

AUTODESK BUILDATHON 2026

THREEFOLD

A Data-Driven Learning and Innovation Hub

***Site:** Dover Residences, Open field near school grounds and near One-North MRT (train station), Singapore*

Team information

Team: Tough Crowd

Members: **Rylee** Peren (*Group Leader*) , **Cayden** Khong, **Glyn** Lee, **Choco** Liew

Institution: Singapore Polytechnic

Submission: Buildathon 2026: Design For Impact

01 - SITE ANALYSIS _____ *(PG 3-11)*

02 - SITE SELECTION _____ *(PG 12-13)*

03 - NARRATIVE _____ *(PG 14-15)*

04 - MASSING PROPOSAL _____ *(PG 16-25)*

05 - FINAL MASSING _____ *(PG 26-29)*

06 - FACADE _____ *(PG 30-31)*

07 - ZONING _____ *(PG 32-37)*

08 - FINAL DRAWINGS AND RENDERS _____ *(PG 38-47)*

09 - REQUIREMENTS _____ *(PG 48-51)*

CONTENTS

SITE ANALYSES

SITE 01 — BISHAN JUNCTION 8

Neutral Environmental Baseline: Solar Exposure and Outdoor Thermal Comfort

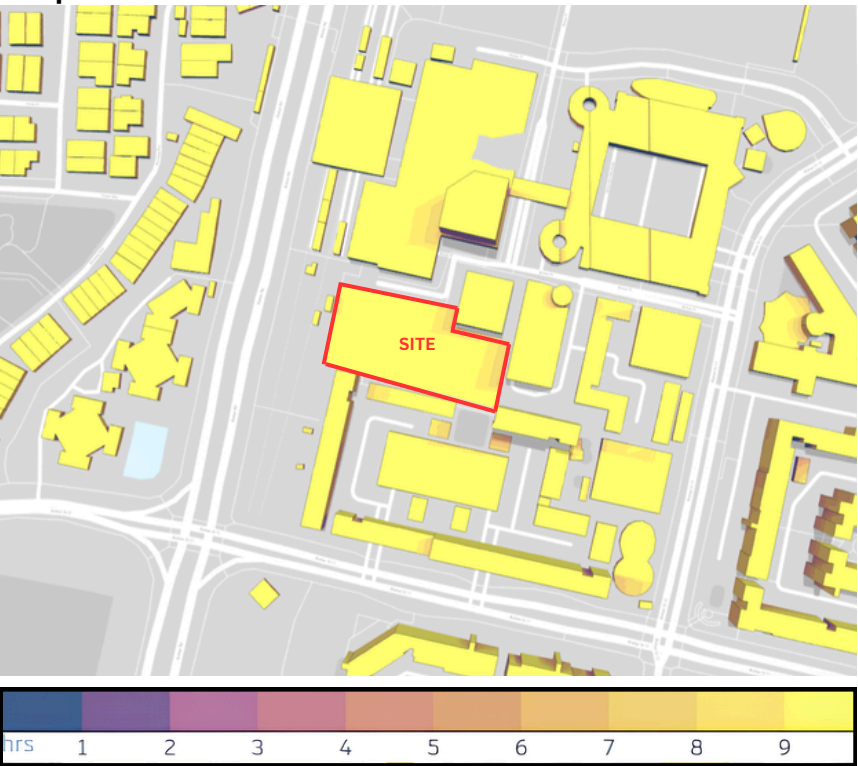
Location: Open field beside Junction 8 and Bishan MRT (train station)

Coordinates: 1.34971° N, 103.84847° E

Analysis condition: Existing empty site, no proposed massing

SUN EXPOSURE

Top View



ANALYSES

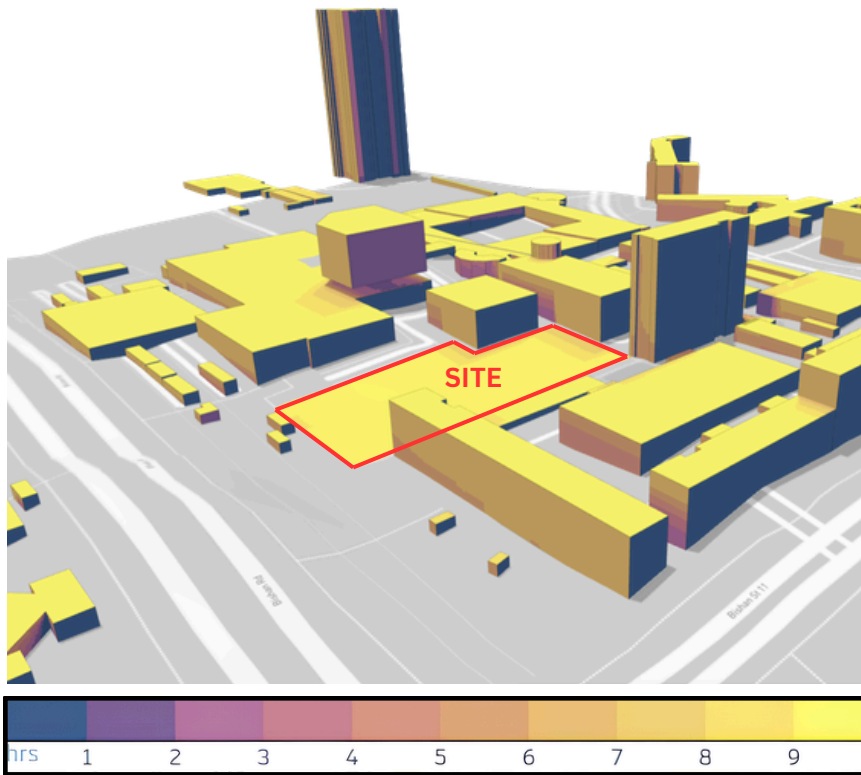
Site receives high **solar exposure**.
Most of the plot remains unshaded.
Buildings create limited **edge shadows**.
Strong daylight and PV potential.
Risk of heat and glare.
Good for testing shading and **orientation**.

OVERALL CONCLUSIONS

- Clear environmental problem.
- Strong solar opportunity.
- Requires heat mitigation.
- Good site for measurable improvement.

SHADOW CONDITIONS

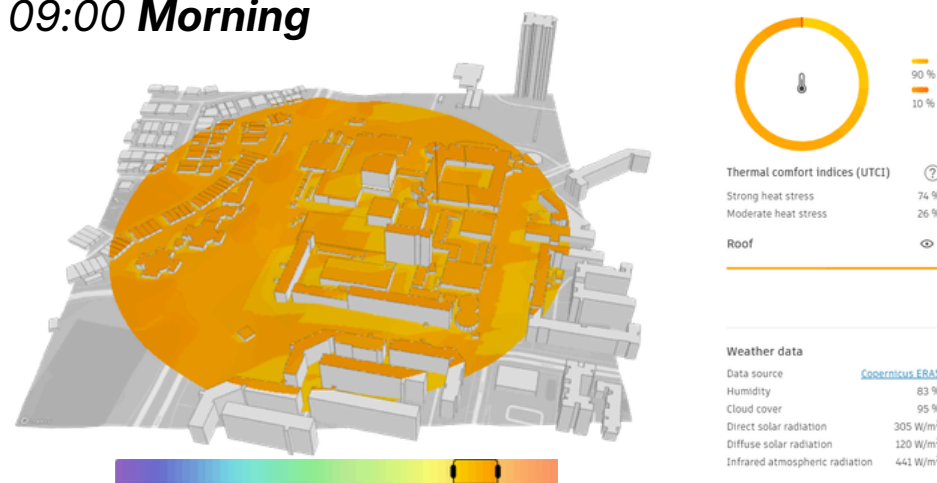
View from South West



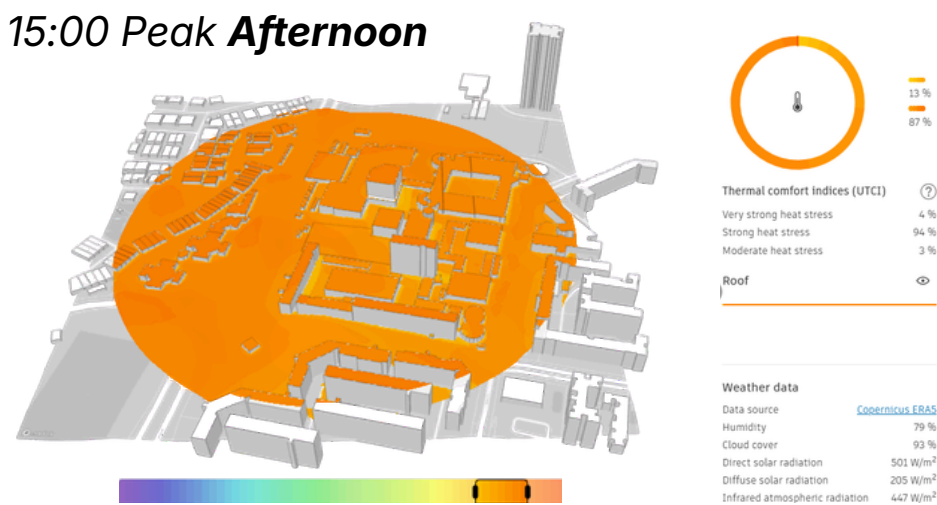
- Warm conditions begin by 9am.
- Thermal stress peaks around 3pm.
- Limited cooling variation across the site.
- Some heat remains at 8pm, however no solar radiation.
- Hardscape may contribute to heat retention.
- Good for testing shade, greenery and airflow.

MICROCLIMATE (Surrounding Temp, Aug 18)

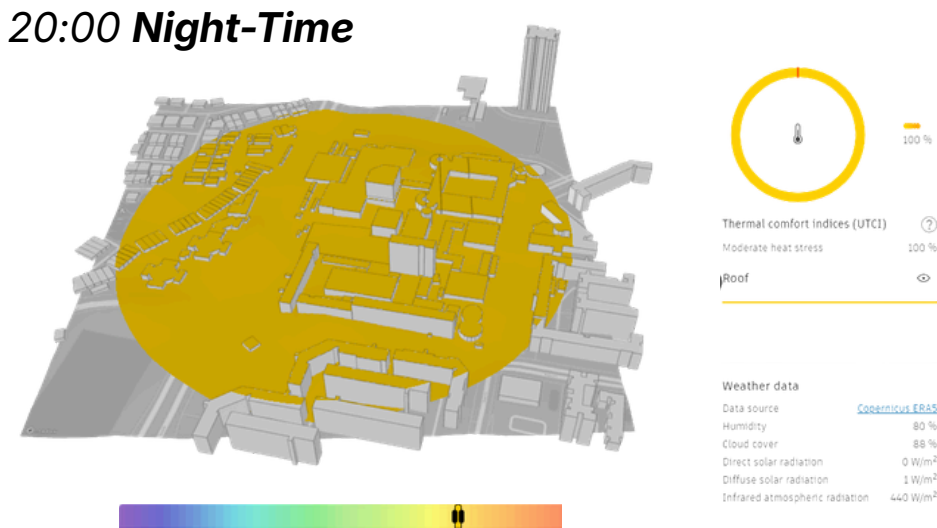
09:00 **Morning**



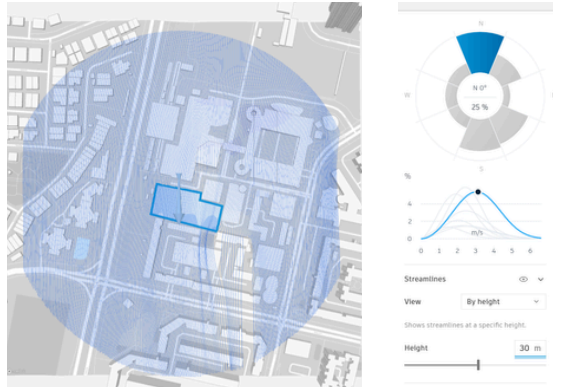
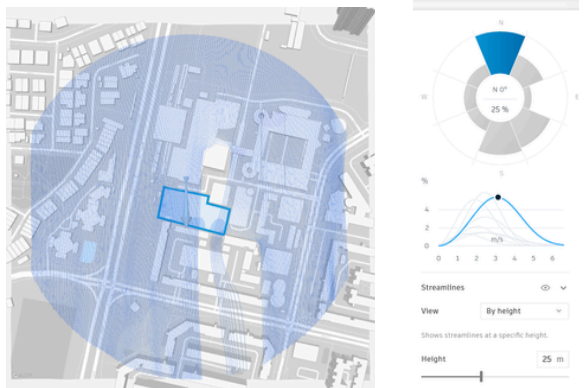
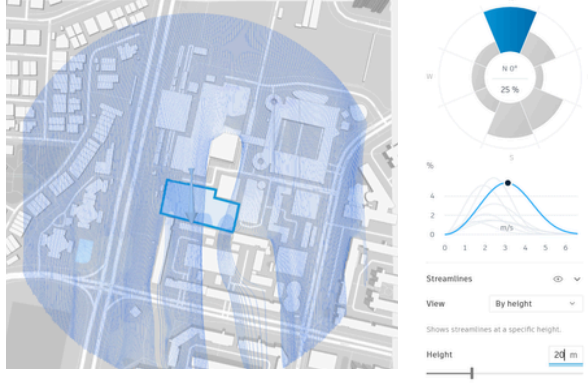
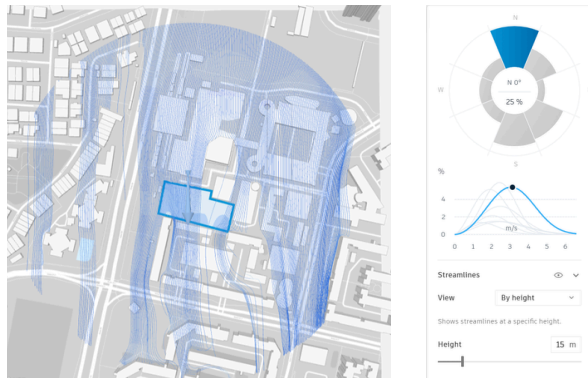
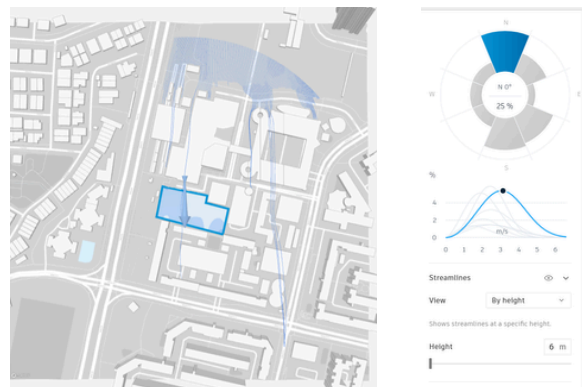
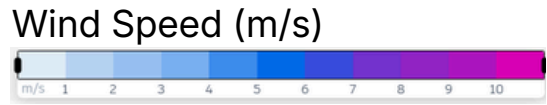
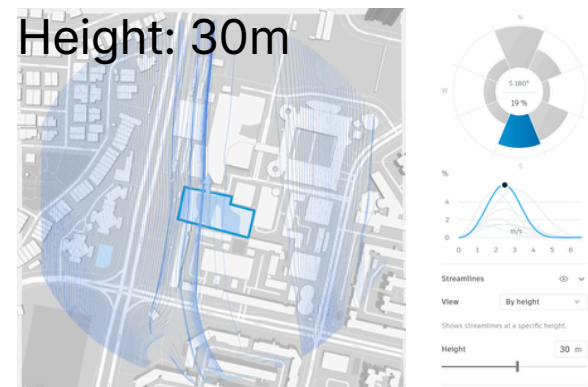
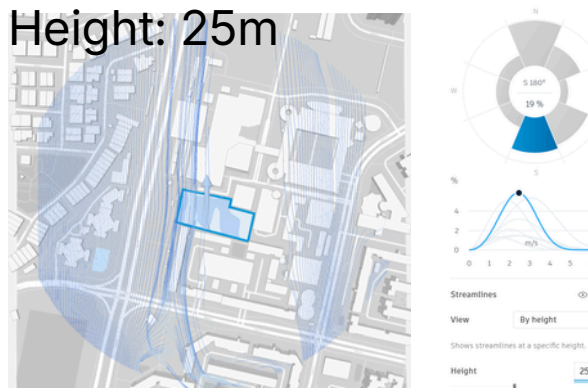
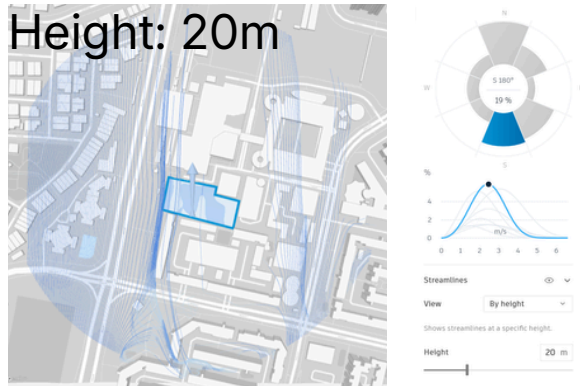
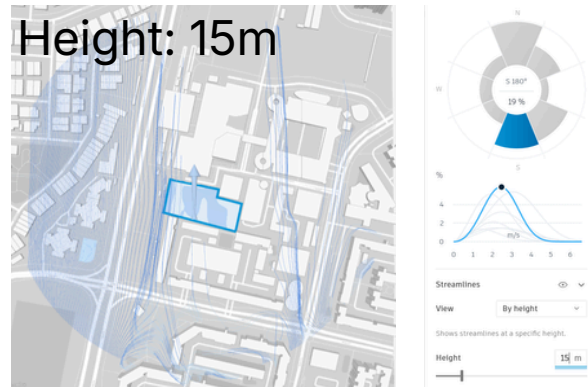
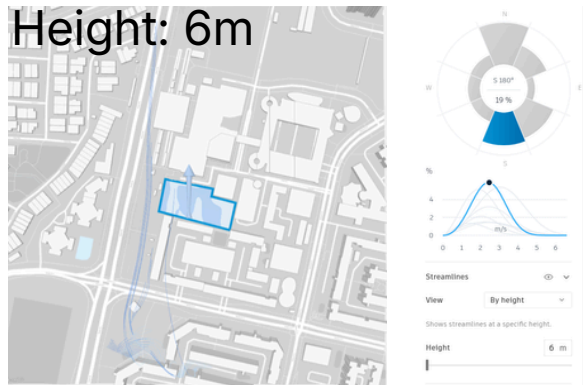
15:00 **Peak Afternoon**



20:00 **Night-Time**



WIND SPEED ANALYSIS



Average Wind Speed

Height: 6m
1.4 m/s

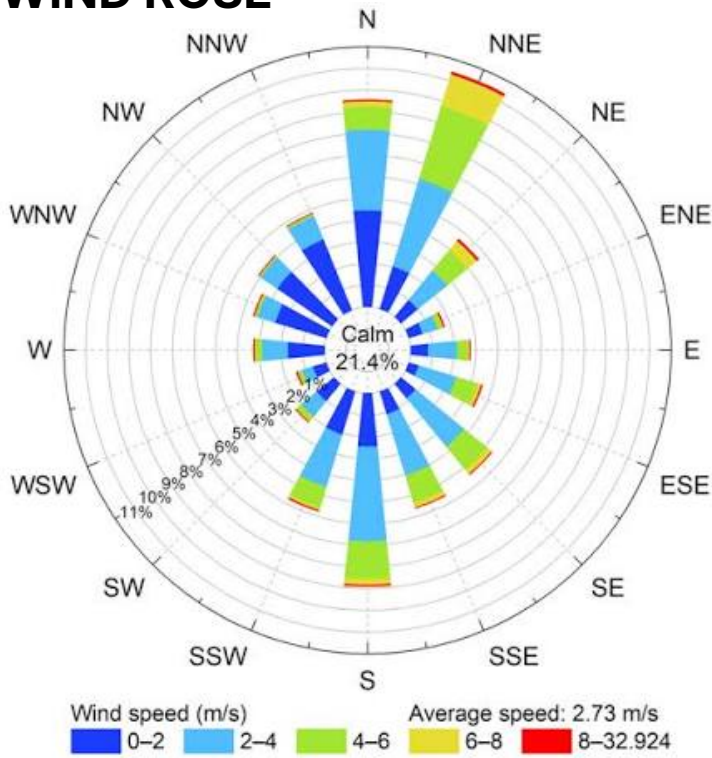
Height: 15m
2.0 m/s

Height: 20m
2.3 m/s

Height: 25m
2.6 m/s

Height: 30m
2.9 m/s

WIND ROSE



ANALYSES

- Average wind speed is moderate at 2.73 m/s.
- Calm conditions occur 21.4% of the time.
- Dominant winds arrive from N–NNE and south.
- At 6 m, surrounding buildings shelter the site.
- Wind becomes stronger and more continuous above 15 m.
- Building gaps create localised channeling and turbulence.
- Ground-level ventilation may be weak.
- Main airflow follows a north–south direction.
- Entrances and breezeways should align with this airflow.
- Outdoor learning should occupy sheltered but ventilated areas.

