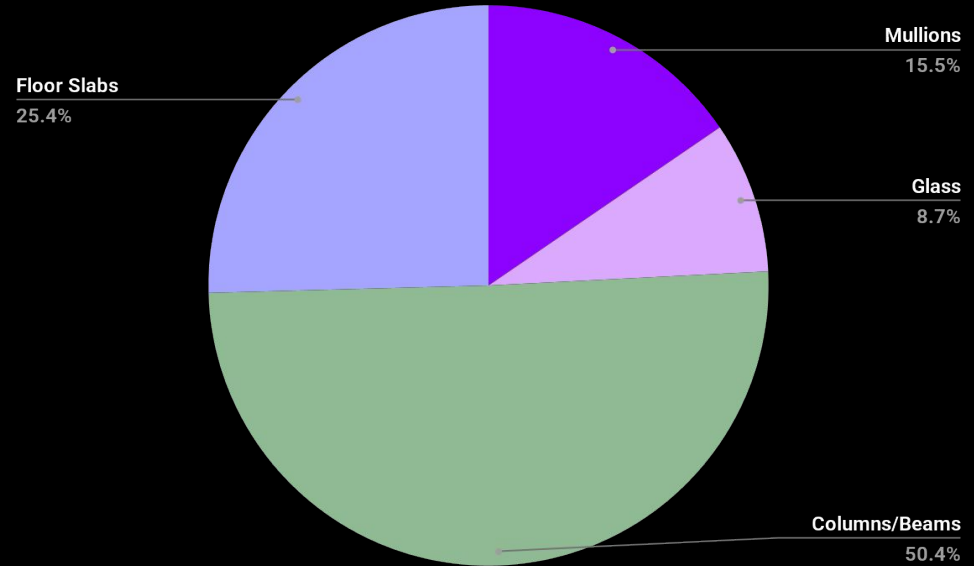
Development

Demolition



TOTAL EMBODIED CARBON (tCO₂e)

**13,977 metric tons
(tCO₂e) of
embodied carbon to
build JLG**



CONSIDERATIONS FOR PARTIAL AND WHOLE REUSE

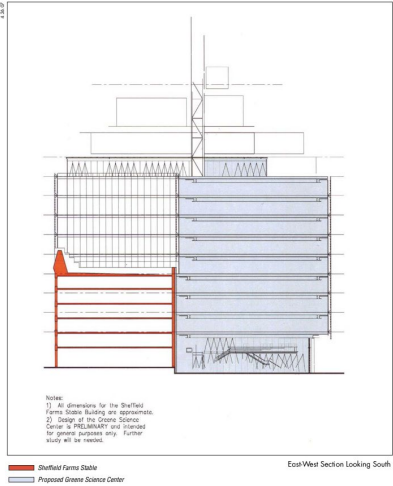


Figure 15
Section A-A:
Retain Entire Sheffield Farms Stable

MANHATTANVILLE IN WEST HARLEM REZONING
AND ACADEMIC MIXED-USE DEVELOPMENT

10.4K tCO₂e or
25% Carbon Savings

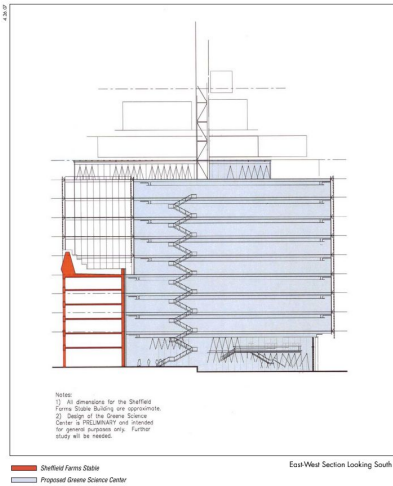


Figure 19
Section A-A:
Retaining 50 Percent of Sheffield Farms Stable

MANHATTANVILLE IN WEST HARLEM REZONING
AND ACADEMIC MIXED-USE DEVELOPMENT

12.3K tCO₂e or
12.5% Carbon Savings

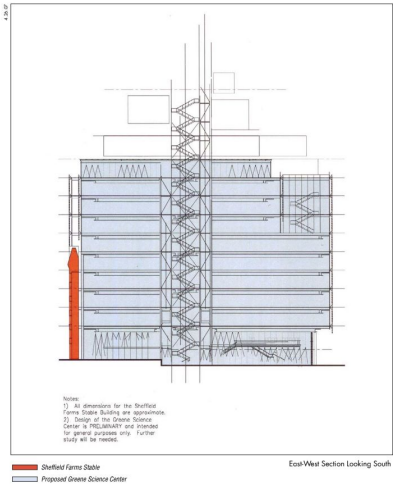


Figure 23
Section A-A:
Retaining Facade of Sheffield Farms Stable

MANHATTANVILLE IN WEST HARLEM REZONING
AND ACADEMIC MIXED-USE DEVELOPMENT

13.7K tCO₂e or
2% Carbon Savings

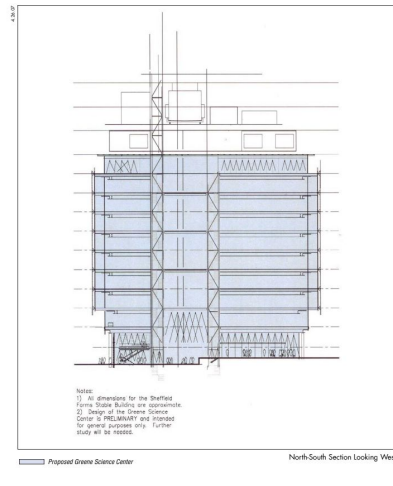


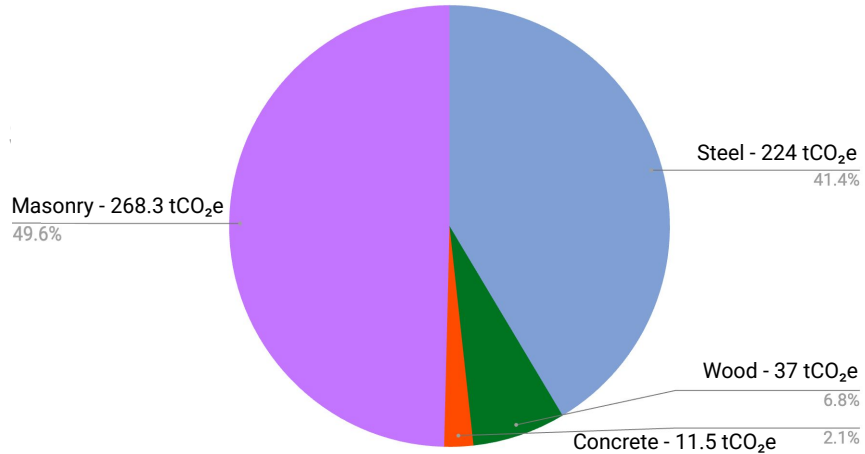
Figure 24
Section B-B:
Retaining Facade of Sheffield Farms Stable

MANHATTANVILLE IN WEST HARLEM REZONING
AND ACADEMIC MIXED-USE DEVELOPMENT

SHEFFIELD FARMS STABLES

INTERIOR MATERIALS

Interior Embodied Carbon Amounts



BRICK MASONRY WALL

Demolition Photos, Simpson Gumpertz & Heger Inc.