SITE AIRFLOW POTENTIAL RATING:



SITE 02 — DOVER RESIDENCES

Neutral Environmental Baseline: Solar Exposure and Outdoor Thermal Comfort

Location: Open field near school grounds and near One-North MRT (train station)

Coordinates: 1.30026° N, 103.78347° E

Analysis condition: Existing empty site, no proposed massing

SUN EXPOSURE AND SHADOW CONDITIONS

View from North



Top View



View from South



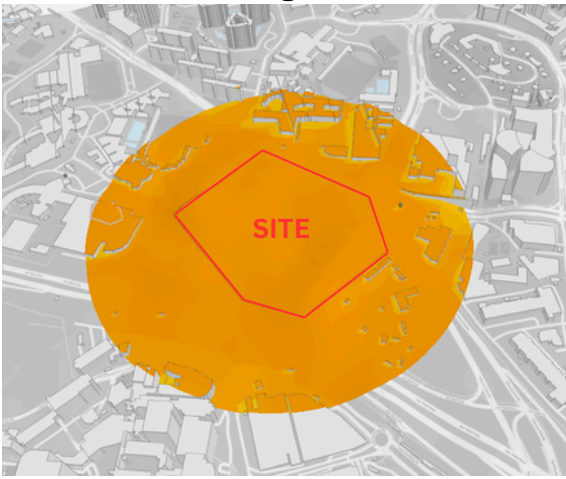
ANALYSES

- Site receives high solar exposure.
- Most of the plot remains unshaded.
- Buildings create some edge shadows.
- Strong daylight and PV potential.
- Risk of heat and glare.
- Good for testing shading and orientation.
- Warm conditions begin by 9am.
- Thermal stress peaks around 3pm.
- Limited cooling variation across the site.
- Some heat remains at 8pm, however no solar radiation.
- Lesser hardscape may contribute to less heat retention.
- Good for testing shade, greenery and airflow.

OVERALL CONCLUSIONS

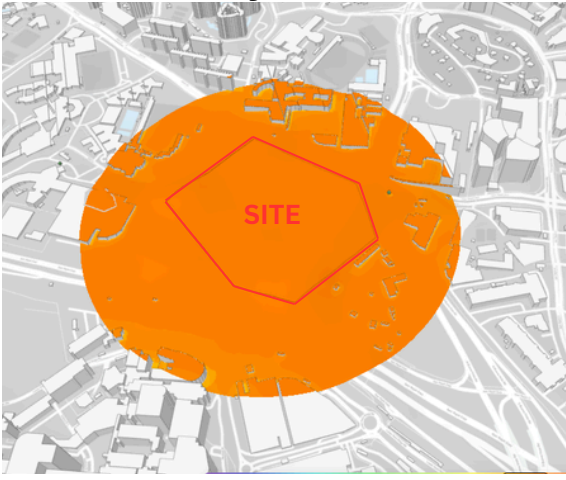
- Some environmental problem.
- Strong solar opportunity.
- Requires some heat mitigation.
- Good site for measurable improvement.

MICROCLIMATE (Surrounding Temp, Aug 18)



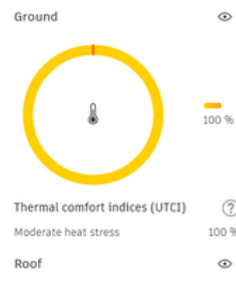
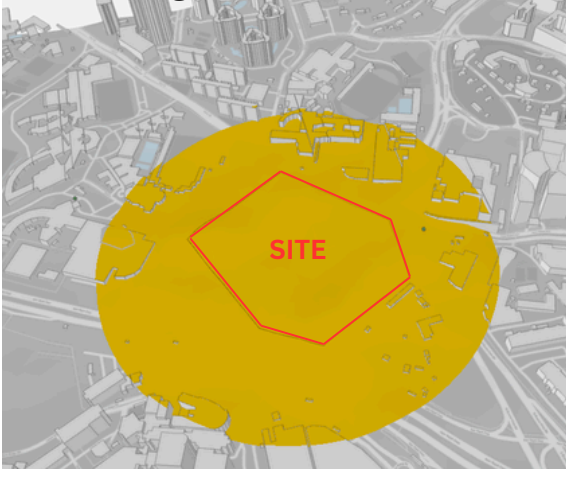
Weather data	
Data source	Copernicus ERA5
Humidity	83 %
Cloud cover	95 %
Direct solar radiation	306 W/m ²
Diffuse solar radiation	120 W/m ²
Infrared atmospheric radiation	441 W/m ²

15:00 Peak Afternoon



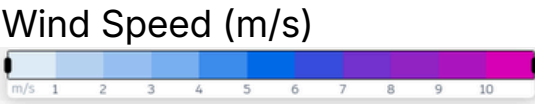
Weather data	
Data source	Copernicus ERA5
Humidity	79 %
Cloud cover	93 %
Direct solar radiation	501 W/m ²
Diffuse solar radiation	205 W/m ²
Infrared atmospheric radiation	447 W/m ²

20:00 Night-Time

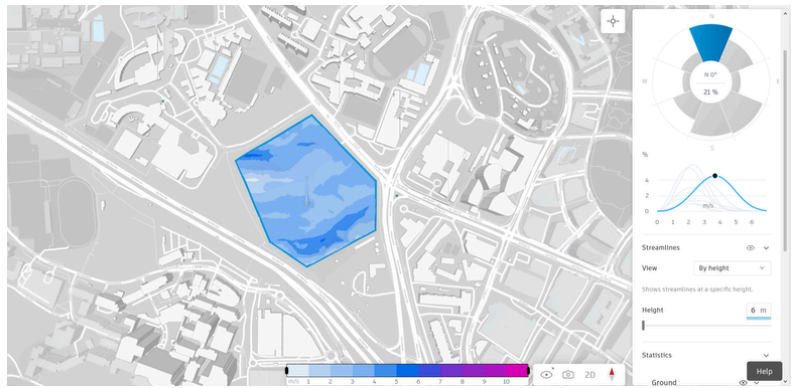
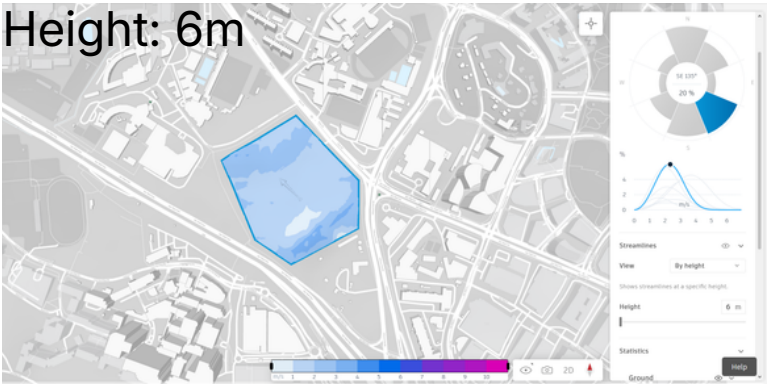


Weather data	
Data source	Copernicus ERA5
Humidity	80 %
Cloud cover	88 %
Direct solar radiation	0 W/m ²
Diffuse solar radiation	1 W/m ²
Infrared atmospheric radiation	440 W/m ²

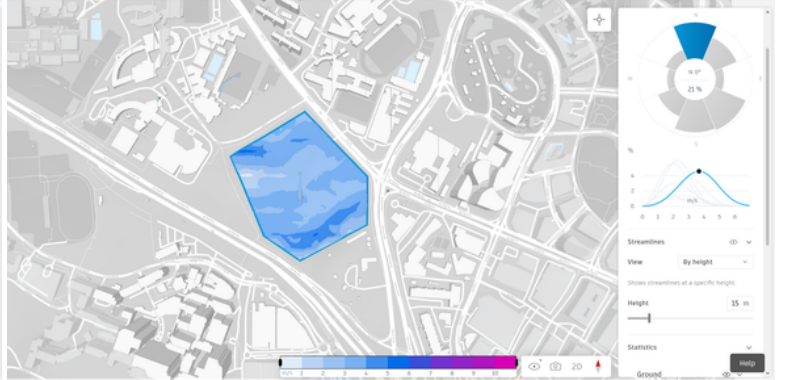
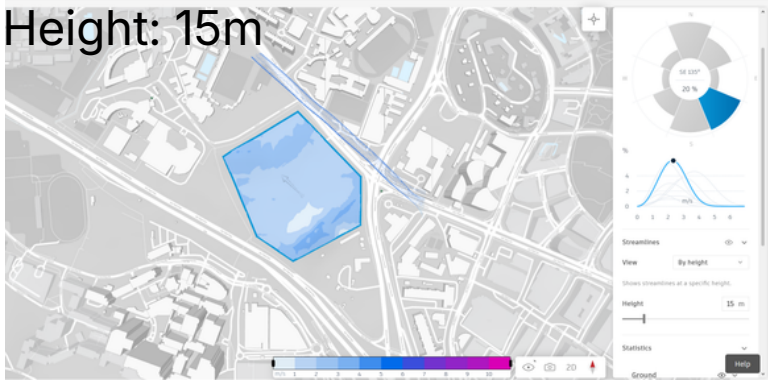
WIND SPEED ANALYSIS



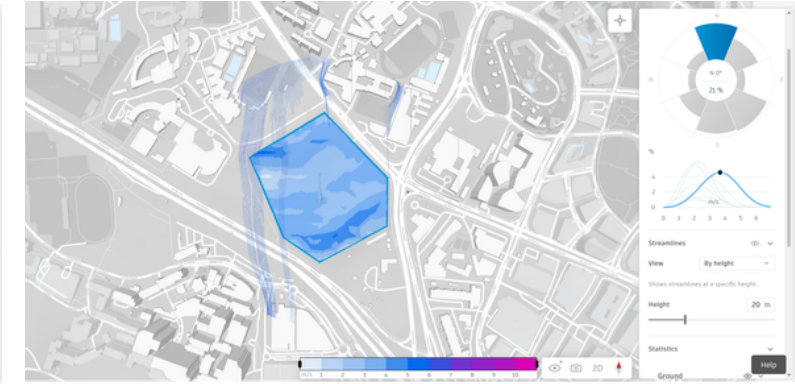
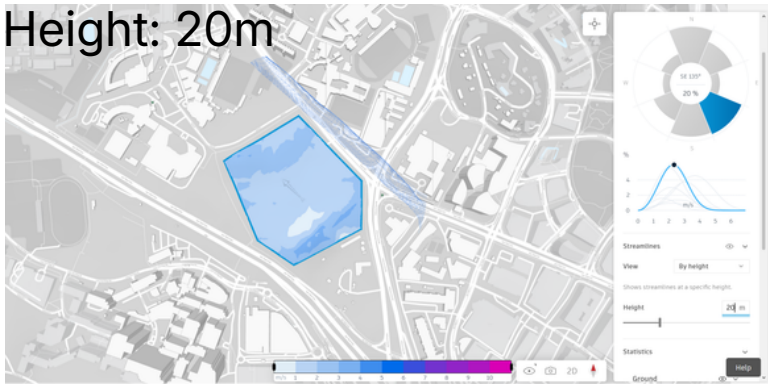
Height: 6m



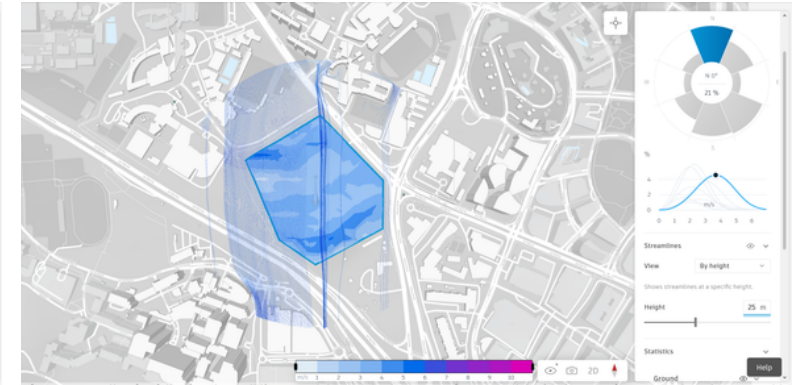
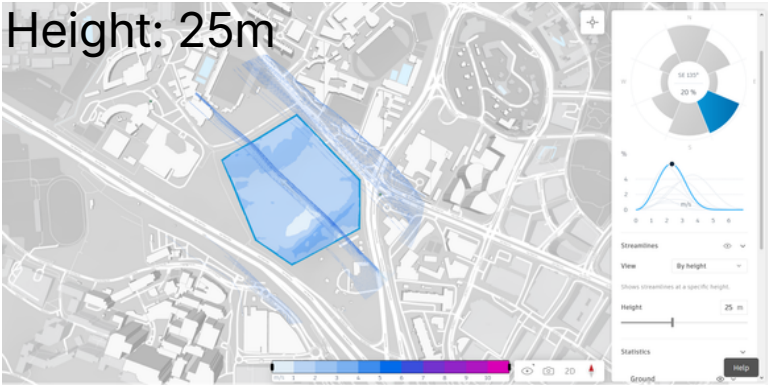
Height: 15m



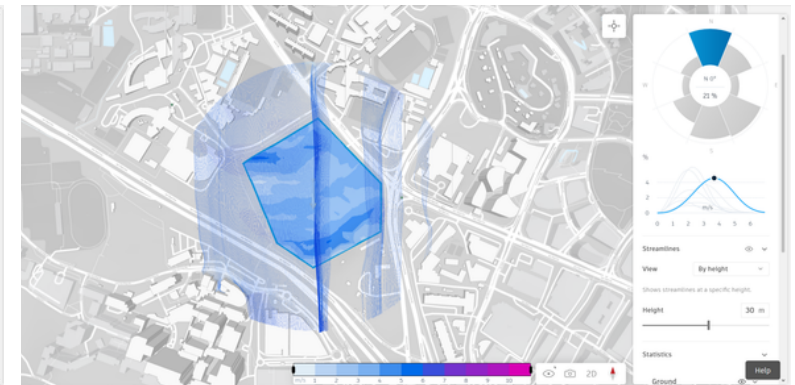
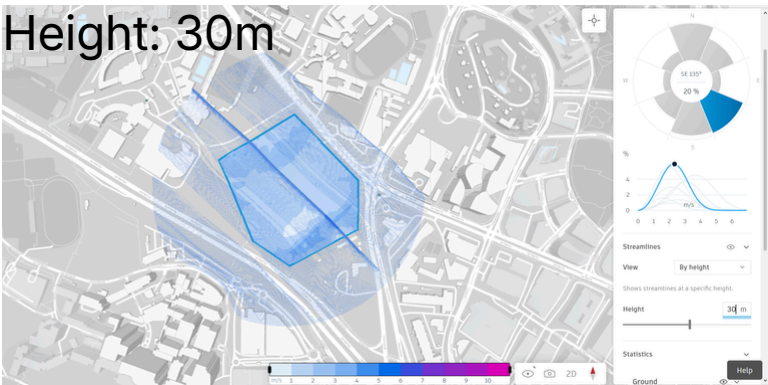
Height: 20m



Height: 25m



Height: 30m



Average Wind Speeds

Height: 6m
2.2 m/s

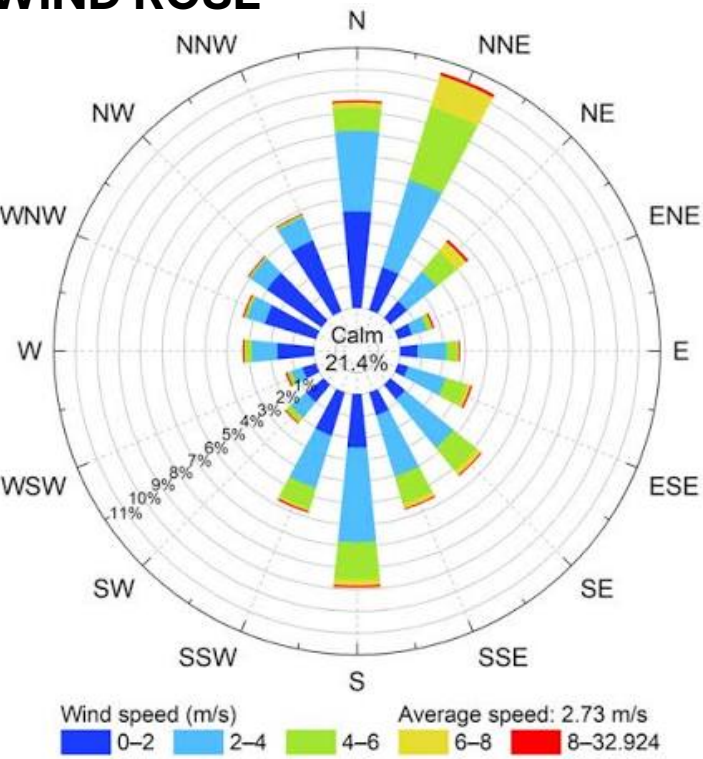
Height: 15m
2.5 m/s

Height: 20m
2.9 m/s

Height: 25m
3.2 m/s

Height: 30m
3.6 m/s

WIND ROSE



ANALYSES

- Site receives low wind flow at street level
- Wind flow around the side at around 20m
- Most wind flows at 25- 30 m at around roof level.
- Strong gust of wind from North and South-east at roof level
- Good for sky terraces.

SITE AIRFLOW POTENTIAL RATING:



SITE 03 — DOVER MEADOW

Neutral Environmental Baseline: Solar Exposure and Outdoor Thermal Comfort

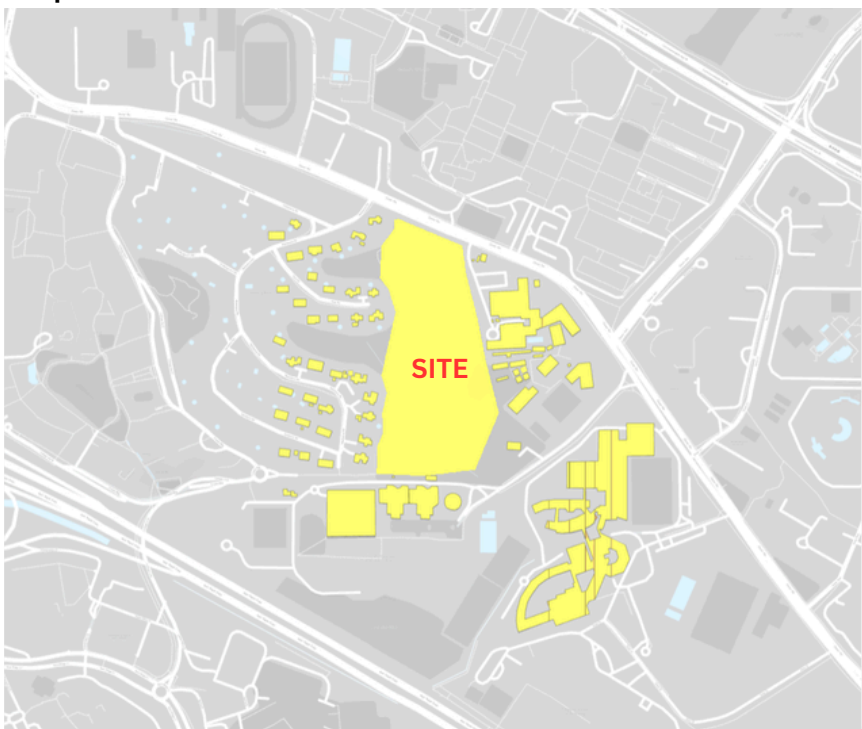
Location: Open meadow at the former Transview Golf Course, beside Singapore Polytechnic and near Dover MRT

Coordinates: 1.30557° N, 103.77816° E

Analysis condition: Existing empty site, no proposed massing

SUN EXPOSURE AND SHADOW CONDITIONS

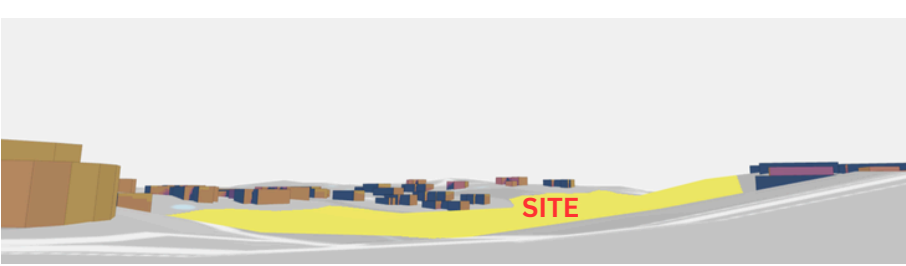
Top View



View from South



Human Scale View



ANALYSES

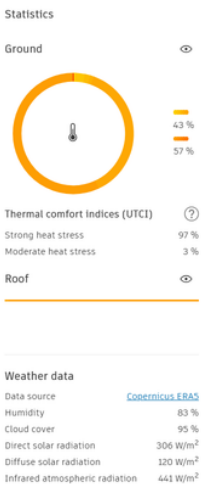
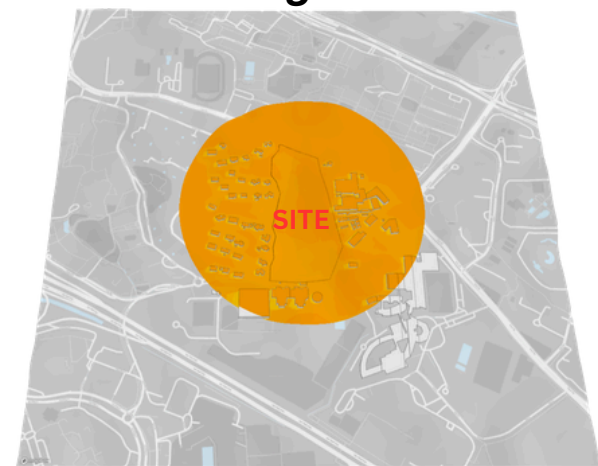
- Site receives very high solar exposure.
- Large meadow remains mostly unshaded.
- Low-rise surroundings create minimal shadows.
- Strong daylight and PV potential.
- Risk of heat and glare.
- Good for testing shading and orientation.
- Warm conditions begin by 9am.
- Thermal stress peaks around 3pm.
- Temperature is relatively uniform across the site.
- Noticeable cooling occurs by 8pm.
- Vegetation may support night-time cooling.

OVERALL CONCLUSIONS

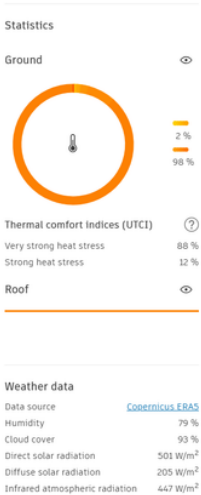
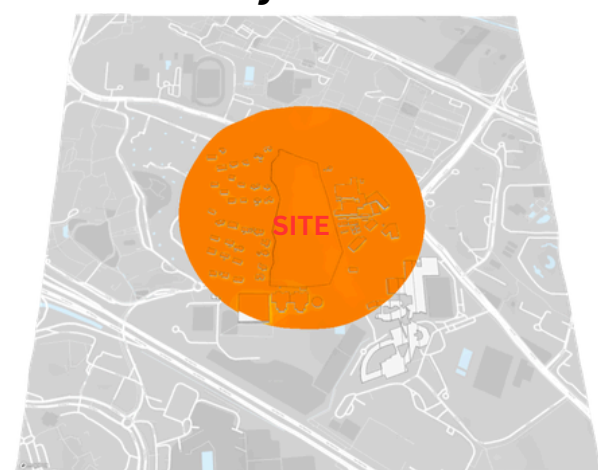
- Clear solar and heat challenge.
- Strong renewable-energy opportunity.
- Less environmental variation than the Bishan Site.

MICROCLIMATE (Surrounding Temp, Aug 18)

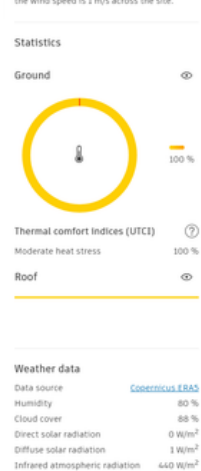
09:00 Morning



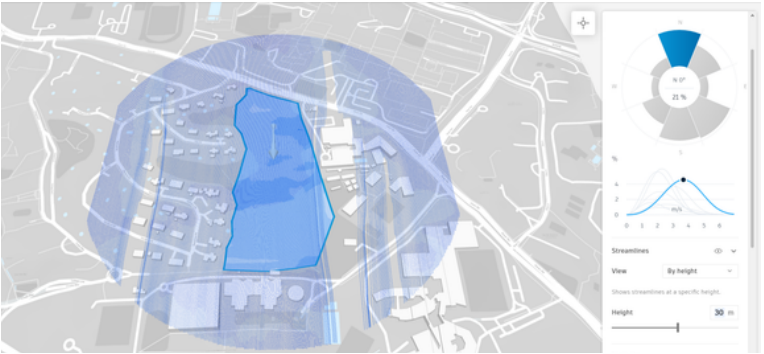
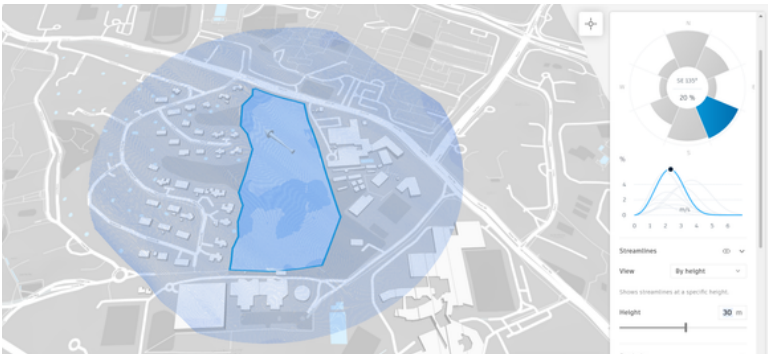
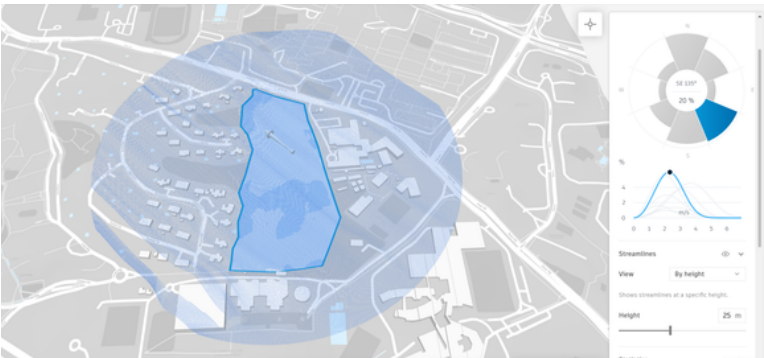
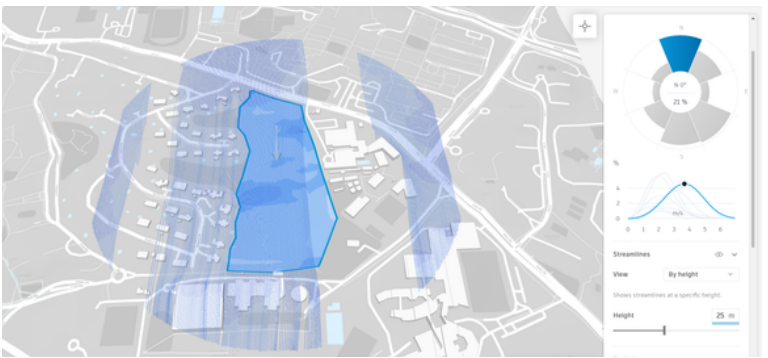
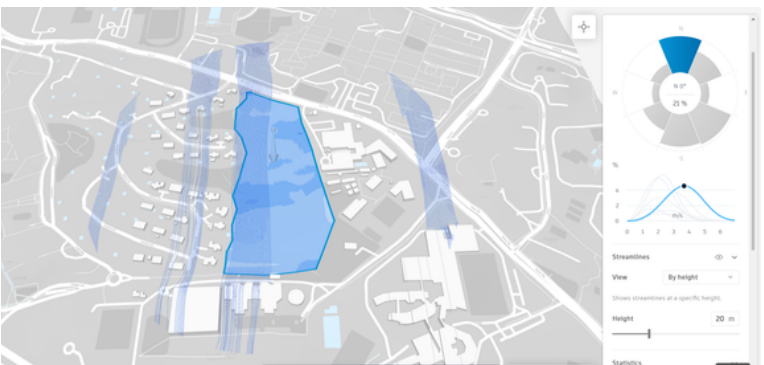
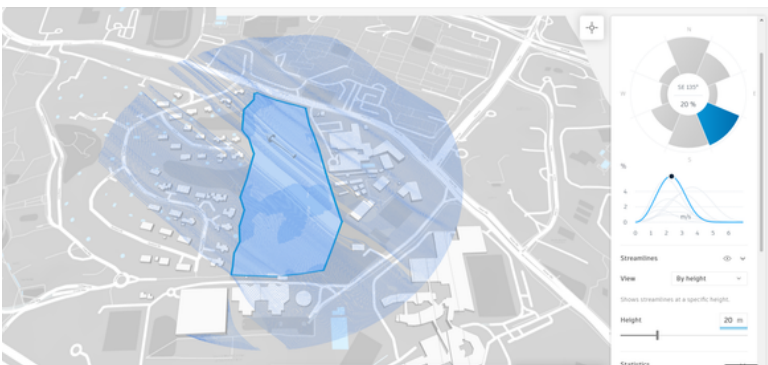
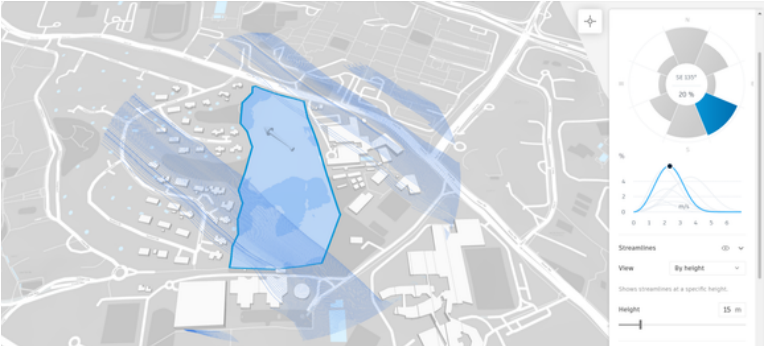
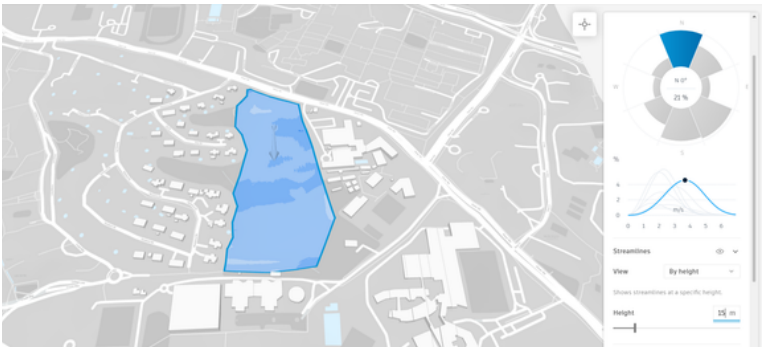
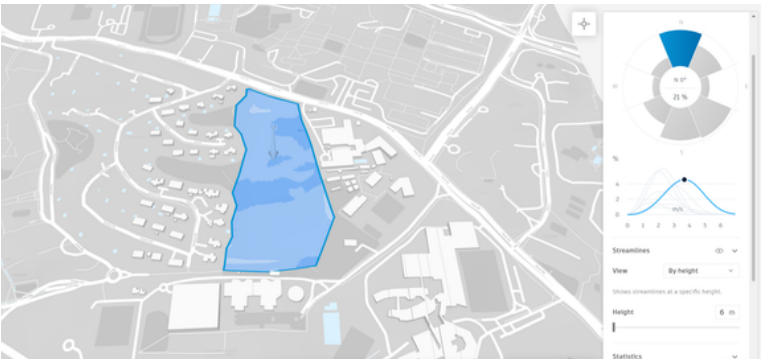
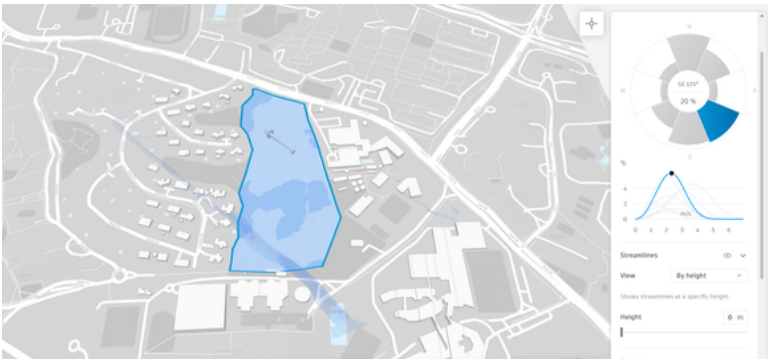
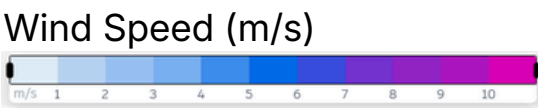
15:00 Peak Afternoon



20:00 Night-Time



WIND SPEED ANALYSIS



Average Wind Speeds

Height: 6m
2.0 m/s

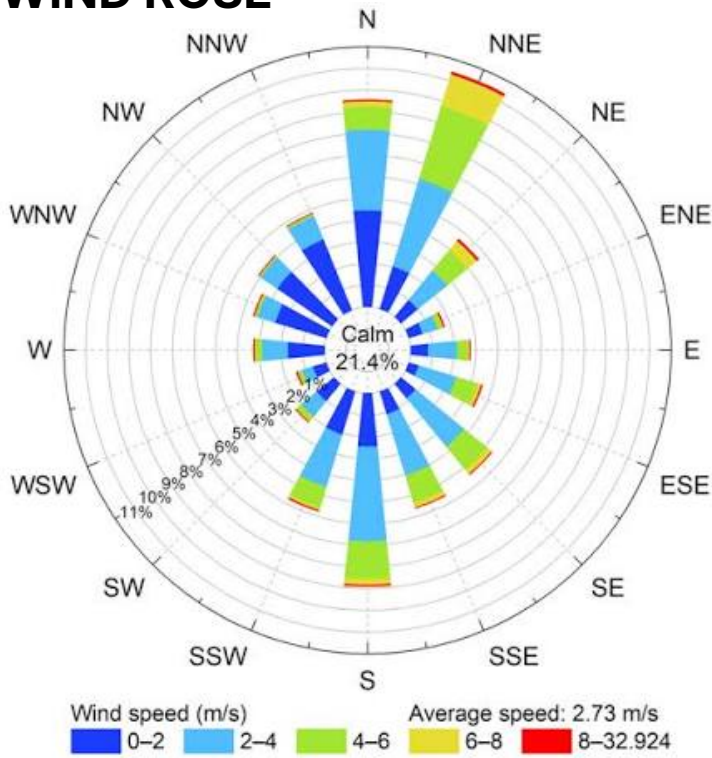
Height: 15m
2.3 m/s

Height: 20m
2.7 m/s

Height: 25m
3.0 m/s

Height: 30m
3.4 m/s

WIND ROSE



ANALYSES

- Average regional wind speed is 2.73 m/s.
- Calm conditions occur 21.4% of the time.
- Dominant winds arrive from N–NNE and south.
- Wind flow is low to moderate at 6 m.
- The open meadow allows relatively even airflow.
- Wind increases noticeably between 15–20 m.
- Airflow becomes more continuous at 25–30 m.
- Surrounding buildings create limited sheltered pockets.
- Breezeways should follow the north–south airflow.
- Outdoor learning should be shaded without blocking ventilation.

SITE AIRFLOW POTENTIAL RATING:



NOISE ANALYSIS

Daytime-Nighttime Noise Analysis

Criterion	Bishan Junction 8	Dover Residences	Dover Meadow
Main source	Bishan Road, bus interchange, MRT and mall activity	Dover Road, North Buona Vista Road, school traffic and distant AYE traffic	Local roads, school activity and elevated East-West Line
Type of sound	Continuous traffic; bus acceleration/braking; intermittent train and crowd noise	Continuous road hum; occasional buses, motorcycles and school drop-off peaks	Intermittent trains and vehicles; occasional school/activity noise
Estimated daytime level	68–74 dBA	62–68 dBA	55–62 dBA
Estimated peak events	75–80 dBA from buses, trains and horns	70–75 dBA from buses, motorcycles and peak traffic	65–70 dBA during train pass-bys or school peaks
Estimated evening level	62–68 dBA	57–63 dBA	50–57 dBA
Perceived loudness	Loud to very loud	Moderately loud to loud	Moderate; occasionally loud
Noise pattern	Noise affects most edges; limited quiet zones	Strongest along road-facing north/east edges; quieter toward the interior	Localised noise near roads and rail; quieter central meadow
Suitability for learning	Weak without substantial acoustic buffering	Manageable through zoning, setbacks and landscape buffers	Generally suitable, but train events may interrupt outdoor learning
Design response	Continuous acoustic edge, enclosed teaching rooms and limited openings toward transport	Place labs, maker spaces, cores and services along noisy edges; face courtyard and quieter learning	Keep quiet teaching spaces away from rail/roads; use trees and landscaped earth buffers
Noise risk rating	High — 2/5	Medium-high — 3/5	Medium-low — 4/5

Noise Level Guide

Approximate level	Classification	Typical perception
Below 50 dBA	Quiet	Suitable for focused learning
50–55 dBA	Soft–moderate	Generally comfortable
55–60 dBA	Moderate	Noticeable background noise
60–65 dBA	Moderately loud	May disturb outdoor teaching
65–70 dBA	Loud	Acoustic mitigation recommended
Above 70 dBA	Very loud	Unsuitable for quiet learning without protection

Site Selection Conclusion

Dover Residences presents the most useful design challenge as road noise is **measurable but not overwhelming**, creating a **clear gradient** from noisy road edges to a **quieter internal courtyard** that can directly inform **programme zoning and massing**.

OVERALL SUMMARY OF SITE COMPARISON

Site Comparison Table

Criterion	Bishan	Dover Residences	Dover Meadow
Education ecosystem	★★★★ Guangyang Secondary Raffles Institution Raffles Girls School Kuo Chuan Presbyterian Catholic High School	★★★★★ Fairfield Secondary + Primary Tanglin Trust School UWC Dover Singapore Polytechnic Anglo-Chinese Junior College Anglo-Chinese School Independent Dover court International	★★★★★ Dover Court International Newtown Secondary Singapore Polytechnic Fairfield Secondary + Primary School of Science and Technology UWC Dover Anglo-Chinese School Independent
Accessibility	★★★★★	★★★★★	★★★★★
Community catchment	★★★★★	★★★★★	★★★★★
Green / public space potential	★★★	★★★★	★★★★★
Urban / architectural potential	★★★★	★★★★★	★★★★★
Overall	20/25	24/25	24/25

Strengths	Residential + community strength being situated in prominent urban area with high building density.	Near existing innovation ecosystem with jtc launchpad, fusionopolis, and one-north.	Connection to greenery and generous open area.
Weaknesses	Less connection to students (key demographic) than other sites.	Low wind flow at lower heights.	Minimal shading from direct sunlight + longer side of site primarily faces east-west.