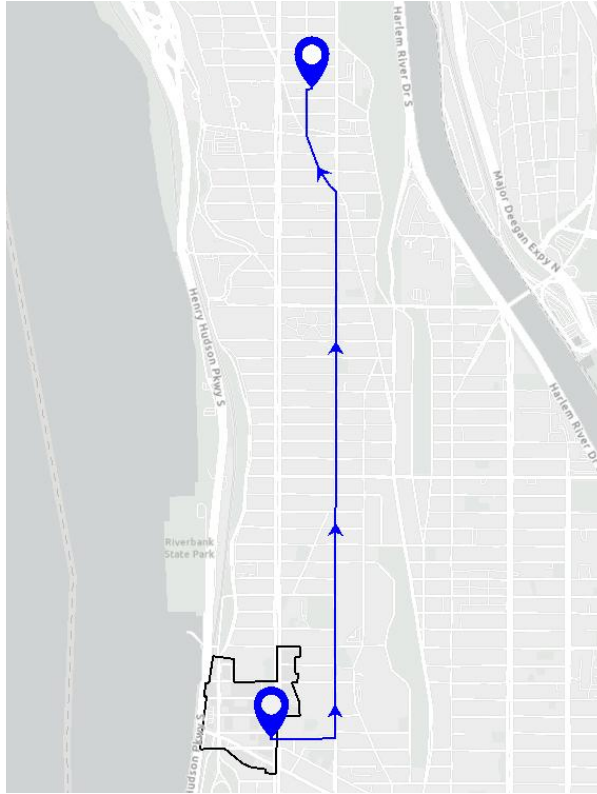
FACADE EMBODIED CARBON

- Terra Cotta
 - Water Table: **300 kgCO₂e**
 - Cornice: **619 kgCO₂e**
 - Tile: **498 kgCO₂e**
 - Quoins: **978 kgCO₂e**
 - Chimney: **574 kgCO₂e**



TERRACOTTA ON FACADE
Sheffield Farms by Columbia University

FACADE DECONSTRUCTION AND REINSTALLATION

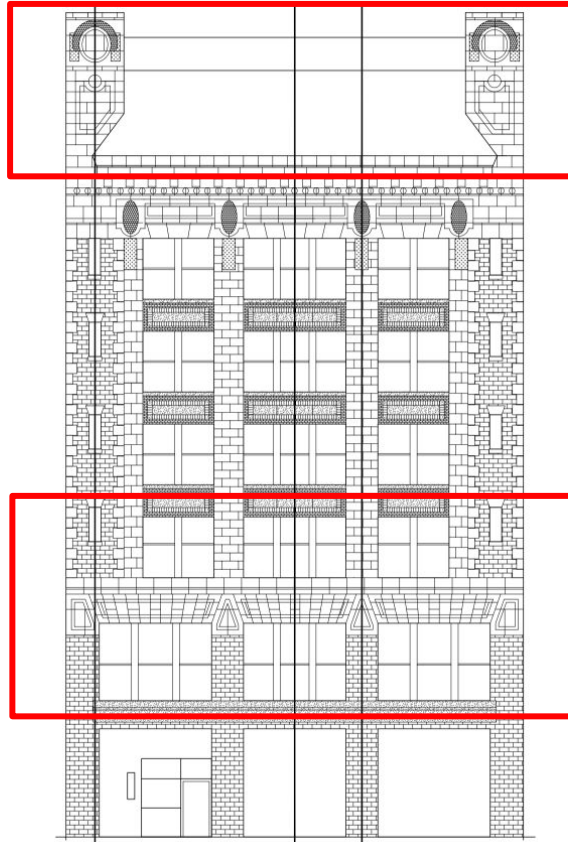


FACADE RELOCATION MAP
Lindsey Johnston



51 AUDUBON AVE
Photo by Lindsey Johnston

FACADE DECONSTRUCTION AND REINSTALLATION



FACADE ELEVATION
HABS Report

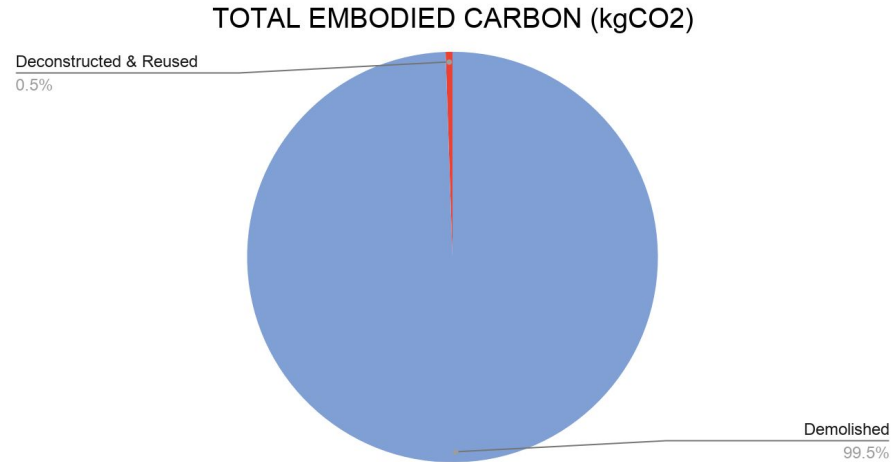


51 AUDUBON AVE
Photo by Lindsey Johnston

FACADE DECONSTRUCTION CARBON IMPACT

Total Embodied Carbon: **853 tCO₂e**

Deconstructed and Reused: **4.5 tCO₂e**



51 AUDUBON AVE

Photo by Lindsey Johnston

WEST MARKET DINER BUILDING(S)

1921 GIBB'S DINER - HISTORICAL PHOTOS

P.J. TIERNEY DINING CAR



GIBBS DINER EXTERIOR, c. 1920s
Harlem Bespoke



GIBBS DINER INTERIOR, c. 1920s
Harlem Bespoke



GIBBS DINER EXTERIOR, c. 1920s
Harlem Bespoke

EMBODIED CARBON OF MOUNTAINVIEW DINING CAR

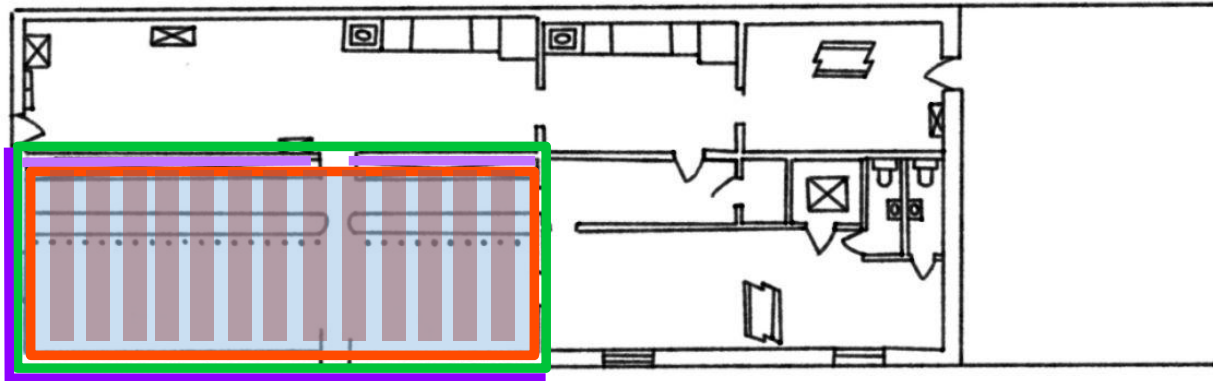
= 11 tCO₂e

DEMOLISHED ELEMENTS:

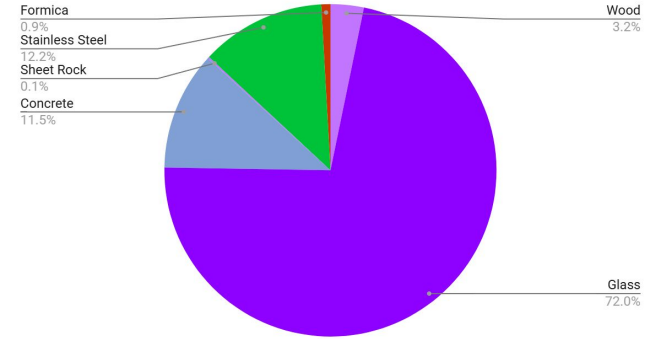
- CONCRETE SLAB FLOOR
- STUD WALL WITH SHEETROCK
- 6" GLASS BLOCKS (NO INFORMATION)
- 1/8" WINDOWS (NO INFORMATION)

SALVAGED ELEMENTS:

- WOOD CEILING JOISTS
- FORMICA CEILING
- STAINLESS STEEL INTERIOR & EXTERIOR PANELING
- TERRAZZO TILED FLOOR



Percentage of Embodied Carbon by Material vs. Material



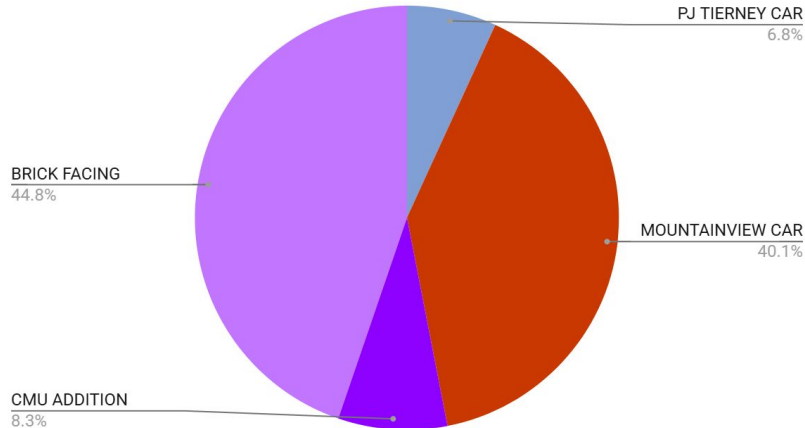
KEY:

- FORMICA CEILING
- STAINLESS STEEL PANELING
- WOOD CEILING JOISTS
- FULL HEIGHT 2"x4" STUD WALL WITH SHEETROCK
- TERRAZZO FLOOR OVER CONCRETE SLAB
- GLASS WINDOWS

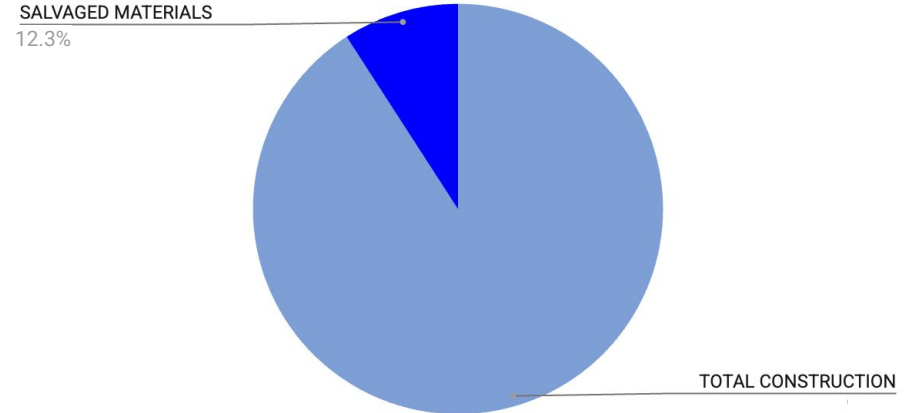
EMBODIED CARBON TOTAL VS. SALVAGED ELEMENTS

- Total Embodied Carbon = **29 tCO₂e**
- Embodied Carbon of Salvaged Parts = **3 tCO₂e**