SITE SELECTION

SELECTED SITE

DOVER RESIDENCES

LOCATION PLAN



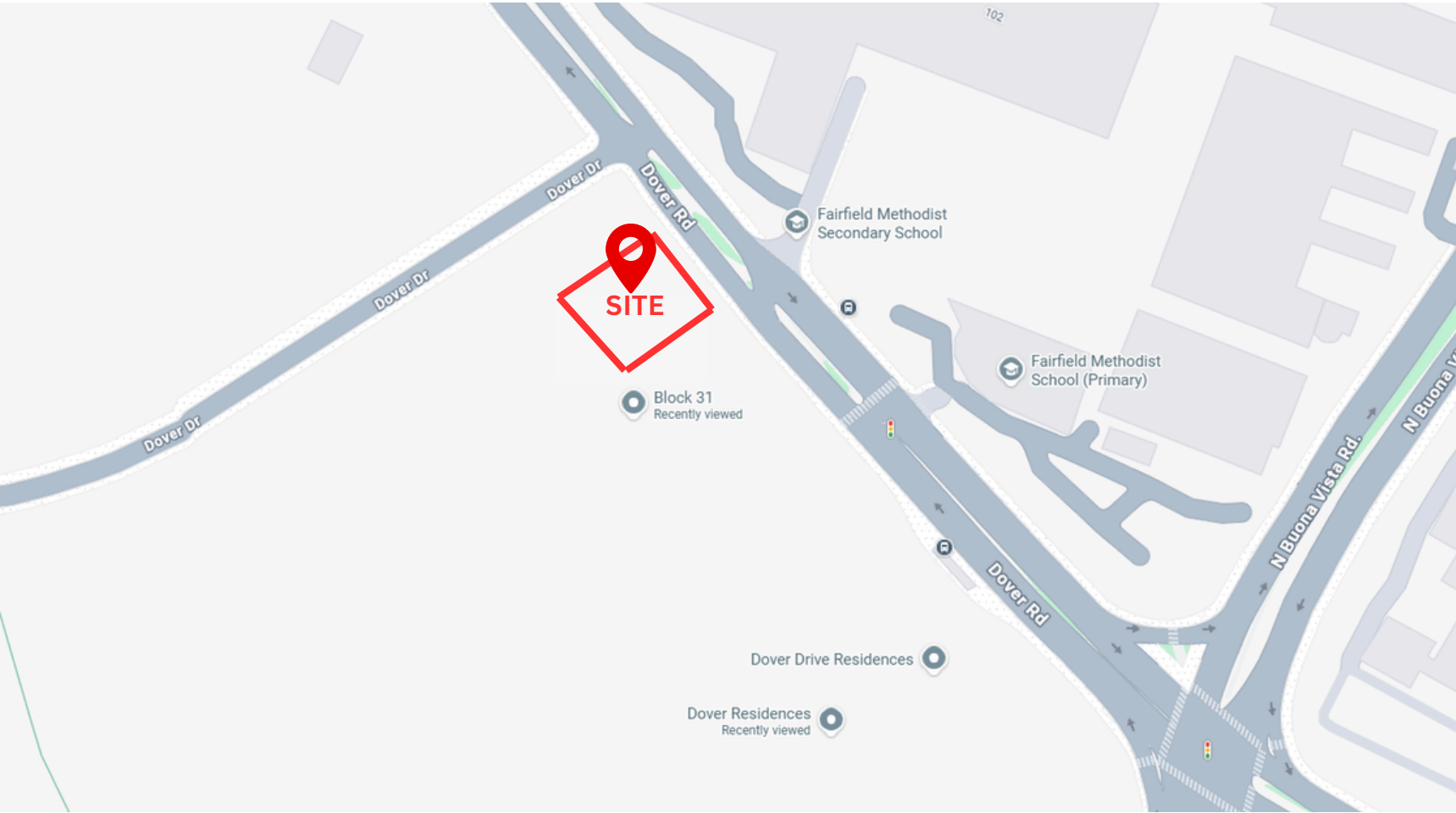
Site Information

- **Location:** Open site along Dover Drive, within the Dover–one-north area
- **Approximate Coordinates:** 1.30026° N, 103.78347° E
- **Site type:** Urban regeneration / education-edge site
- **Analysis condition:** Existing neutral site with no proposed building massing
- **Site boundary:** Selected conceptual study area shown in red

Why This Site?

- Located between **major education** and **innovation** communities.
- Close to **schools, Singapore Polytechnic and one-north.**
- Relevant to **students, educators, residents and technology workers.**
- **Accessible** by MRT, buses, pedestrian routes and surrounding roads.
- Provides a **meaningful setting for digital learning and collaboration.**

SITE PLAN



Site suitability

- Site can accommodate the complete 4,030 m² programme.
- A 1,000–1,350 m² footprint remains below the maximum.
- Remaining land can support outdoor learning and landscape.
- Site shape permits several different building configurations.
- Surrounding roads and buildings provide usable Forma context.

Neutral Baseline Findings

- High solar exposure with limited shade.
- Strong daylight and PV potential.
- Weak pedestrian-level airflow.
- Better wind flow at upper levels.
- Afternoon heat and possible road noise.
- Good potential for measurable improvement.

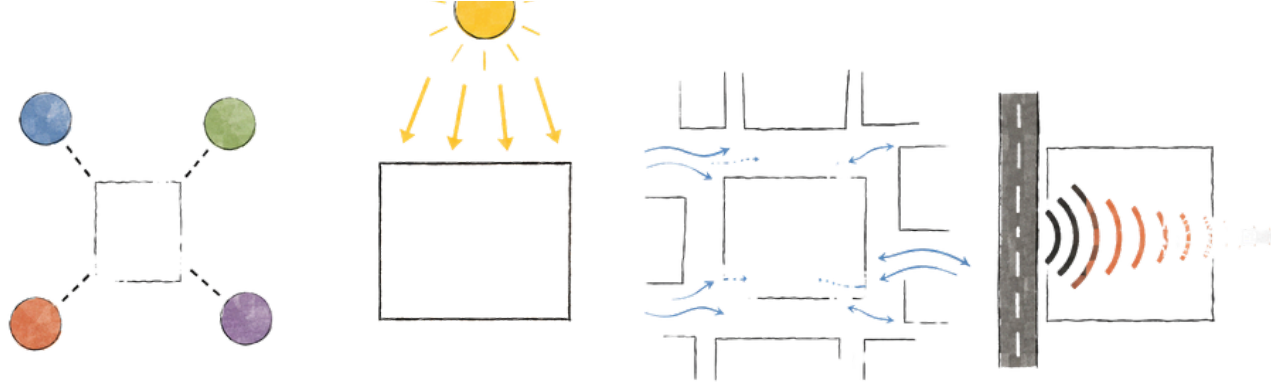
Site Selection Conclusion

The site supports the full programme and provides clear environmental challenges for performance-led design.

NARRATIVE

Design Issue

- **Disconnected** learning communities within an **exposed environment**



Dover is surrounded by **schools, Singapore Polytechnic, residents** and the **one-north innovation district**, but these users **lack a shared space** for **learning, making and knowledge exchange**. The **open** site also experiences **strong solar exposure, afternoon heat, weak pedestrian-level airflow and potential road noise**.

Design Strategies

1. Buffer the Urban Edge

- Place maker spaces, plant rooms, cores and services along the noisy north/northeast road edges.
- Locate computer labs, studios and offices behind this protective layer.
- Reduce openings facing traffic while maintaining a visible entrance.

Purpose: Improve weak pedestrian-level ventilation and outdoor comfort.

2. Channel the Breeze

- Create north-south breezeways aligned with prevailing winds.
- Use narrow 12–15 m-deep learning wings.
- Introduce porous ground levels, courtyards or gaps between blocks.
- Place terraces around the stronger 15–20 m airflow zone.

Purpose: Improve weak pedestrian-level ventilation and outdoor comfort.

3. Reveal the Learning Process

- Organise spaces around a central collaboration heart.
- Make maker spaces and project activities visible from circulation.
- Position collaboration spaces between labs and teaching studios.
- Use bridges, open stairs or shared landings to encourage interaction.

Purpose: Showcase digital collaboration and interdisciplinary learning.

4. Extend Learning into the Landscape

- Create shaded outdoor classrooms and social-learning courts.
- Use trees and planting to reduce heat and glare.
- Step upper floors to generate usable learning terraces.
- Integrate rooftop PV, rainwater collection and renewable-energy demonstrations.

Purpose: Turn sustainability into an observable part of the learning experience.

Design Intent

- To create a **climate-responsive space** that connects **education, community and industry together** through **ubiquitous visible collaboration**, and **comfortable indoor-outdoor learning**.

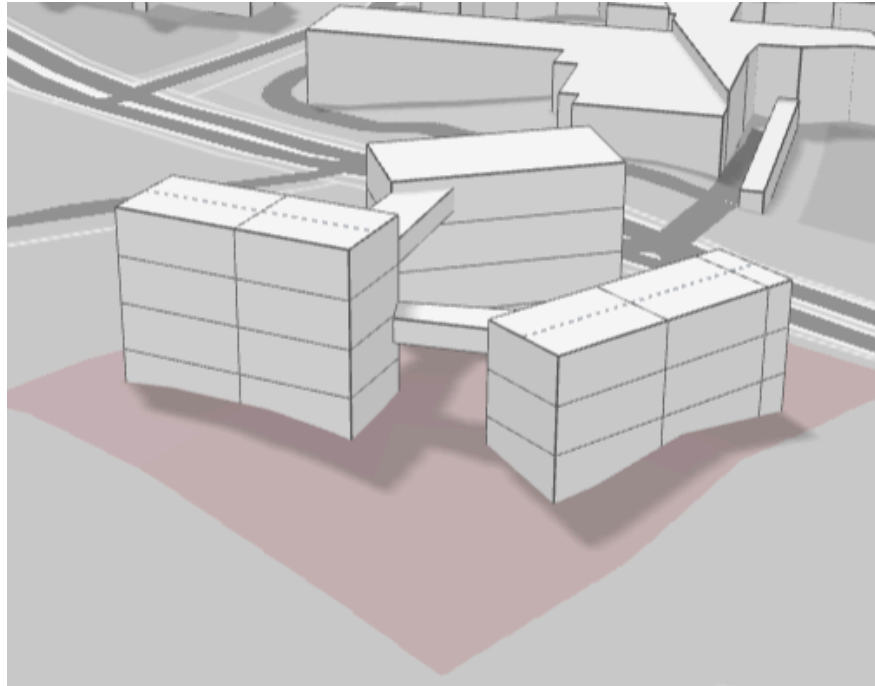
The **Learning and Innovation Hub** acts as a **bridge** between Dover's **educational institutions, residential community** and **one-north innovation ecosystem**. Its massing responds to **solar heat, wind** and **road noise** by combining **protective edges** with **porous learning spaces**. Teaching, computing, making and collaboration are visually connected around a **shared social heart** prioritizing **human comfort** and **experience**, allowing ideas to move between different users and disciplines. With **integrated greenery**, users will be **intrinsically drawn** into the space.

MASSING PROPOSALS

MASSING PROPOSALS

A

THE BRIDGER

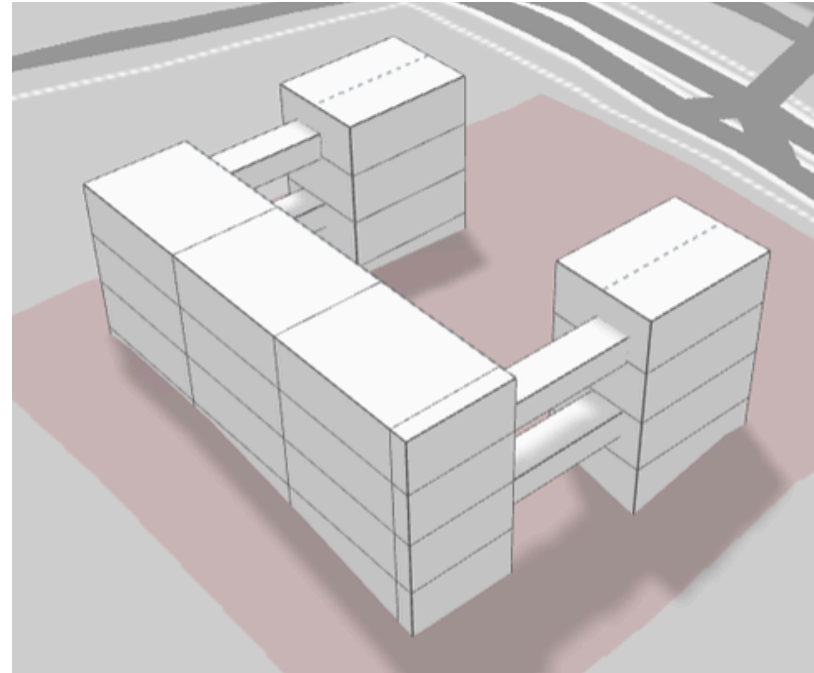


Massing Description

- Massing from 3 different blocks with bridges connecting each other
- Open courtyard space, allowing for activities
- Variation in the height of the wind helps direct wind flow into the courtyard
- Provides shade along the building while not taking away daylight from the building itself
- Bridges being sky terraces
- Rooftops being green roof/ solar catching areas
- Separate volumes for different zonings and learning environments.

B

SPLIT CONNECTION

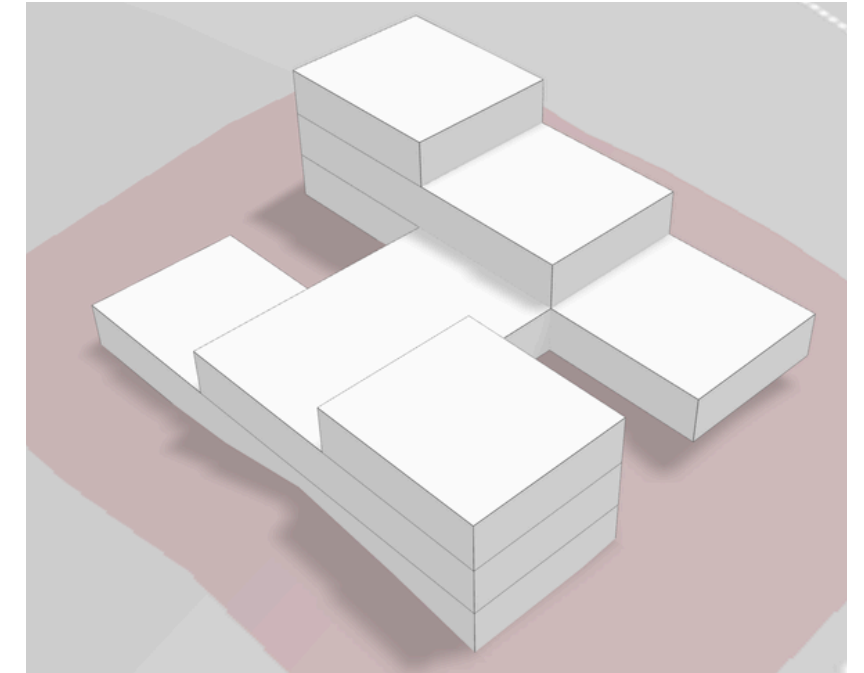


Massing Description

- Massing is split in half, then split again to form 3 solid forms.
- Forms are spaced apart and orientated to help optimise windflow through the building.
- Orientated forms also help mitigate direct sunlight
- Separate massings are then connected by bridges to maintain connection.
- Central courtyard area opens up to road frontage for public engagement, with smaller openings on the sides.

C

STEPPED LEARNING WEAVE



Massing Description

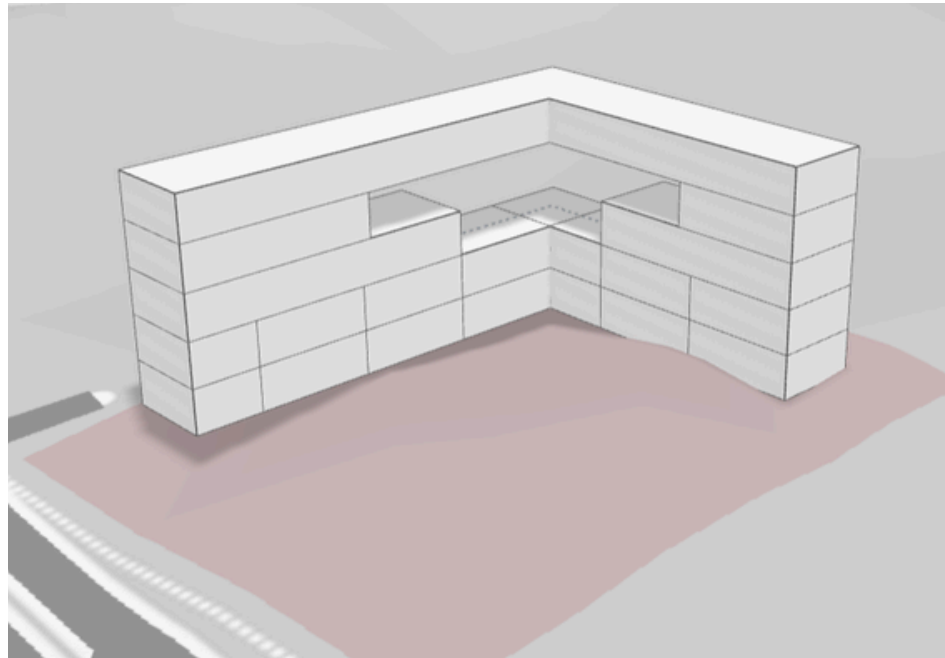
- Massing is divided into staggered learning blocks around a central collaborative space.
- Stepped volumes reduce the building's overall visual bulk.
- Height variation preserves daylight between the blocks.
- Setbacks create shaded terraces for outdoor learning.
- Upper levels access stronger airflow.
- Exposed roofs provide opportunities for solar-energy generation.
- Separate volumes express different learning, making and collaboration zones.

All options maintain approximately 4,030 m² total programme area and remain below the maximum 1,500 m² projected footprint.

MASSING PROPOSALS

D

TERRACES IN VOIDS

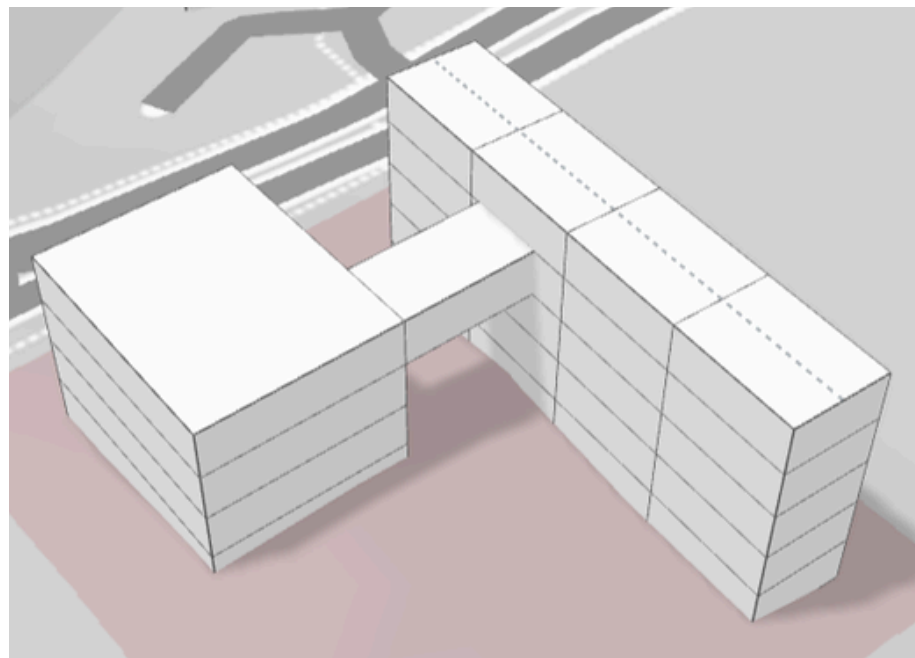


Massing Description

- L-shaped massing facilitating an open courtyard space.
- Void formed in the direction of heaviest wind flow directions.
- Open void direct wind flow down to the open courtyard space.
- Void create shades terraces for outdoor learning.
- Height variation preserves daylight between the blocks.
- Opportunities for green roofs and optimal solar catchment.
- Upper levels access stronger airflow.
- Central courtyard area opens up to road frontage for public engagement.

E

THICK AND THIN

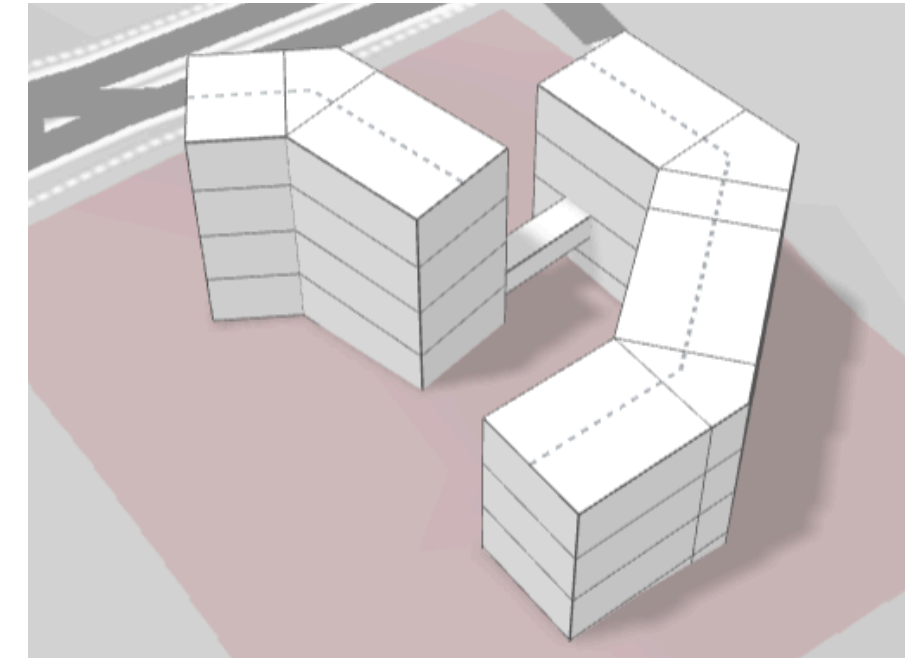


Massing Description

- Massing is split in half, then connected with a bridge.
- Central courtyard area opens up to road frontage for public engagement.
- Two differently sized masings for different zonings and learning environments.
- Opportunities for green roofs and optimal solar catchment.
- Walkable connection bridge connects to wider block for sky terrace.
- Open roof accesses strong airflow.

F

MACARONI



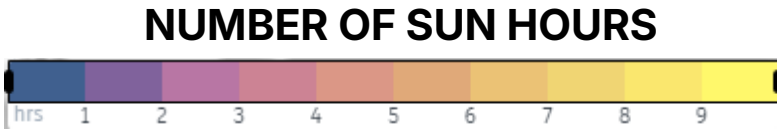
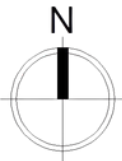
Massing Description

- Massing is divided into staggered learning blocks around a central
- Follow the shape of the terrain
- Bent to follow the sunpath
- Making use of the terrain to make a sheltered courtyard.
- Linking both blocks with a sky terrain incorporates biophilic
- Green roof

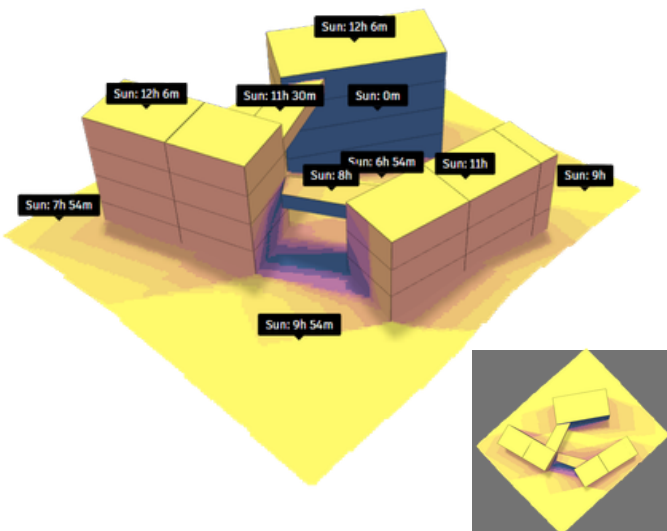
All options maintain approximately 4,030 m² total programme area and remain below the maximum 1,500 m² projected footprint.

FORMA ANALYSIS

BALANCE OF SOLAR EXPOSURE AND SHADE

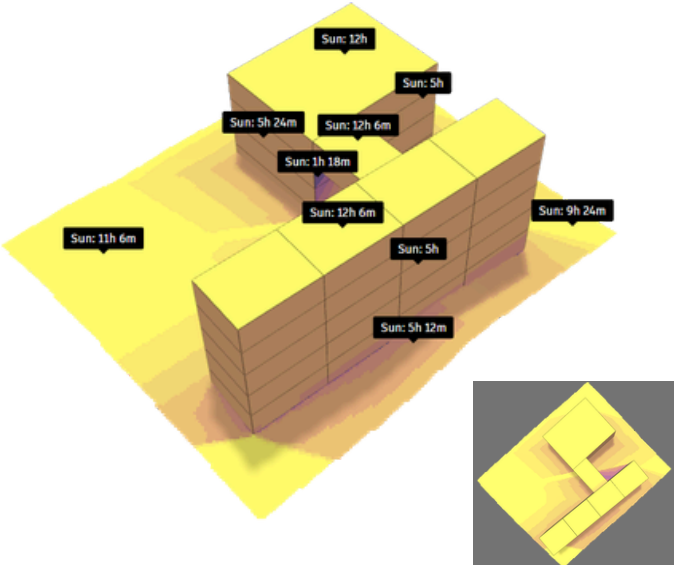


1ST
THE BRIDGER



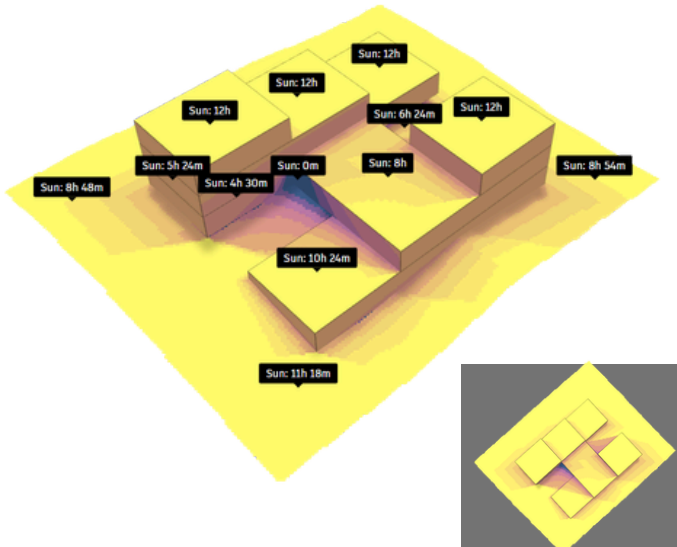
AVG:
8.0 H

2ND
THICK AND THIN



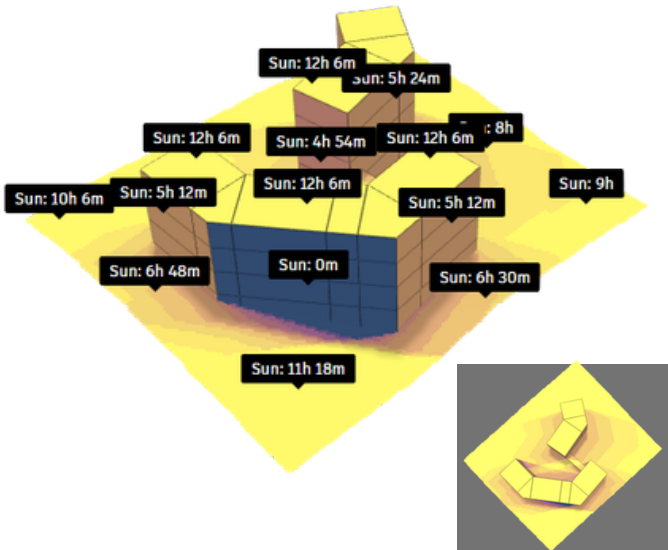
AVG:
8.8 H

3RD
STEPPED LEARNING WEAVE



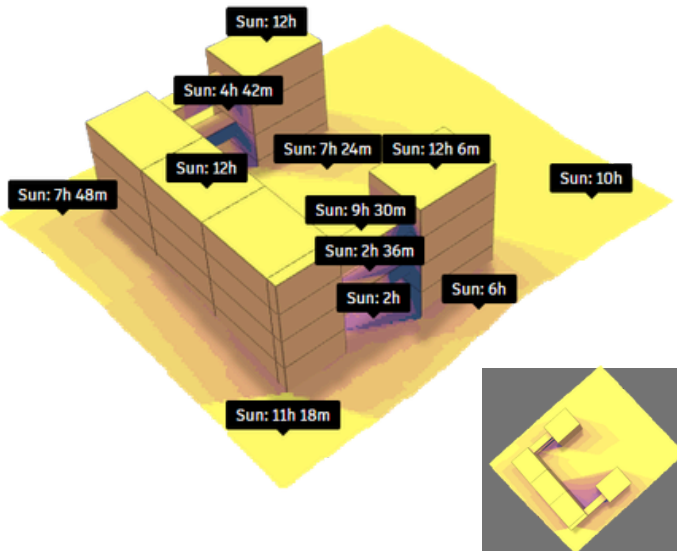
AVG:
7.6 H

4TH
MACARONI



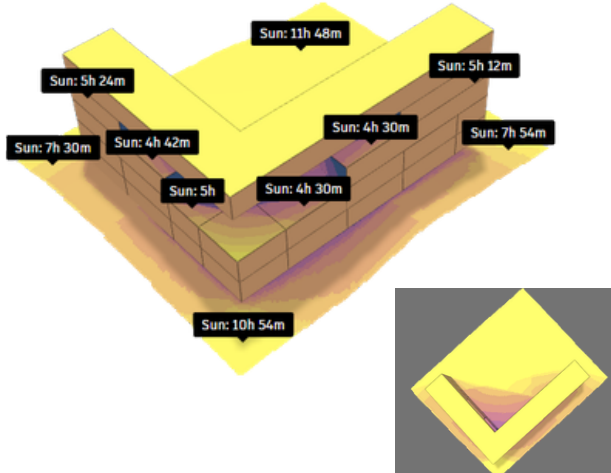
AVG:
8.2 H

5TH
SPLIT CONNECTION



AVG:
7.2 H

6TH
TERRACES IN VOIDS

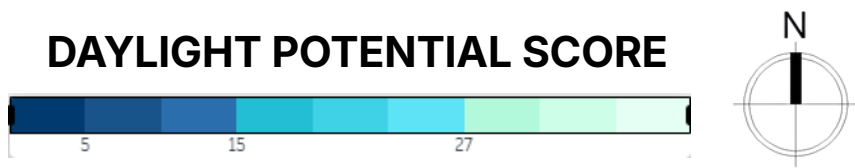


AVG:
6.5 H

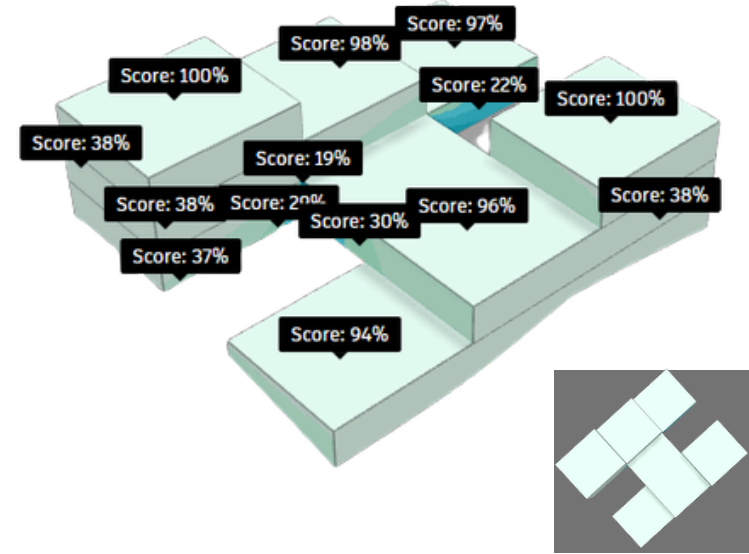
CONCLUSION
the **Bridger** provides the best balance of solar exposure and shade, supporting PV generation while reducing excessive heat gain.

FORMA ANALYSIS

DAYLIGHT POTENTIAL

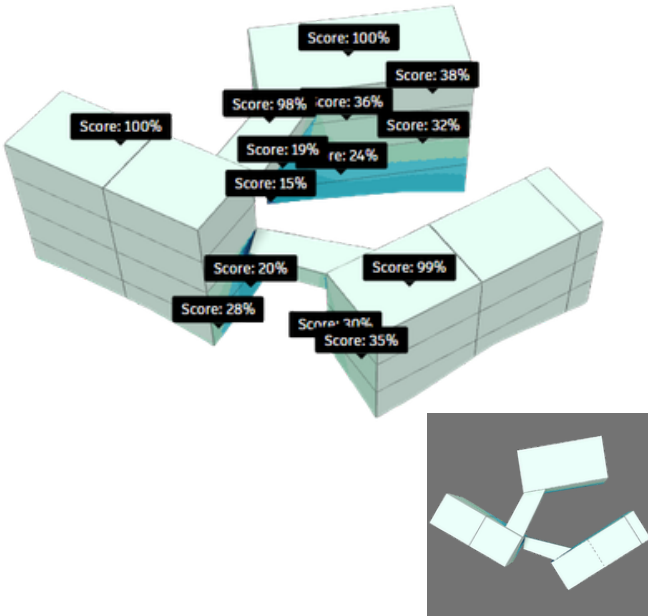


1ST
STEPPED LEARNING WEAVE



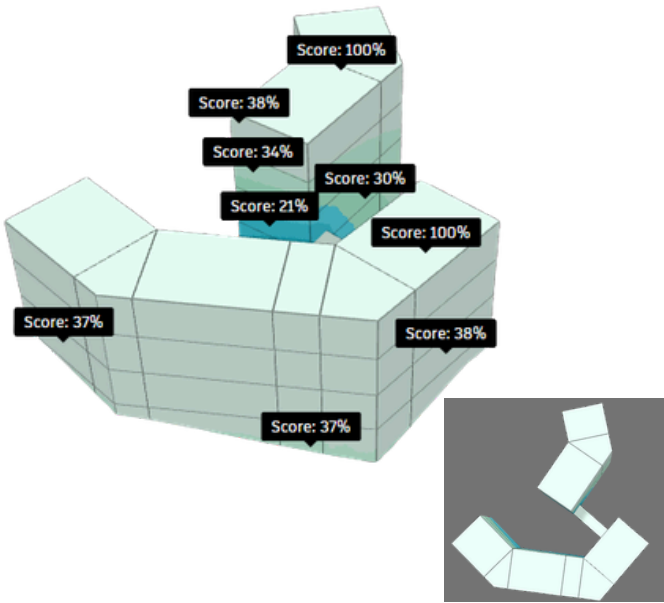
AVG:
61%

2ND
THE BRIDGER



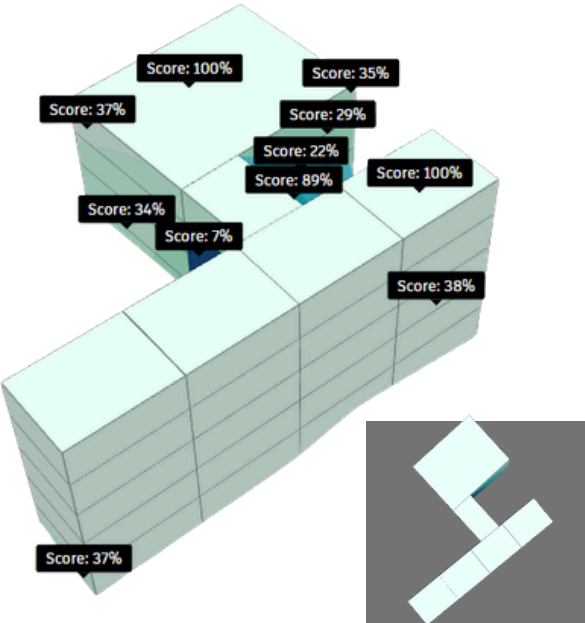
AVG:
55%

3RD
MACARONI



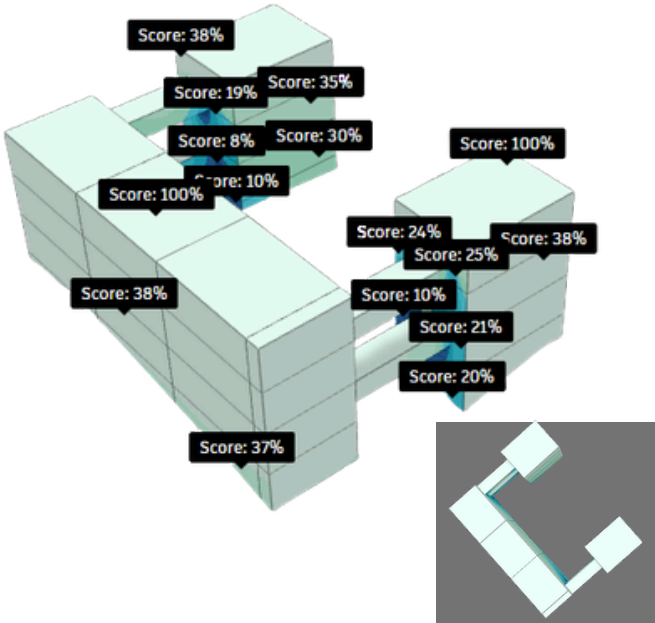
AVG:
50%

4TH
THICK AND THIN



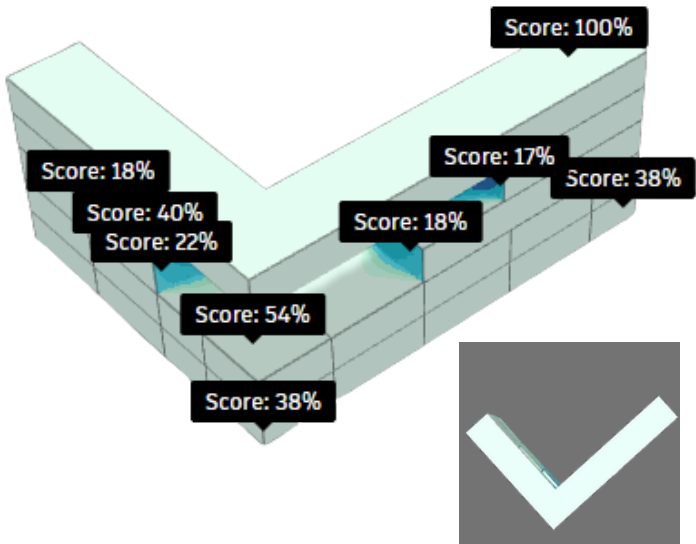
AVG:
48%

5TH
SPLIT CONNECTION



AVG:
44%

6TH
TERRACES IN VOIDS

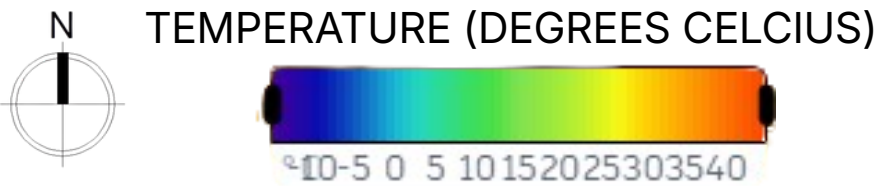


AVG:
38%

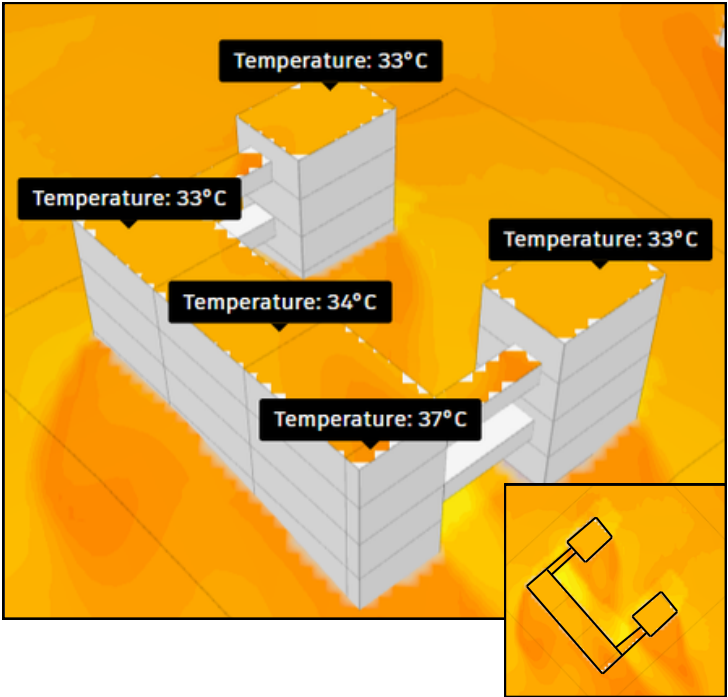
CONCLUSION

Stepped Learning Weave provides the most consistent daylight across its façades by reducing self-shadowing through its fragmented, stepped form.