Embodied Carbon of Each Diner Construction Phase



Embodied Carbon of Total Construction Vs. Embodied Carbon of Salvaged Materials



STUDEBAKER BUILDING

ADAPTIVE REUSE POTENTIAL OVER TIME

ALTERATIONS & OWNERSHIP

Borden Milk Processing Plant



1938-
1956

**Restoration works of some spaces
under Columbia University**



2005

1923

**Studebaker Finishing
Plant**



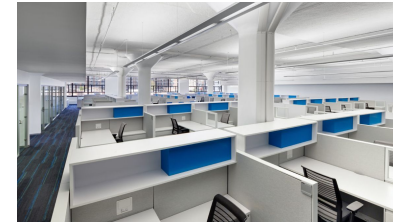
1956-
2012

**Madame Alexander
Doll Factory**



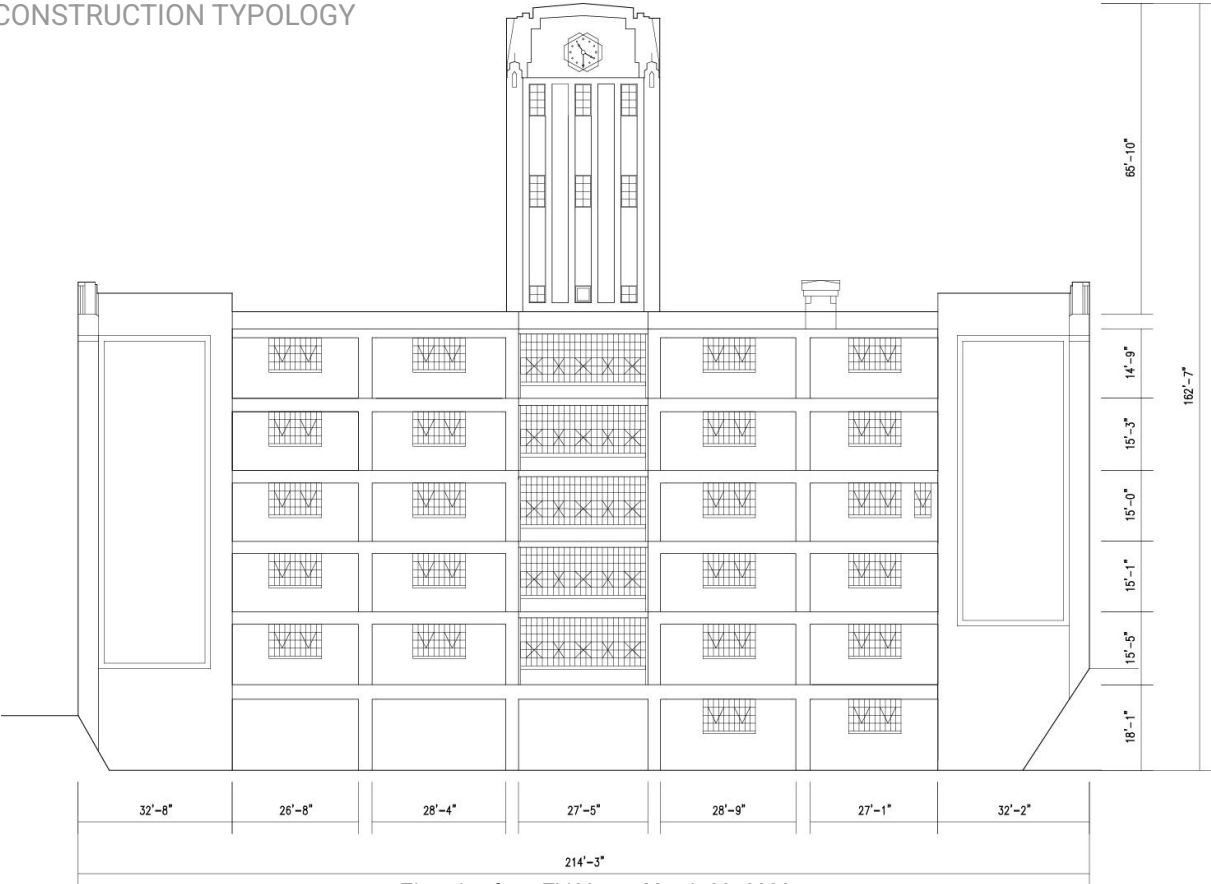
2015

**Fit out works of some interior spaces
for Columbia University offices**



CONSTRUCTION TYPOLOGY

CONSTRUCTION TYPOLOGY



Elevation from Zhi Yang, March 28, 2026

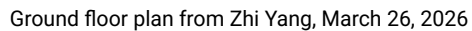


Site visit and measurements
Photo from Zhi Yang, March 24, 2026



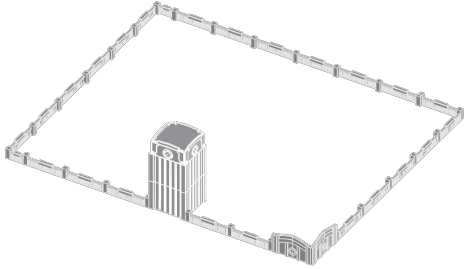
Site visit and measurements
Photo from Zhi Yang, March 24, 2026

PLAN AND SECTION DRAWING



CARBON CALCULATION

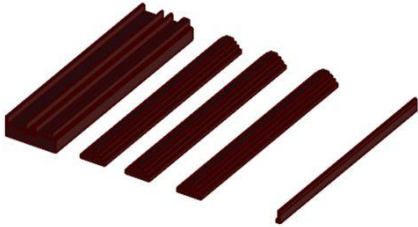
MATERIALS CALCULATION BY DIFFERENT VOLUME



Parapet/ Tower (Concrete)

Volume: 13295339.7 (+/- 0.01)
cubic inches = 217.87 cubic meters

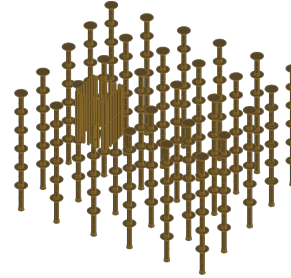
EmbodiedCarbon (0.126 CO₂e/kg)
= 66 tCO₂e



Basement (Reinforced Concrete)

Volume: 87079077.6 (+/- 0.1) cubic
inches = 1427 cubic meters

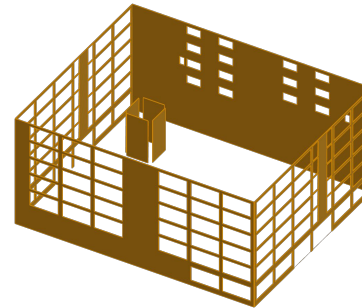
Embodied Carbon (0.156 CO₂e/kg)
= 557 tCO₂e



Mushroom Columns (Reinforced Concrete)

Volume: 36068621 (+/- 13) cubic
inches = 591.06 cubic meters

EmbodiedCarbon (0.156 CO₂e/kg)
= 165 tCO₂e



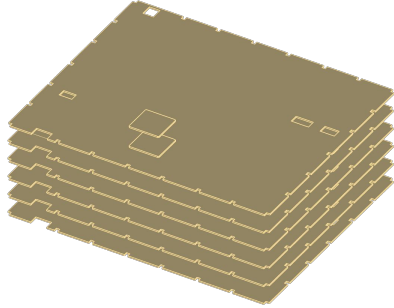
Masonry facade (Brick & Clay)

Volume: 18675150.3 (+/- 0.1) cubic
inches = 306.03 cubic meters

Material Densities (1910 kg/m³)
Embodied Carbon (0.195 CO₂e/kg)
= 114 tCO₂e

CARBON CALCULATION

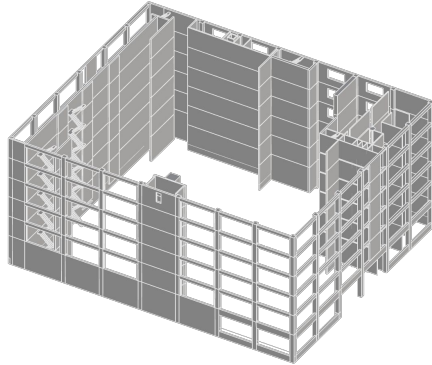
MATERIALS CALCULATION BY DIFFERENT VOLUME



Slab (Reinforced Concrete)

Volume: 285306930 (+/- 0.1) cubic inches = 4675.34 cubic meters

Embodied Carbon (0.156 CO₂e/kg)
= 1823 tCO₂e

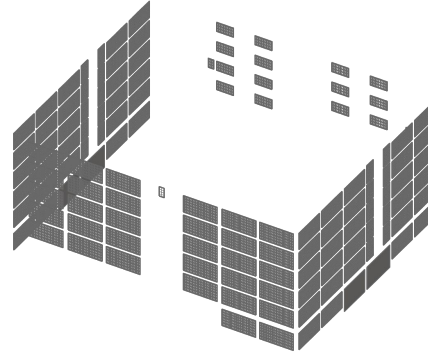


Walls/ Columns/ Stairs (Reinforced Concrete)

Volume: 80490210.7 (+/- 0.21) cubic inches = 1318.99 cubic meters

Material Densities (2500 kg/m³)
Embodied Carbon (0.156 CO₂e/kg)
= 514 tCO₂e

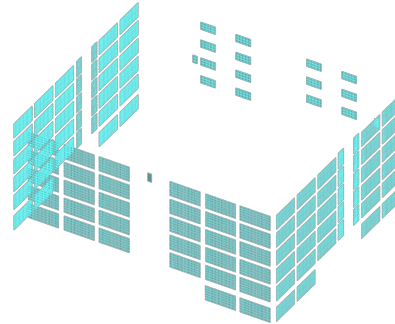
Zhi Yang, 2026



Windows' Frame and Doors (Aluminum)

Volume: 650842.0685 + 22015.1575 (+/- 0.1) cubic inches = 33.17 cubic meters

Material Densities (2700 kg/m³)
Embodied Carbon (6.6 CO₂e/kg)
= 591 tCO₂e



Windows (Double Glaze)

Volume: 8124464.4 (+/- 0.01) cubic inches = 133.135 cubic meters

Material Densities (2500 kg/m³)
Embodied Carbon (1.44 CO₂e/kg)
= 75 tCO₂e

Zhi Yang, 2026

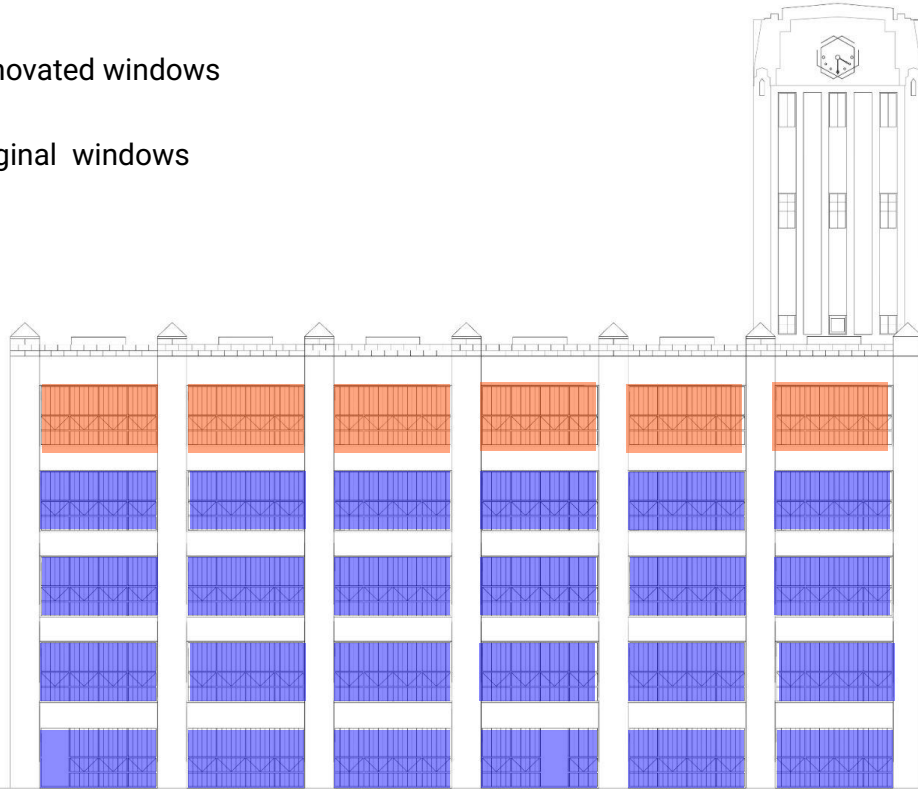
STUDEBAKER BUILDING: WINDOW RENOVATION



Renovated windows



Original windows



Elevation by Francisca Leyton

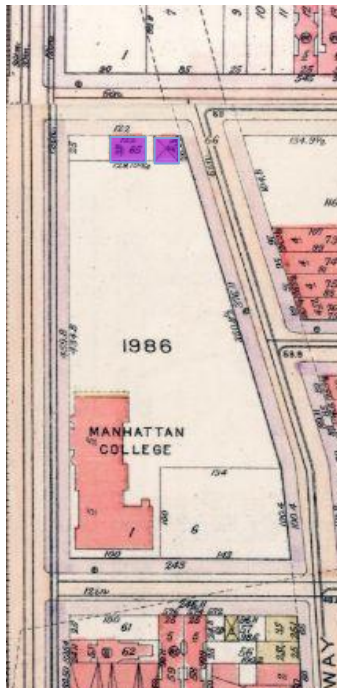


Image by Zhi Yang

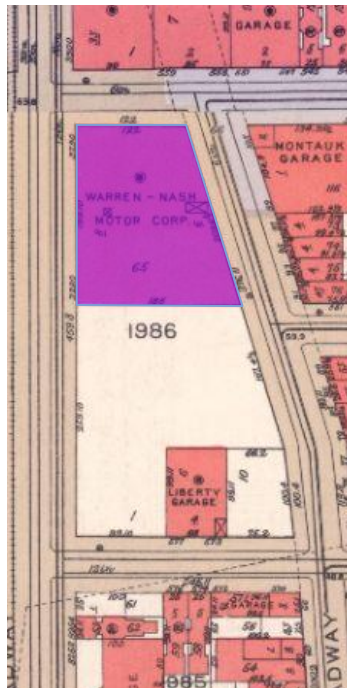
NASH BUILDING

NASH, A CENTURY OLD GIANT

THE MAJOR PART OF EMBODIED CARBON ON THIS LAND LOT



Fire Insurance Map (1916)



Fire Insurance Map (1934)

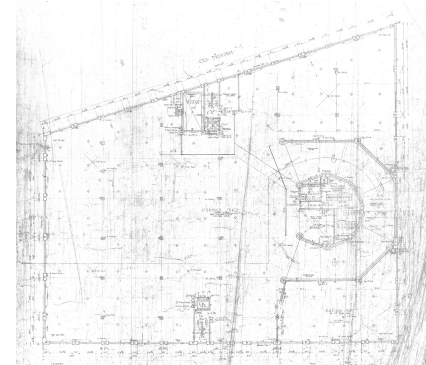
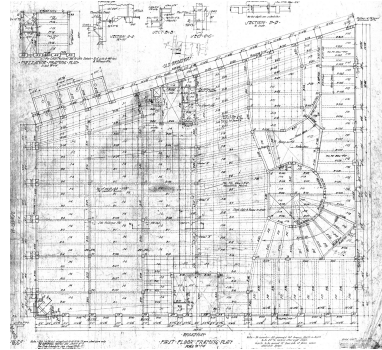
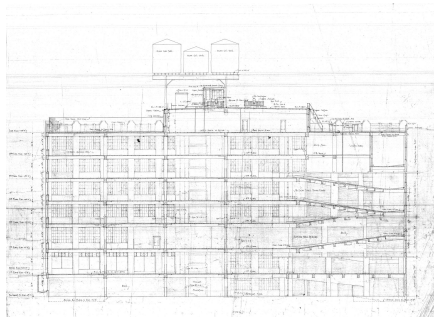
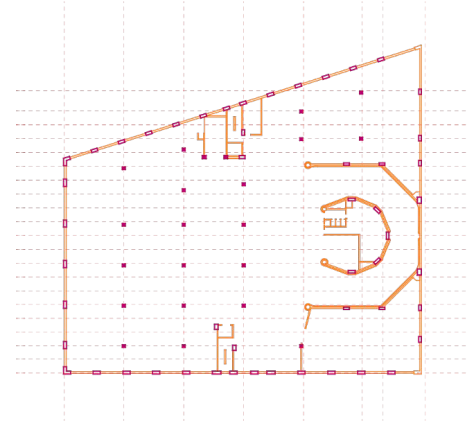
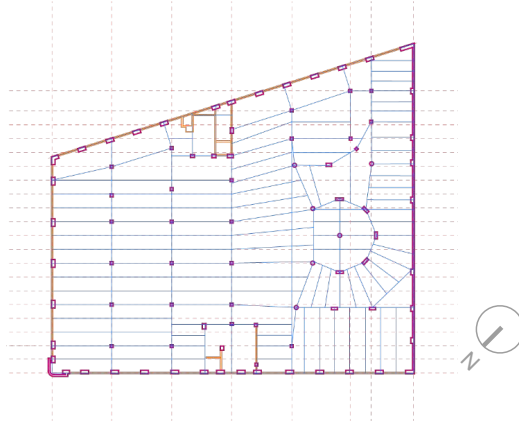
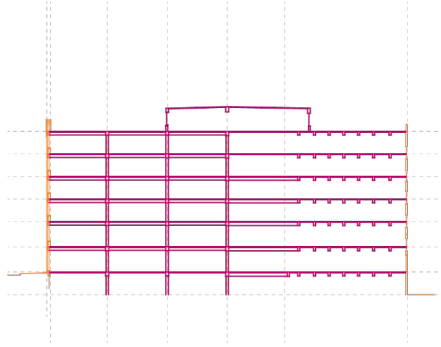


Nash Building (1940)

New York City Municipal Archives. "1940s Tax Photograph (REC0040_1_01986_0065)." 1940s.nyc.
Accessed April 5, 2026. https://1940s.nyc/map/photo/mynyma_rec0040_1_01986_0065