FORMA ANALYSIS
MICROCLIMATE

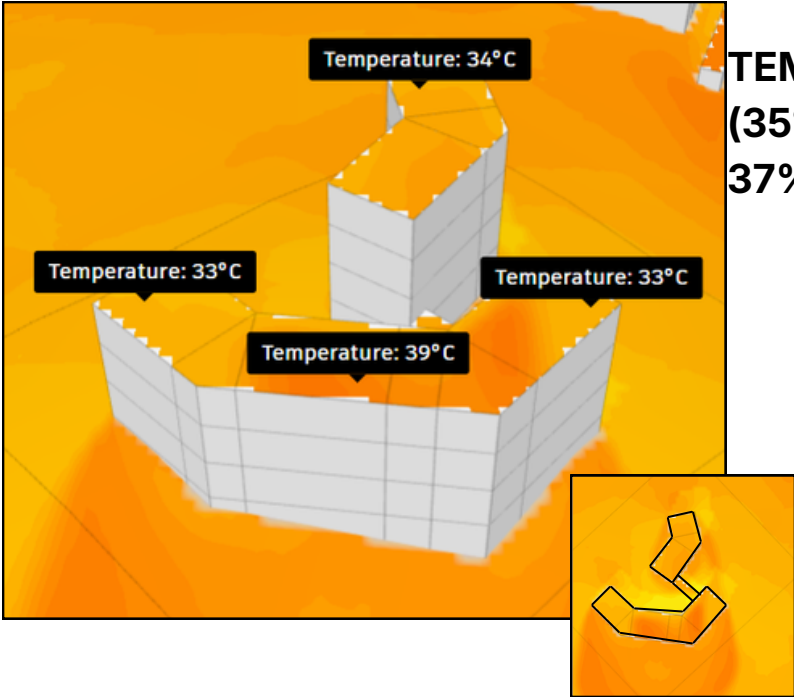


1ST
SPLIT CONNECTION



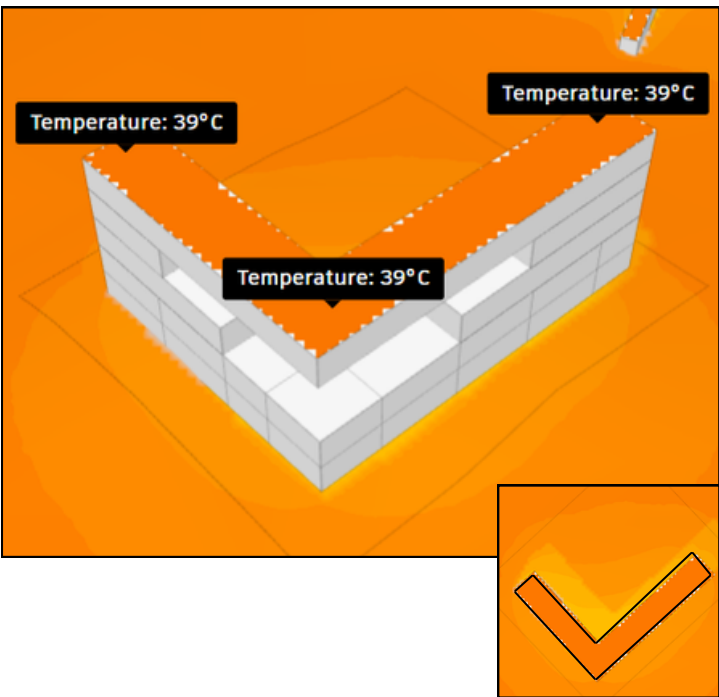
TEMP RANGE
(35°C-40°C):
32%

2ND
MACARONI



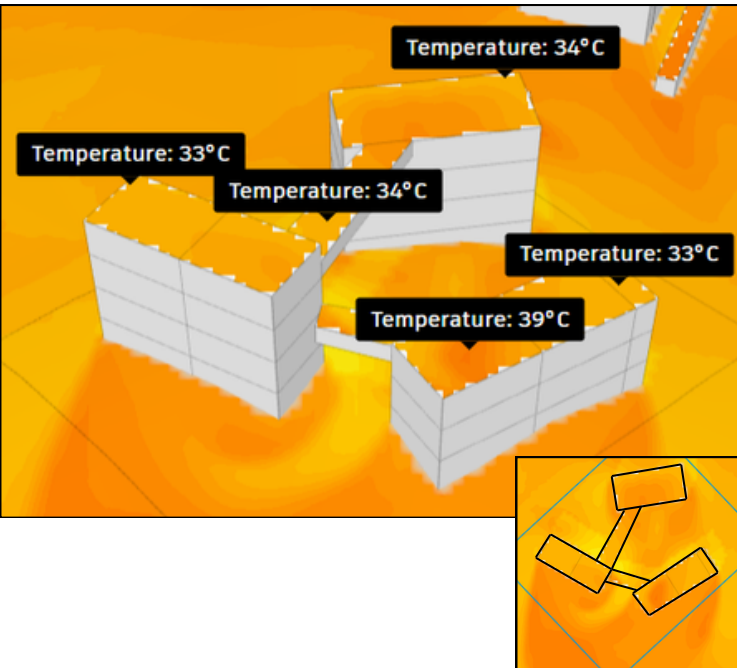
TEMP RANGE
(35°C-40°C):
37%

3RD
TERRACES IN VOIDS



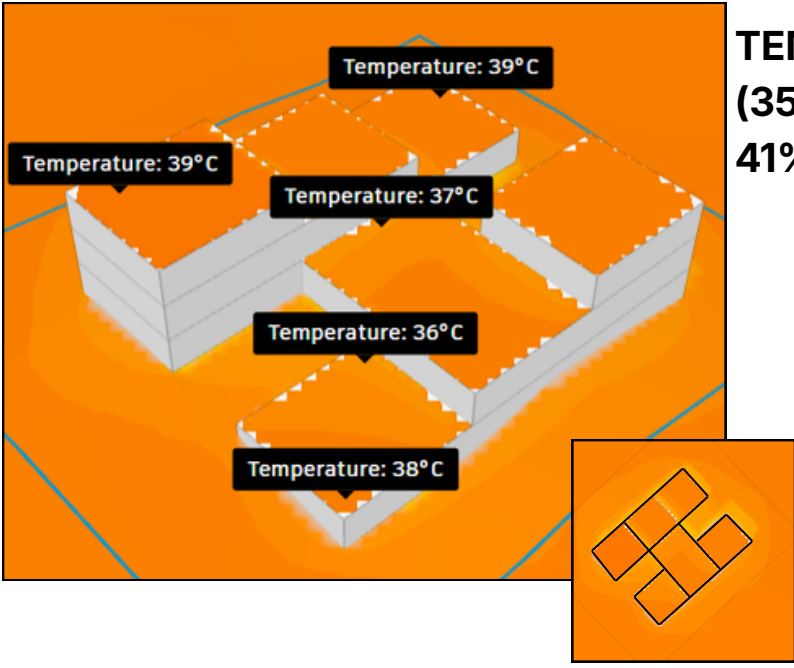
TEMP RANGE
(35°C-40°C):
39%

4TH
THE BRIDGER



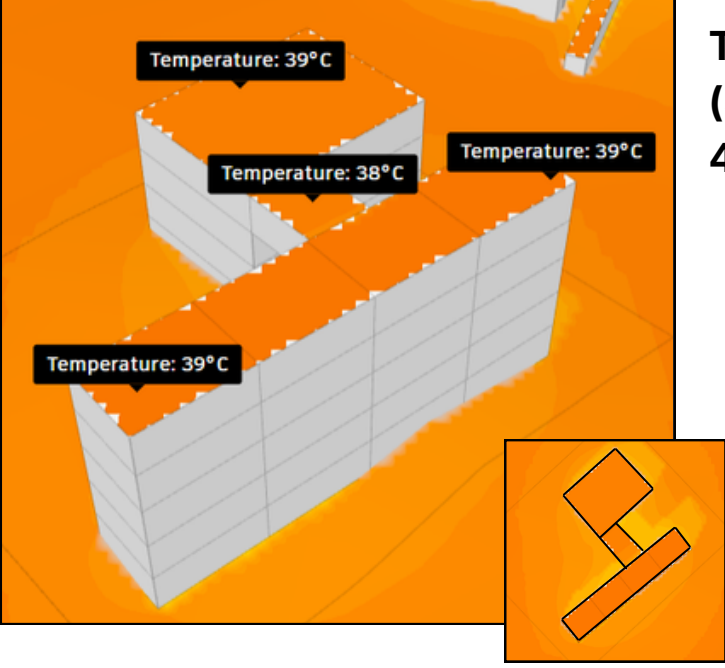
TEMP RANGE
(35°C-40°C):
41%

5TH
STEPPED LEARNING WEAVE



TEMP RANGE
(35°C-40°C):
41%

6TH
THICK AND THIN

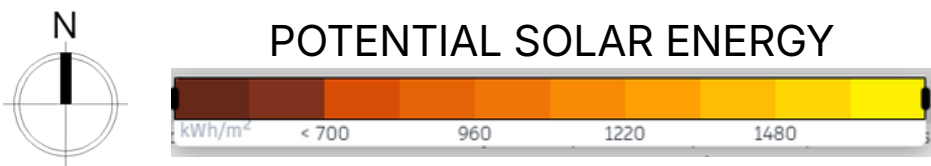


TEMP RANGE
(35°C-40°C):
45%

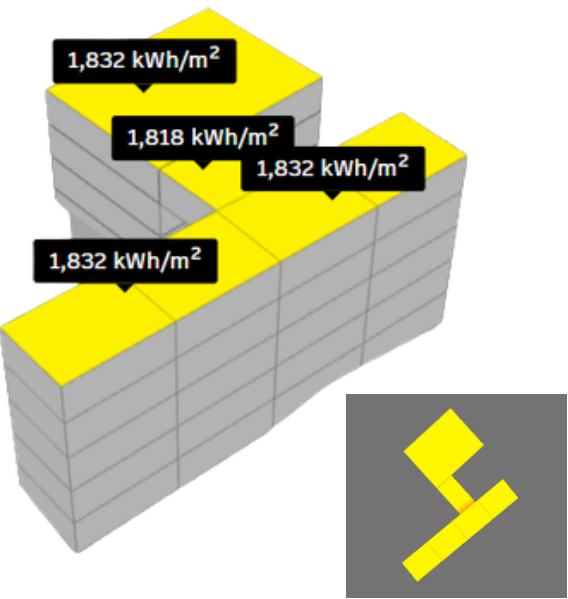
CONCLUSION
Split Connection has the **lowest percentage** of the **highest range of heat (35°C-40°C)**, and hence ranks the best in terms of **microclimate temperature**.

FORMA ANALYSIS

PHOTOVOLTAIC POTENTIAL



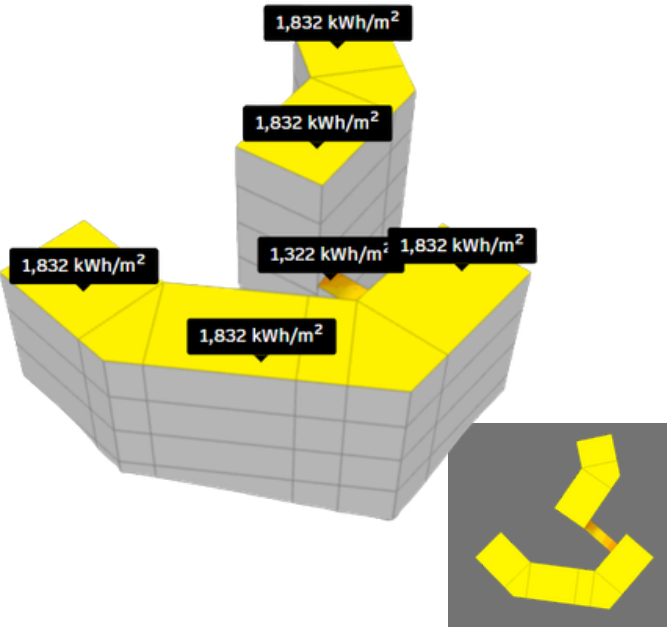
1ST
THICK AND THIN



TOTAL SOLAR ENERGY:
3,090,000 kWh

AVERAGE SOLAR ENERGY:
1,820 kWh/m²

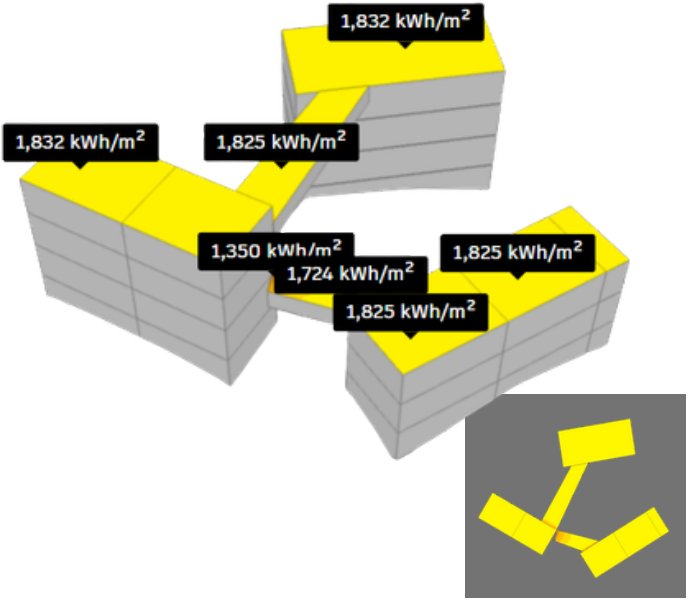
2ND
MACARONI



TOTAL SOLAR ENERGY:
2,080,000 kWh

AVERAGE SOLAR ENERGY:
1,820 kWh/m²

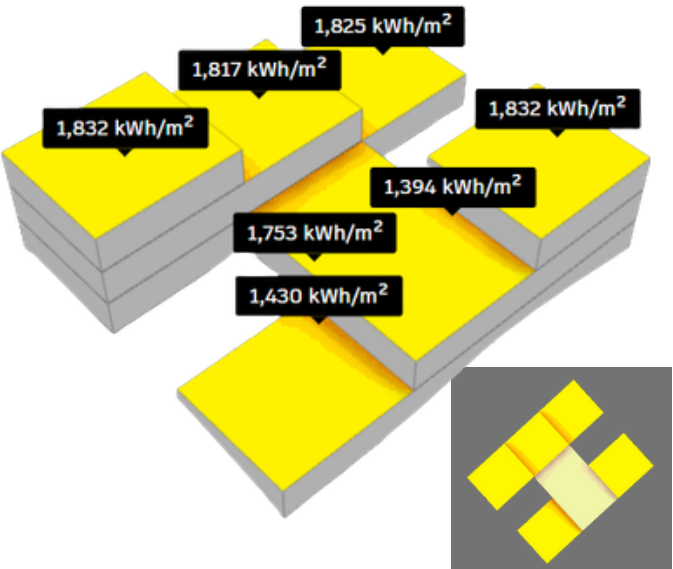
3RD
THE BRIDGER



TOTAL SOLAR ENERGY:
2,740,000 kWh

AVERAGE SOLAR ENERGY:
1,810 kWh/m²

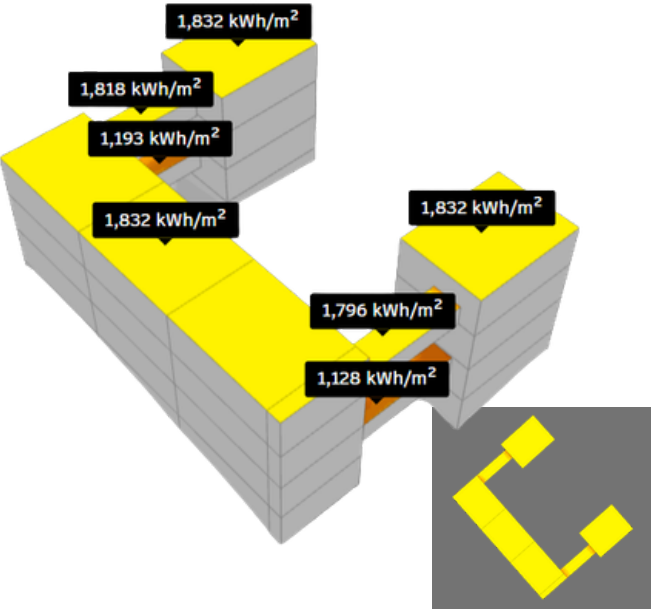
4TH
STEPPED LEARNING WEAVE



TOTAL SOLAR ENERGY:
3,550,000 kWh

AVERAGE SOLAR ENERGY:
1,760 kWh/m²

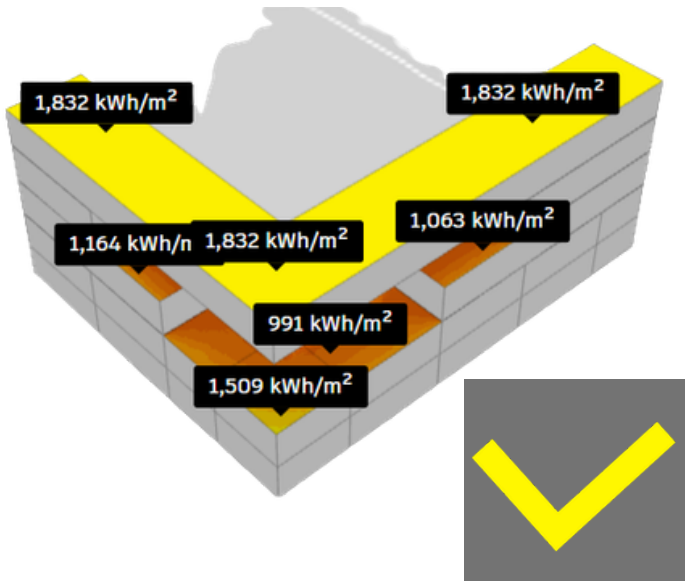
5TH
SPLIT CONNECTION



TOTAL SOLAR ENERGY:
2,120,000 kWh

AVERAGE SOLAR ENERGY:
1,760 kWh/m²

6TH
TERRACES IN VOIDS



TOTAL SOLAR ENERGY:
3,550,000 kWh

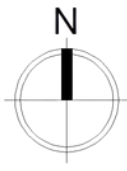
AVERAGE SOLAR ENERGY:
1,530 kWh/m²

CONCLUSION

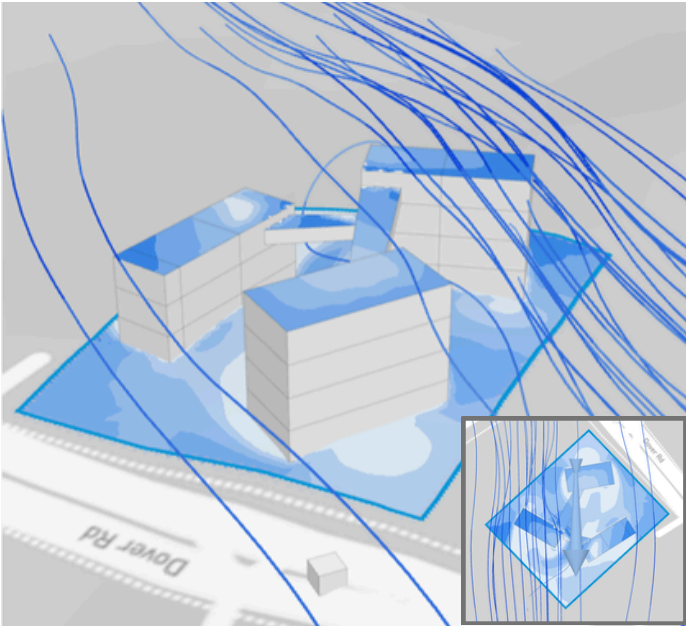
Thick and Thin and Macaroni have the **highest average PV potential**; however, **Thick and Thin** has a **higher total solar energy**. The **Bridger** also offers **strong renewable-energy potential** alongside its better wind, microclimate and collaborative performance.

FORMA ANALYSIS

NORTH WIND SPEEDS



1ST
THE BRIDGER

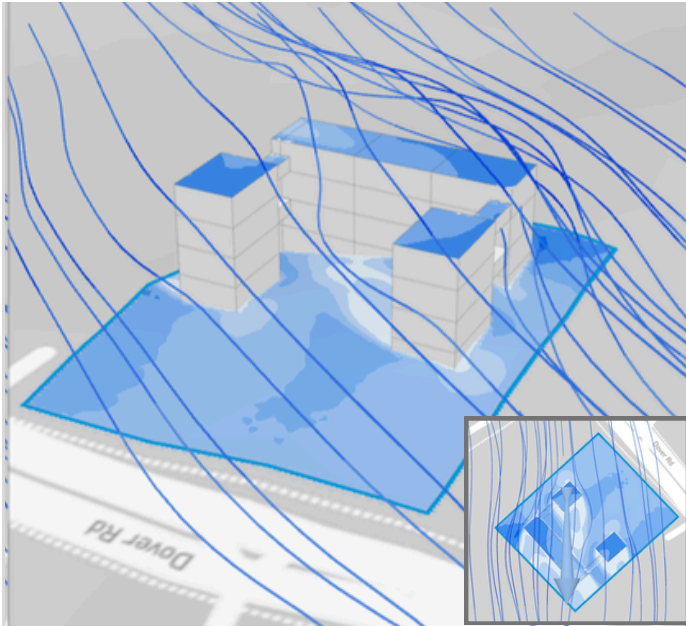


STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER ON THE
LEFT

DATA:
3.7 m/s

2ND
SPLIT CONNECTION

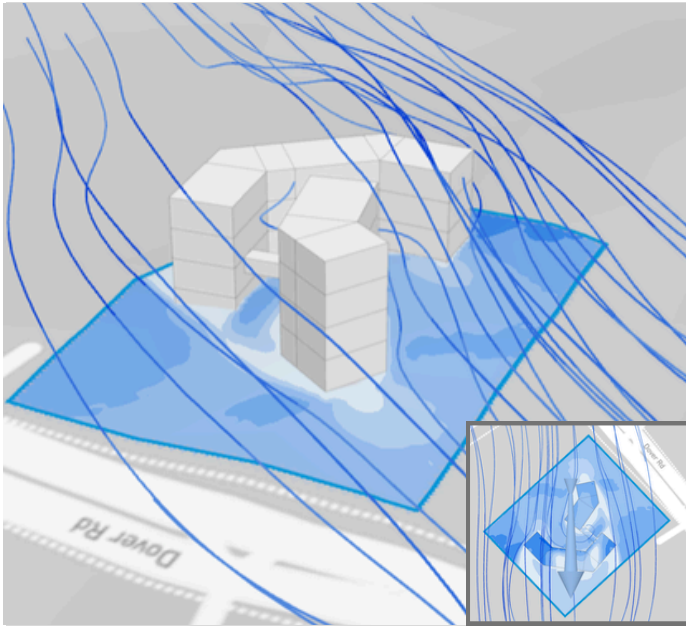


STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER ON THE
LEFT

DATA:
3.7 m/s

3RD
MACARONI

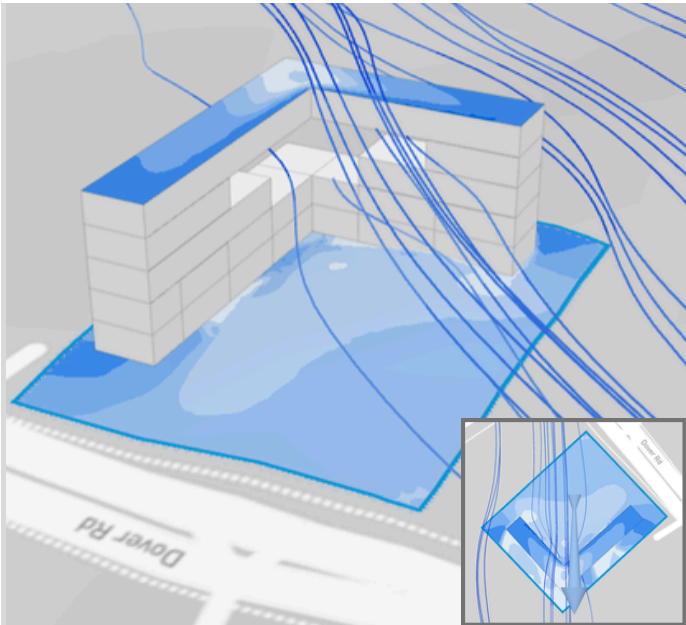


STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER ON THE
LEFT

DATA:
3.7 m/s

4TH
TERRACES IN VOIDS

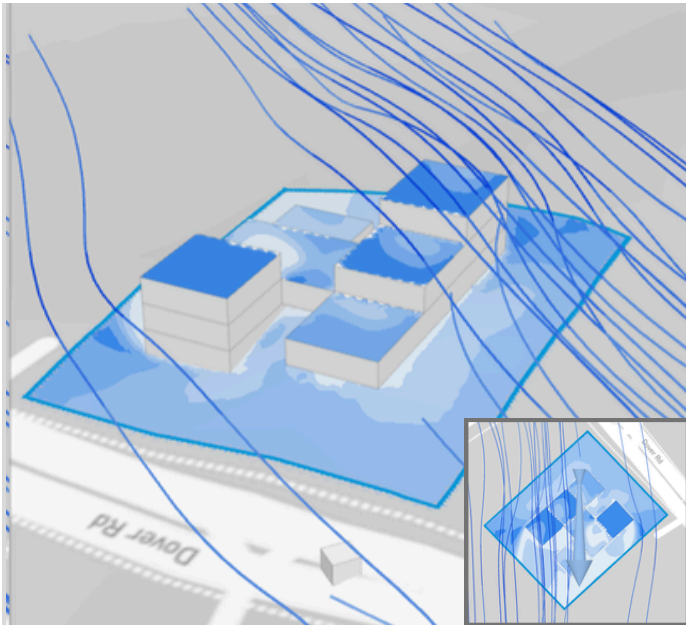


STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER ON THE
LEFT

DATA:
3.7 m/s

5TH
STEPPED LEARNING WEAVE

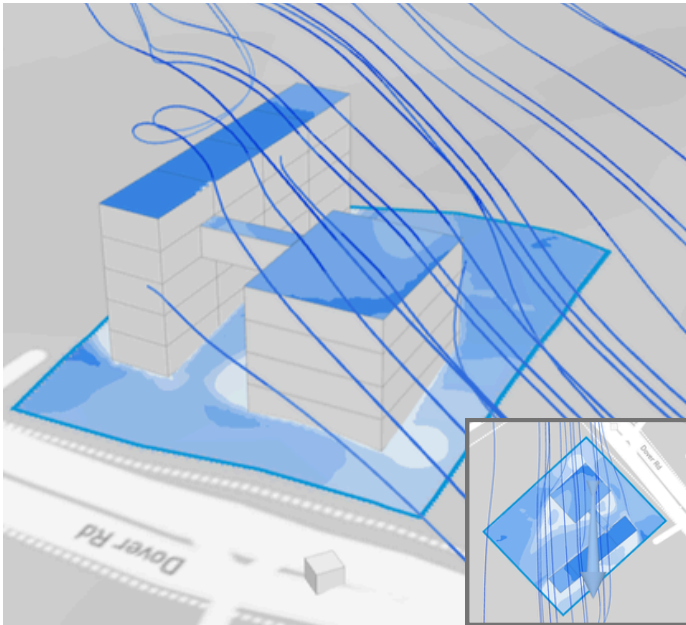


STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER ON THE
LEFT

DATA:
3.7 m/s

6TH
THICK AND THIN



STREET LEVEL:
SOME

AVERAGE
WINDS:
DENSER IN THE
MIDDLE

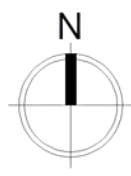
DATA:
3.7 m/s

CONCLUSION

All massing except **Thick and Thin** have similar wind flow patterns with wind flow being denser on the left/north-west to south-west of the site. Thick and Thin has denser wind flow in the middle of the site. However, **The Bridger** is best with catching the northern wind flow as the orientation of the massing allow wind to enter the central courtyard.

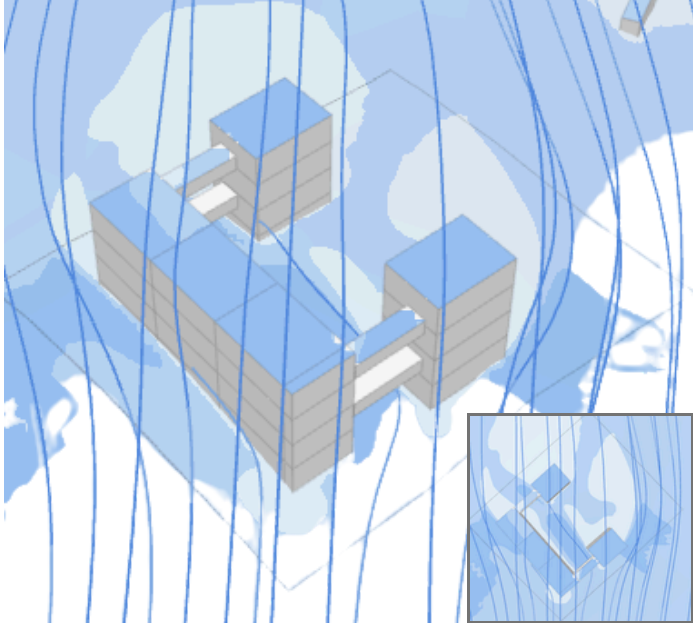
FORMA ANALYSIS

SOUTH WIND SPEEDS



1ST

SPLIT CONNECTION



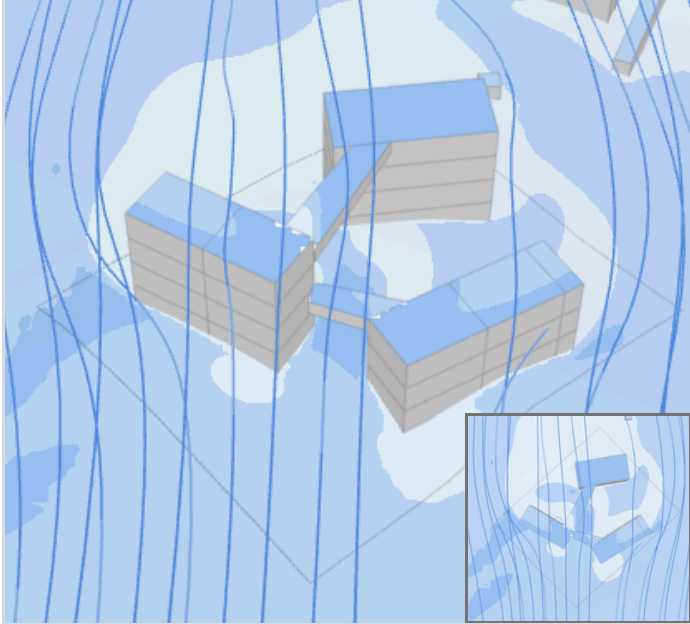
STREET LEVEL:
SOME

AVERAGE WINDS:
VERY DENSE

DATA:
2.1 m/s

2ND

THE BRIDGER



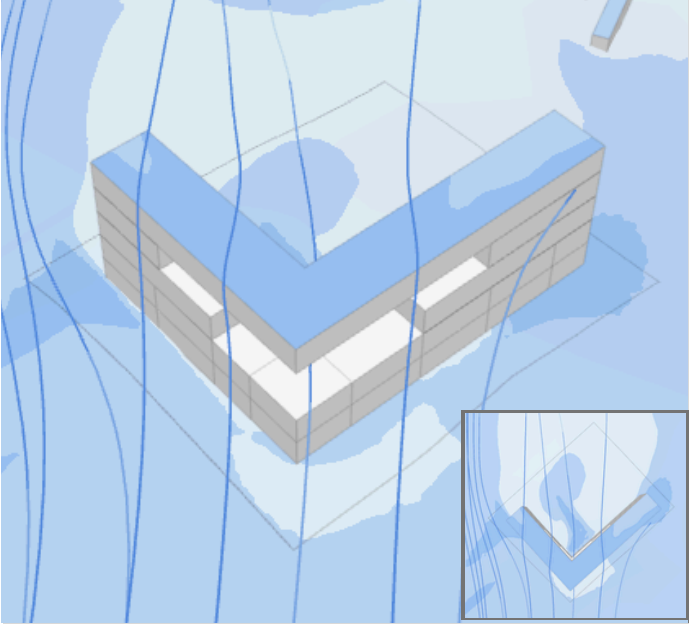
STREET LEVEL:
SOME

AVERAGE WINDS:
DENSE

DATA:
2.1 m/s

3RD

TERRACES IN VOIDS



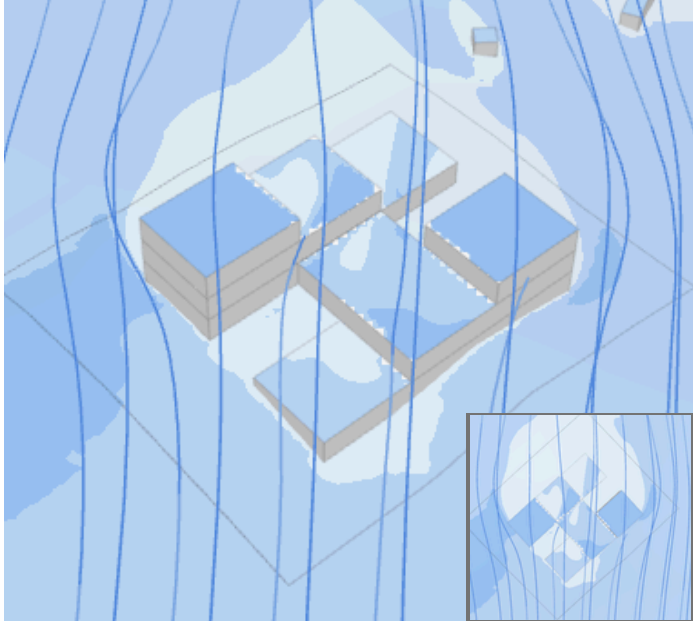
STREET LEVEL:
NONE

AVERAGE WINDS:
SOMEWHAT DENSE

DATA:
2.1 m/s

4TH

STEPPED LEARNING WEAVE



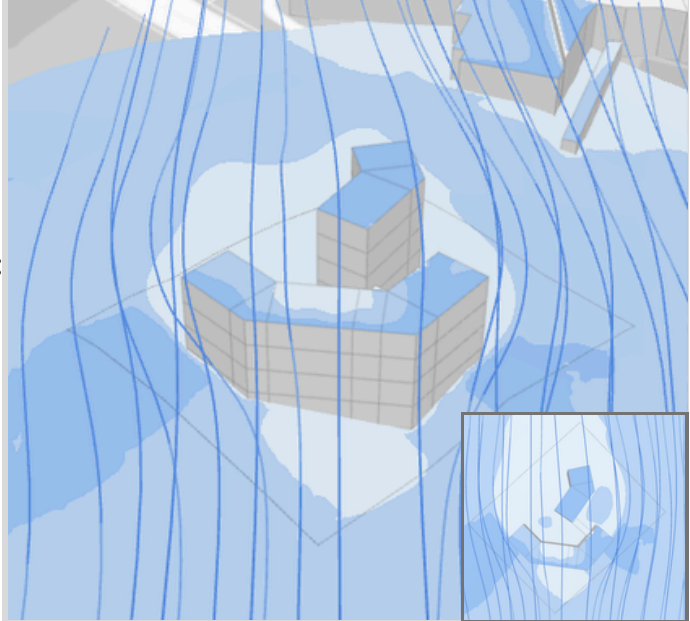
STREET LEVEL:
NONE

AVERAGE WINDS:
SOME

DATA:
2.1 m/s

5TH

MACARONI



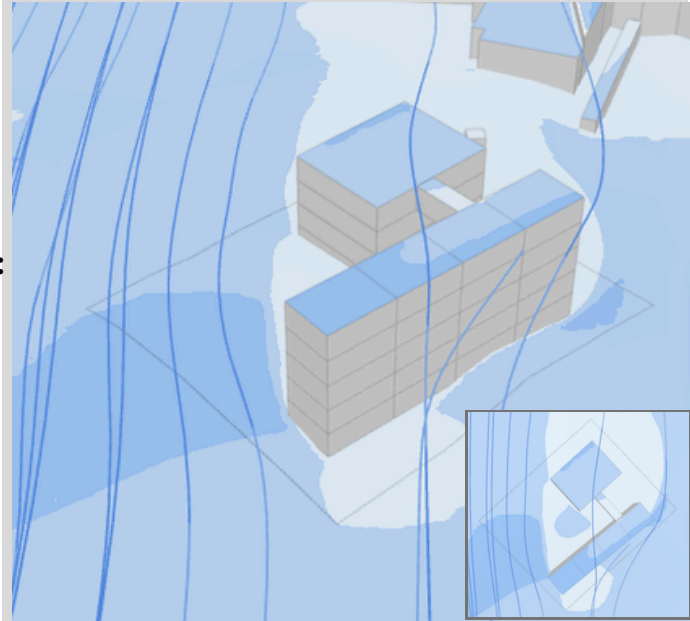
STREET LEVEL:
NONE

AVERAGE WINDS:
SOME

DATA:
2.1 m/s

6TH

THICK AND THIN



STREET LEVEL:
NONE

AVERAGE WINDS:
LITTLE

DATA:
2.1 m/s

CONCLUSION

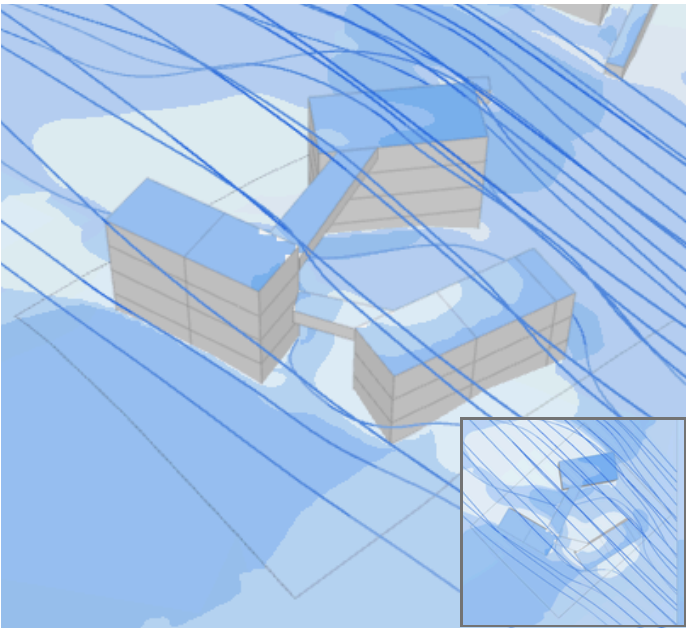
All massing except **Thick and Thin** have similar wind flow patterns with wind flow being denser on the left/north-west to south-west of the site. Thick and Thin has little wind flow in the middle of the site. However, **Split Connection** is best with catching the southern wind flow as the orientation of the massing allow wind to enter the central courtyard.