COMPONENTS OF NASH

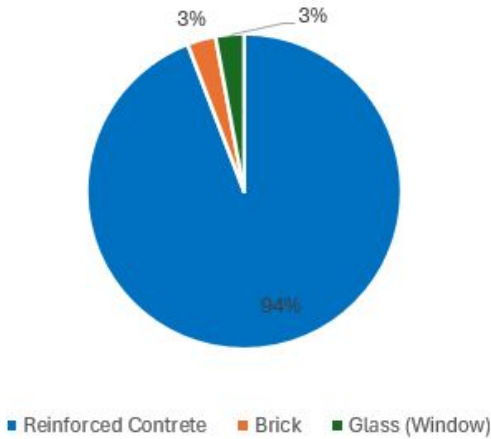
COMPONENTS FOR DIFFERENT MATERIALS



EMBODIED CARBON ANALYSIS

TOTAL MATERIALS EC BY MATERIAL TYPES

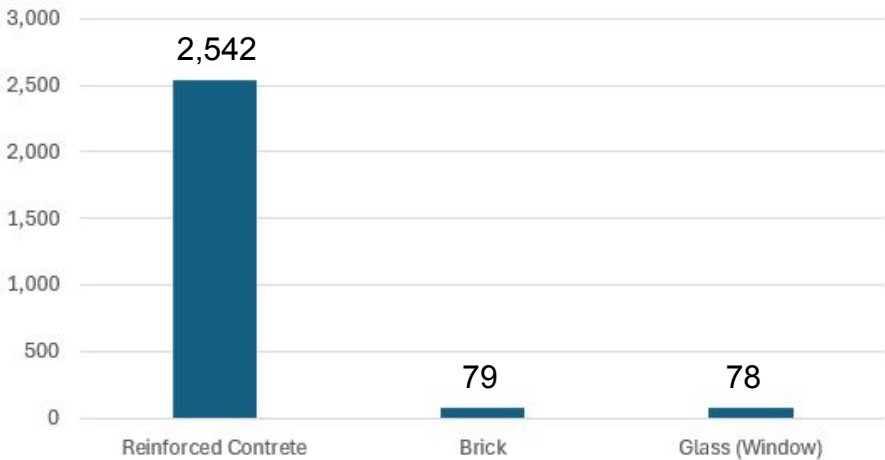
Total Material EC t CO2e by Material Type



Pie chart - Total structural and envelope material embodied carbon

Source/Drawing: Qizhen Chen, Rain Lin, Elen

Total Material EC t CO2e by Material Type

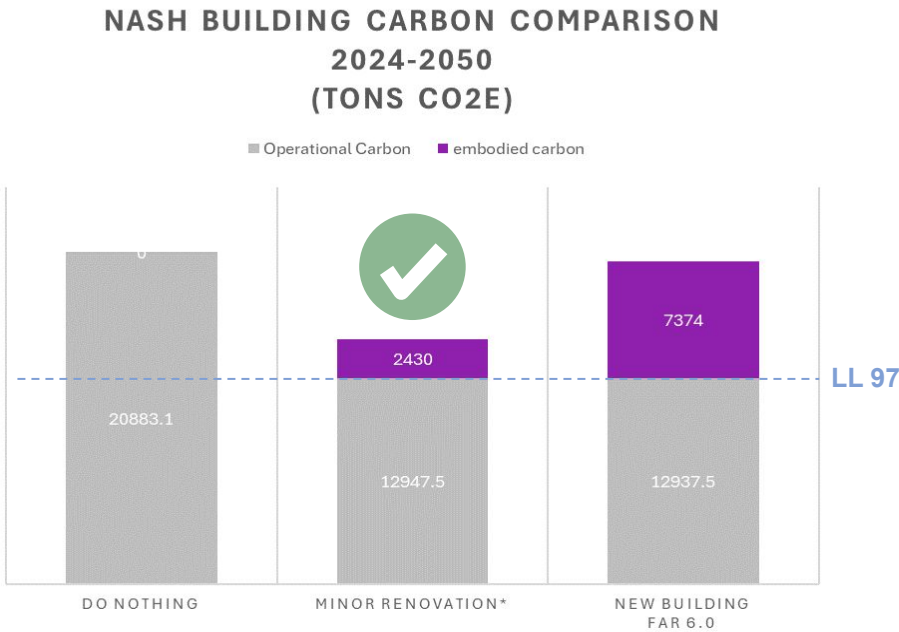


Column chart - Mash total material embodied carbon

Source/Drawing: Qizhen Chen, Rain Lin, Elen

REUSE HAS THE GREATEST VALUE

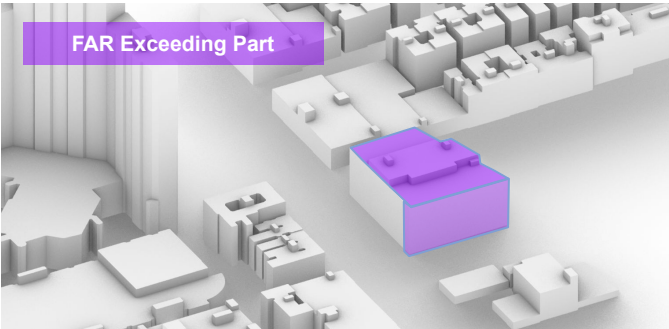
CARBON VALUE, ECONOMIC VALUE, AND HISTORICAL VALUE



CARBON VALUE



HISTORICAL VALUE



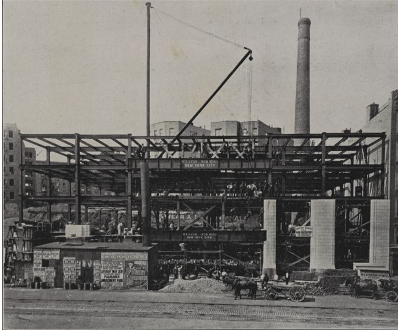
ECONOMIC VALUE

PRENTIS BUILDING

CONTINUOUS REUSE AND REINVESTMENT OF CARBON

1909

Construction begins.



Chapter 3: Manhattanville Transforms. Sheffield Farms.

1949

Columbia purchases the building and converts it into a Heat Transfer Research Facility.

2000

Conversion of the building into an art studio space.



Columbia University School of the Arts, Joel Jares.

1900

1925

1950

1975

2000

2025

1934

Addition and installation of true Guastavino vaults.

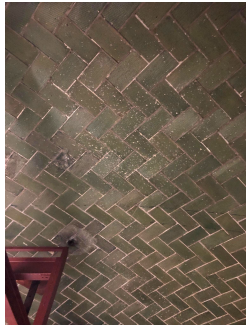


Photo courtesy of the 2019 class site visit.

1962

Alterations.

1995

Alterations.

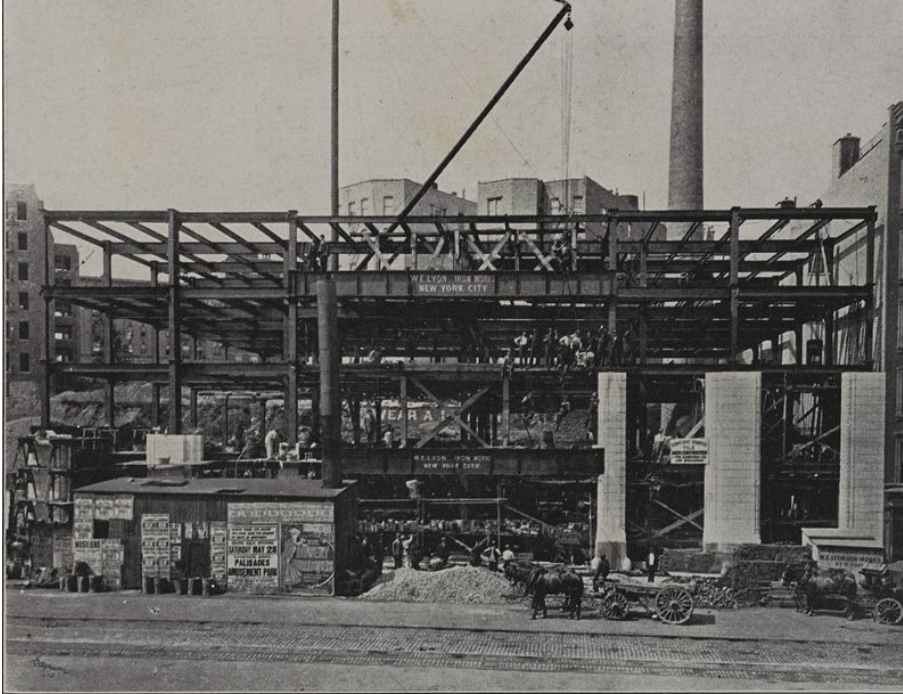
2016

Removal and replacement of roof membrane and brick masonry.



Photo courtesy of the 2019 class site visit.

CONSTRUCTION TYPOLOGY AND MATERIALS



SHEFFIELD FARMS STEEL FRAME CONSTRUCTION, 1909

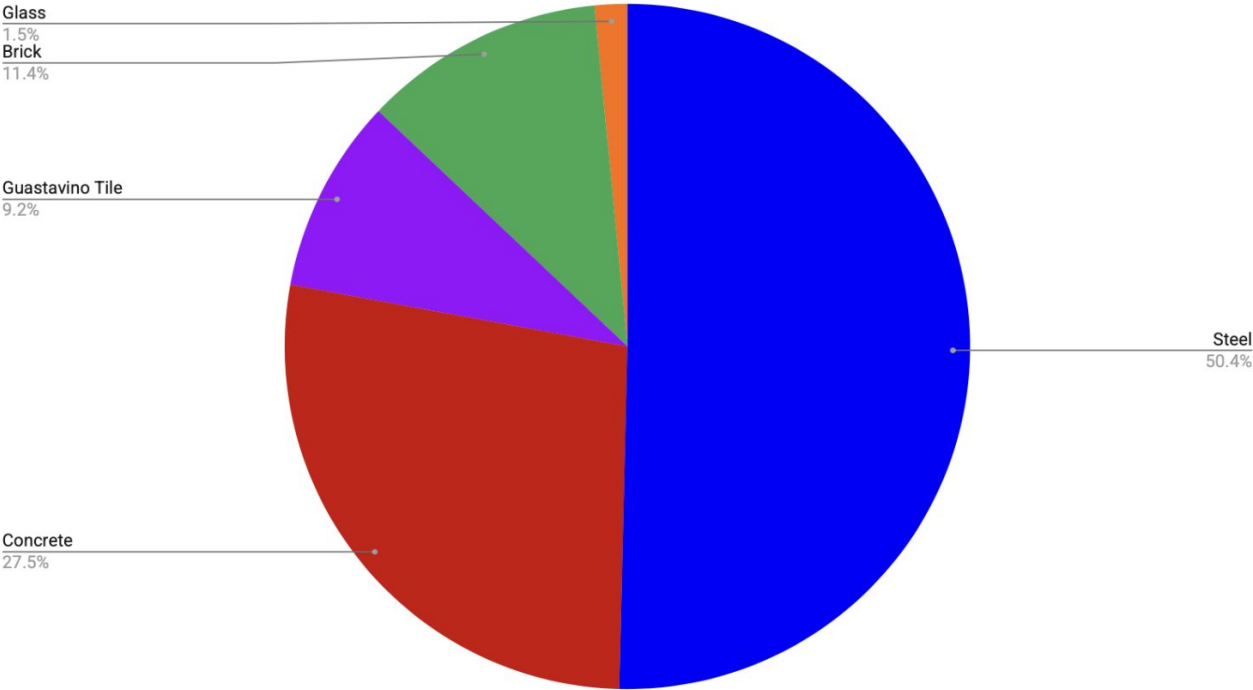
Chapter 3: Manhattanville Transforms. Sheffield Farms. Columbia University



Steel frame encased in concrete
Concrete floors and concrete plaster walls
Brick Walls
Terra cotta facade

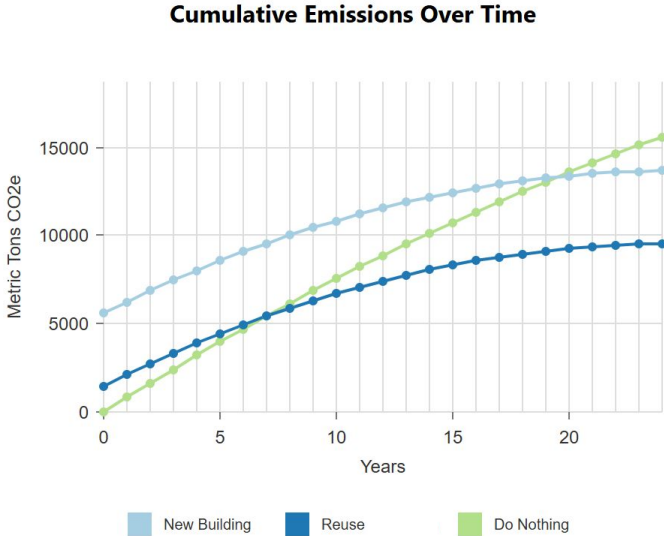
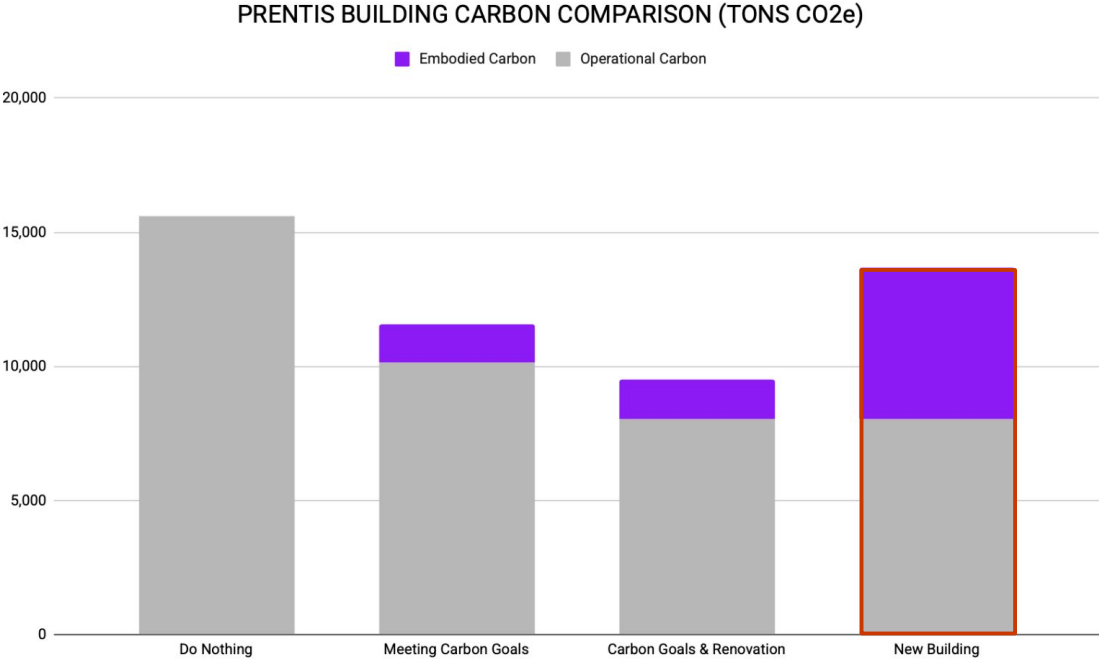
CURRENT EMBODIED CARBON BY MATERIAL

Total Embodied Carbon (tCO2e)



Total Metric Tons = 2420 tCO2e

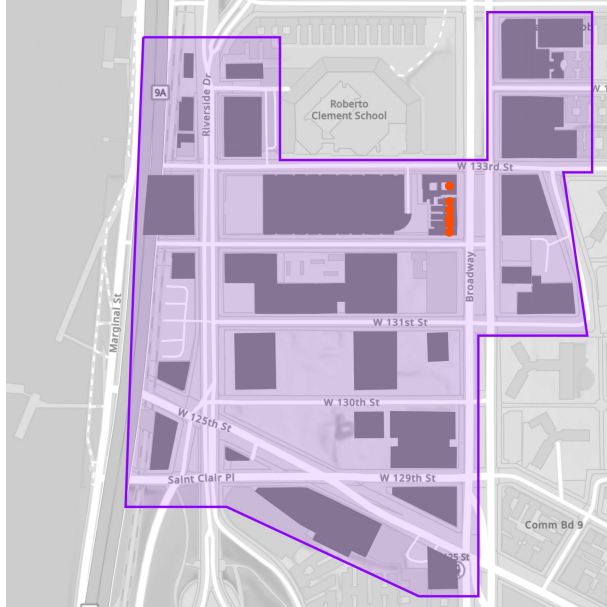
A NEW BUILDING INCREASES CARBON EMISSIONS



THE TENEMENTS & THE BELLMORE

BUILDINGS & EXISTING CONDITIONS

TENEMENTS & BELLMORE



TENEMENTS & BELLMORE LOCATION

Anna Behringer, 2026



CURRENT STREETSCAPE

Anna Behringer and Ben Gering, 2026

RETROFIT: MINIMAL CARBON EMISSIONS

LOWER EMISSIONS COME WITH TRADEOFFS

Reduces tons of Co2 per square foot by

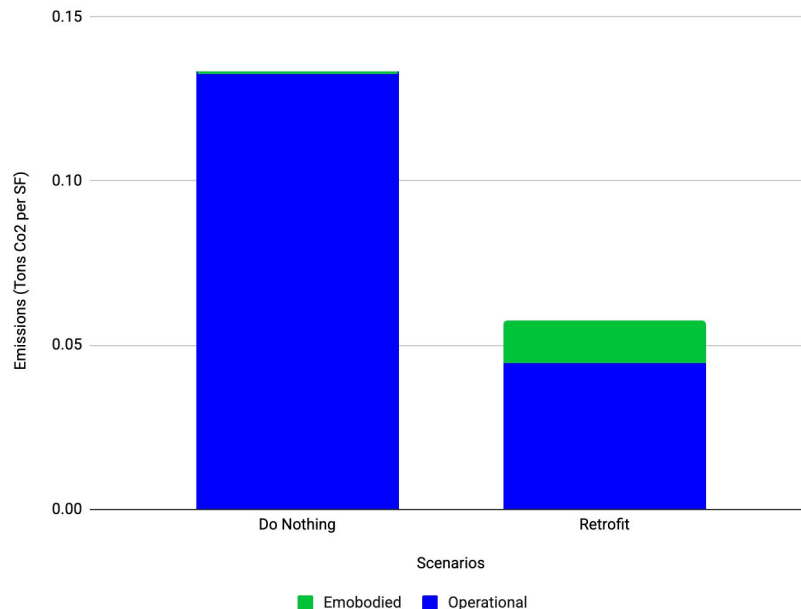
≈57%

but sacrifices

≈53,000

square feet

Normalized Carbon Emissions for Focus Building Scenarios



THE BENEFITS OF RETROFITS

Data from CARE Tool, graph by Ben Gering

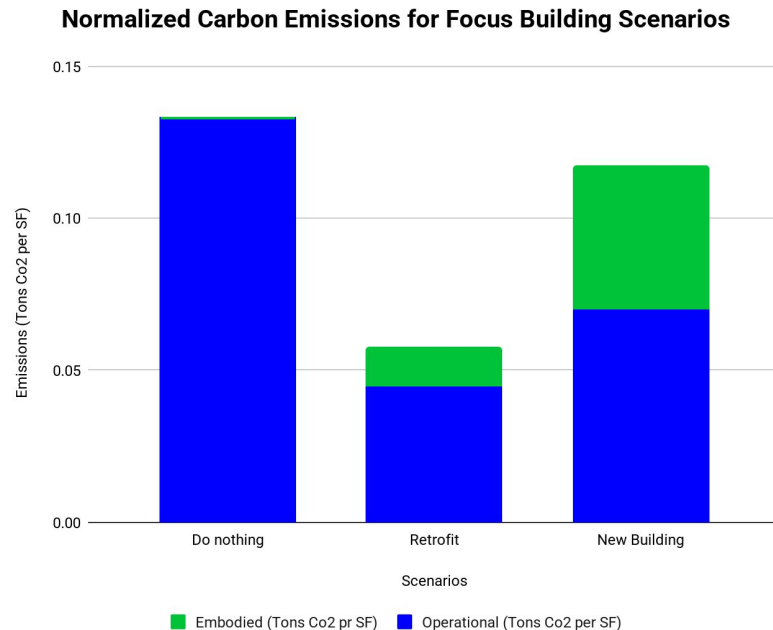
NEW BUILDING: MORE SQUARE FOOTAGE AT A COST

THE PROS AND CONS OF A NEW BUILDING

Increases tons of Co2 per square foot by

≈104%

when compared to retrofitting, but provides the perceived benefits of a modern building and increased square footage



A NEW BUILDING'S CARBON COST

Data from CARE Tool, graph by Ben Gering

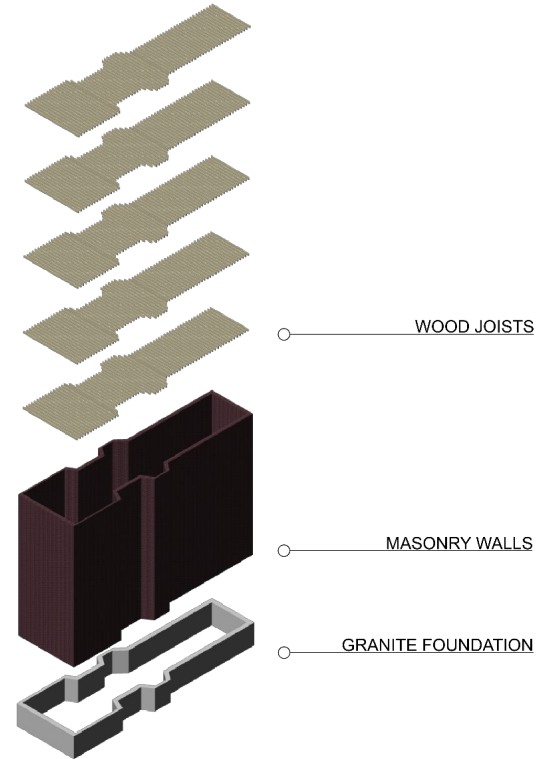
DECONSTRUCTION

A FOURTH OPTION



DECONSTRUCTION AND SALVAGE OF BUILDING MATERIALS

Providence Preservation Society of Rhode Island



3281 BROADWAY COMPONENTS DIAGRAM