FORMA ANALYSIS

SOUTH-EAST WIND SPEEDS



1ST
THE BRIDGER

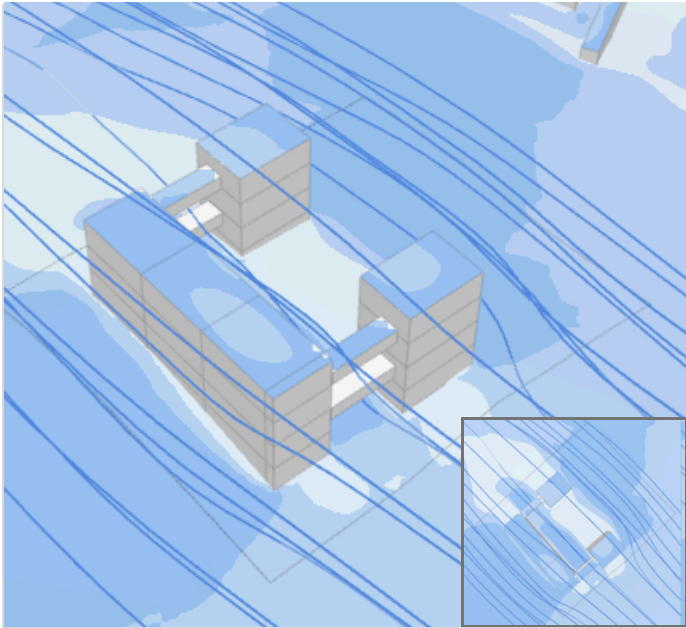


STREET LEVEL:
SOME

AVERAGE WINDS:
VERY DENSE

DATA:
2.3 m/s

2ND
SPLIT CONNECTION

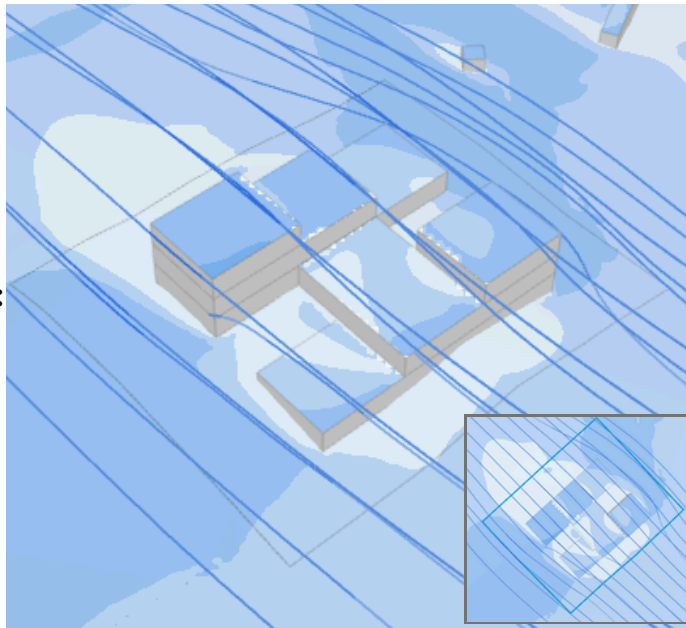


STREET LEVEL:
SOME

AVERAGE WINDS:
VERY DENSE

DATA:
2.3 m/s

3RD
STEPPED LEARNING WEAVE

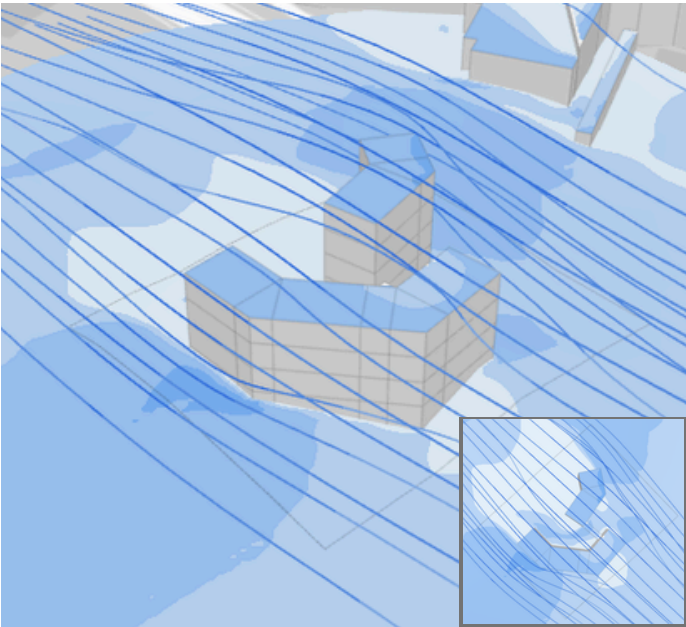


STREET LEVEL:
SOME

AVERAGE WINDS:
SOMEWHAT DENSE

DATA:
2.3 m/s

4TH
MACARONI

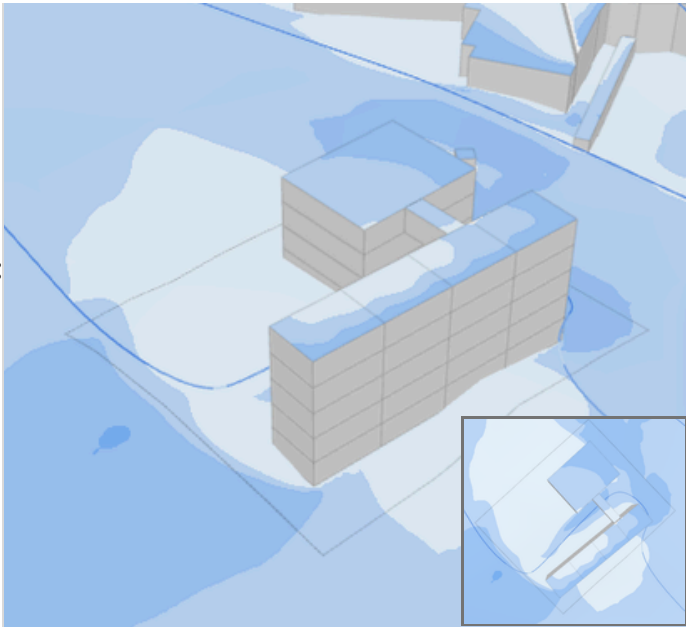


STREET LEVEL:
NONE

AVERAGE WINDS:
DENSE

DATA:
2.3 m/s

5TH
THICK AND THIN

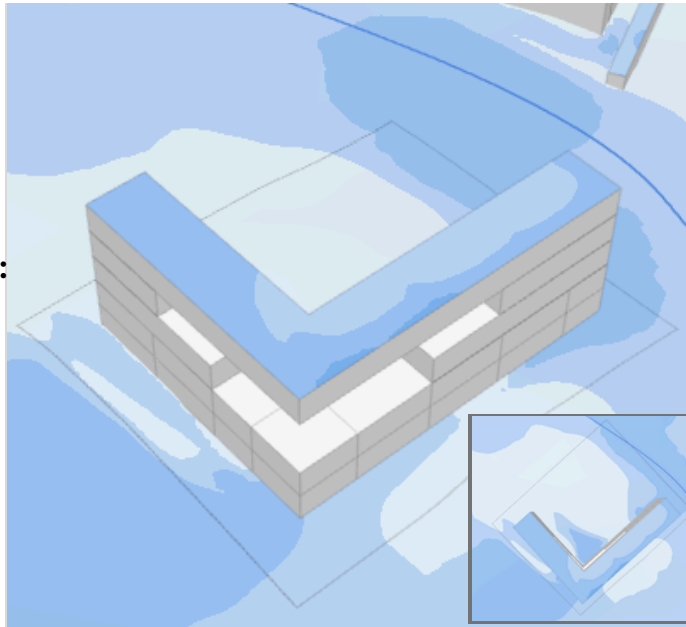


STREET LEVEL:
LITTLE

AVERAGE WINDS:
NONE

DATA:
2.3 m/s

6TH
TERRACES IN VOIDS



STREET LEVEL:
NONE

AVERAGE WINDS:
NONE

DATA:
2.3 m/s

CONCLUSION

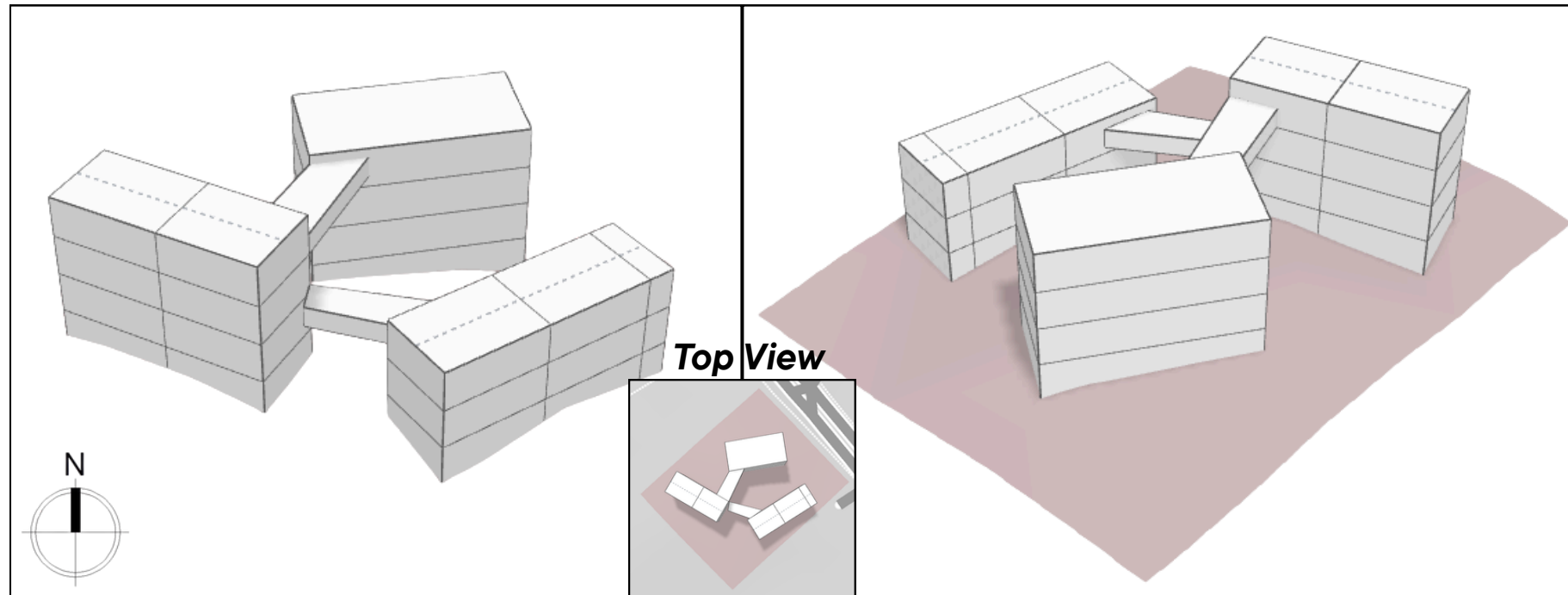
All massing except **Thick and Thin** and **Terraces in the void** have similar wind flow patterns, with wind barely flowing through the site. Thick and Think has little wind flow in the middle of the site, and Terraces in the void doesn't have any wind at all. However, **The Bridger** is best with catching the south-eastern wind flow as the orientation of the massing allow wind to enter the central courtyard.

FINAL MASSING

THE BRIDGER

Exterior View From South

Exterior View From North

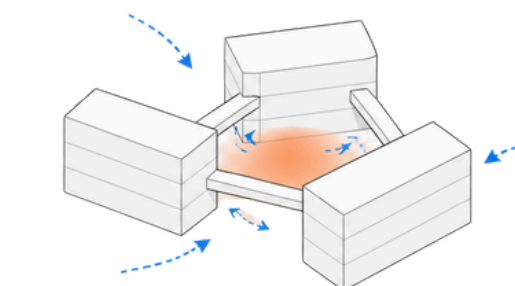
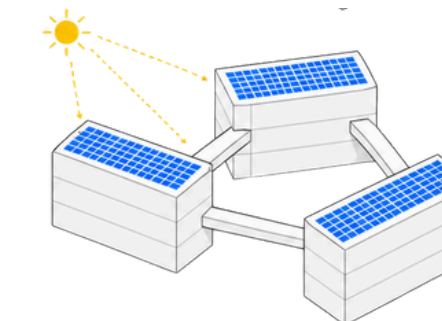
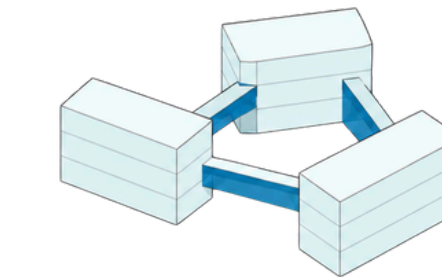
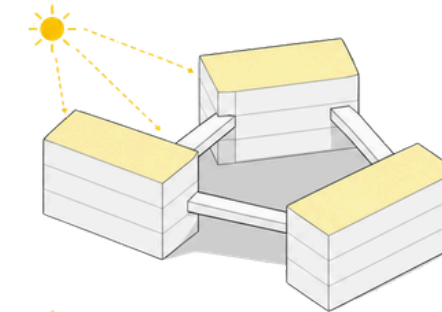
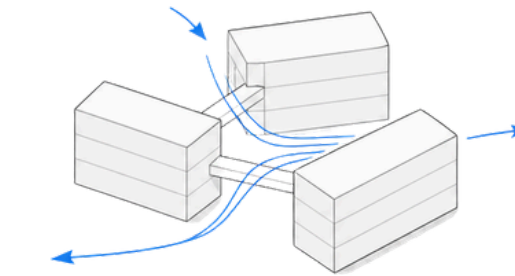
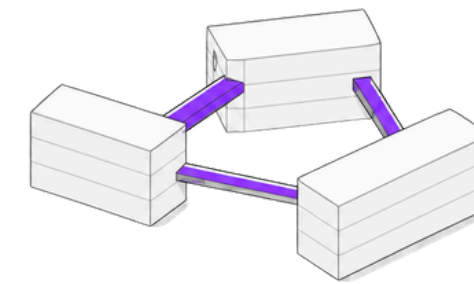


Why Was The Bridger Selected?

- **Best overall** environmental balance **rather than only excelling in one analysis.**
- **Ranked 4th for microclimate**, maintaining approximately **35–40°C**, likewise with alternatives reaching/passing 39°C.
- **Ranked 1st for north and south-east winds** and **2nd for south winds**, allowing airflow into the central courtyard.
- **Achieved the 2nd-highest daylight potential at 55%**, with strong daylight on exposed façades.
- **Provides a balanced 8.0 average sun hours**, combining exposed roofs with shaded spaces below.
- **Ranked 3rd for PV potential, generating approximately 2,740,000 kWh** with an average of **1,810 kWh/m².**
- Bridges physically and visually connect learning blocks, directly supporting collaboration and interaction.

Challenges to Resolve During Development

- Bridges create **shaded façade areas** with **daylight scores as low as 15–38%.**
- Some **spaces beneath the bridges receive little or no direct sunlight.**
- **Enclosed parts** of the courtyard may **retain heat or experience weak airflow.**
- **Exposed roofs require PV, greenery and shading** to control solar heat gain.
- Bridge positions, **widths and heights** must be **refined** to **improve daylight and airflow without losing connectivity.**

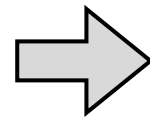
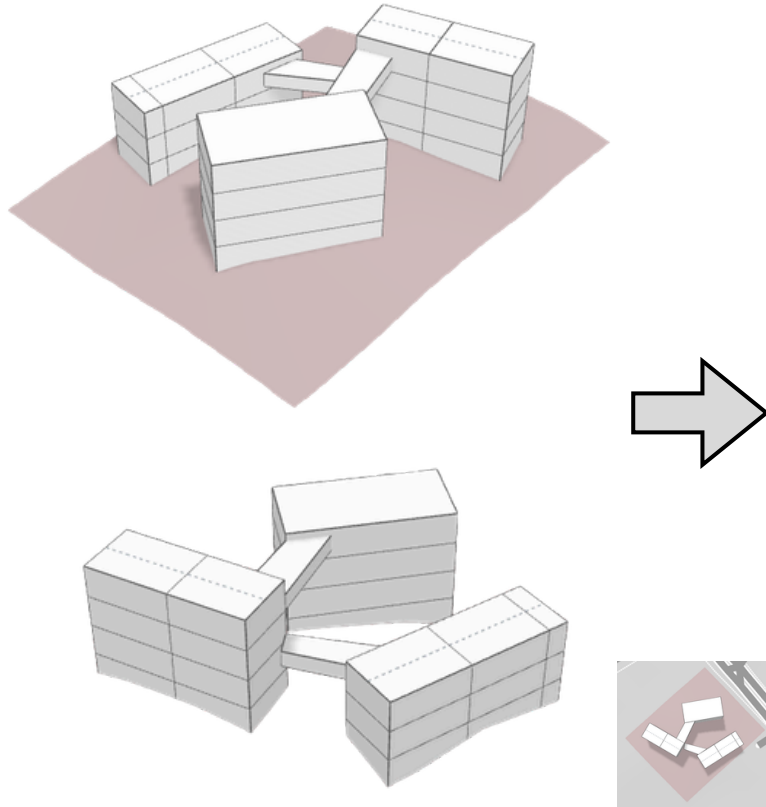


- Bridges connect the three separate programme blocks, encouraging movement, interaction and collaboration.
- Openings between the blocks allow prevailing winds to enter and ventilate the central courtyard.
- Roofs receive strong sunlight while the blocks and bridges shade the courtyard and circulation below.
- Outer façades receive strong daylight, while internal façades and bridge junctions receive less daylight.
- Highly exposed roofs provide suitable areas for PV panels and renewable-energy generation.
- Parts of the enclosed courtyard may retain heat and experience weaker airflow, requiring further massing developments

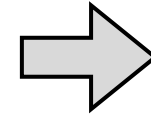
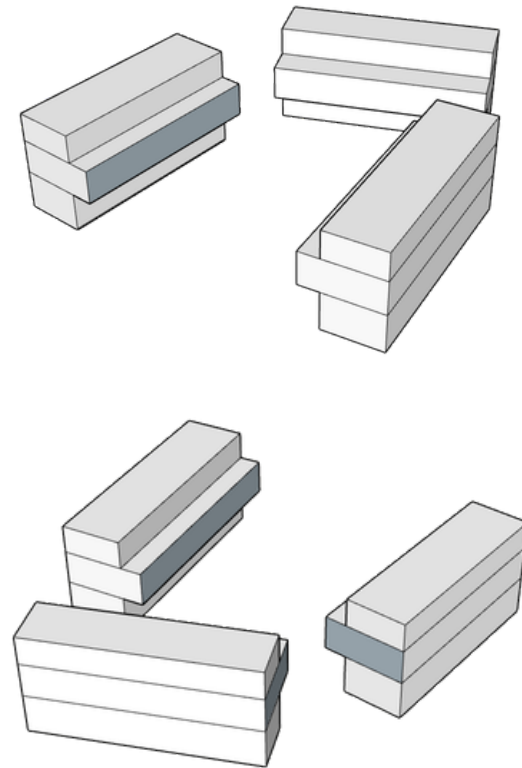
FINAL CONCEPT

Massing Development

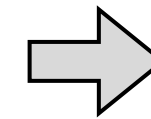
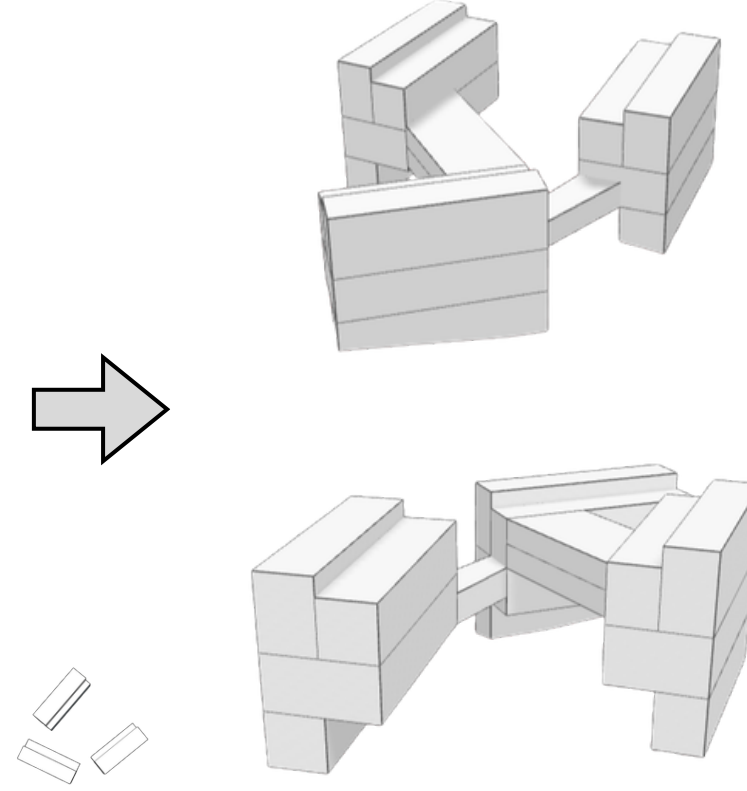
*Starting
Mass*



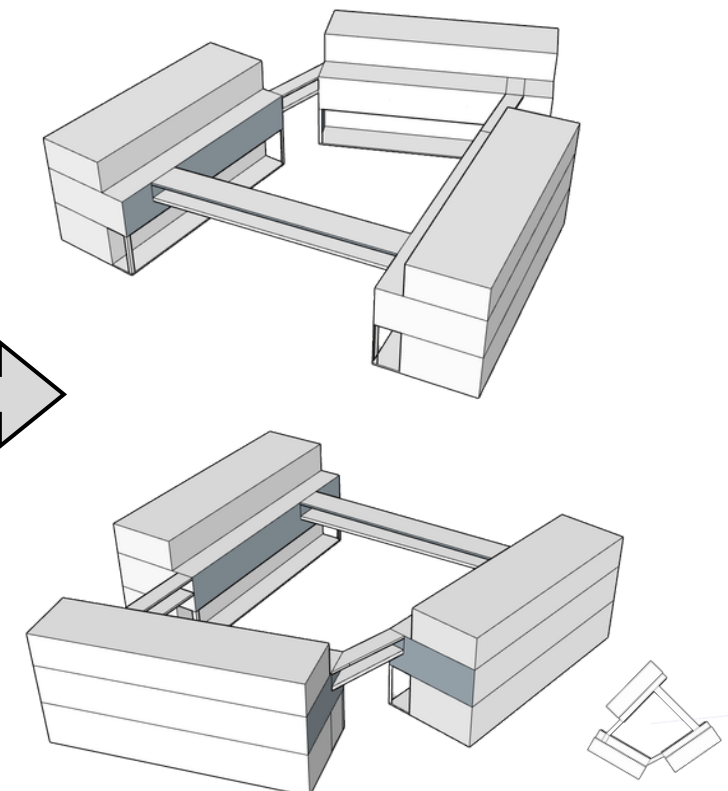
*Reorientation
of Blocks*



*Rough Joining of Bridges
Cut Out Voids and Steps*



*Refined
Final Mass*



1. Starting Mass, The Bridger

- Three separate blocks form a central shared courtyard.
- Bridges connect the blocks physically and visually.
- Selected for its strong wind capture, microclimate performance and programme connectivity.
- Initial challenges included shaded internal façades, heat retention and uneven courtyard airflow.

2. Reorientation of Blocks

- Blocks were rotated and repositioned to respond to north, south and south-east winds.
- Openings were aligned to channel airflow through the central courtyard.
- Block spacing was increased to improve daylight and reduce self-shadowing.
- The blocks were positioned to maintain a noise buffer from Dover Road.

3. Bridge Integration, Voids and Stepping

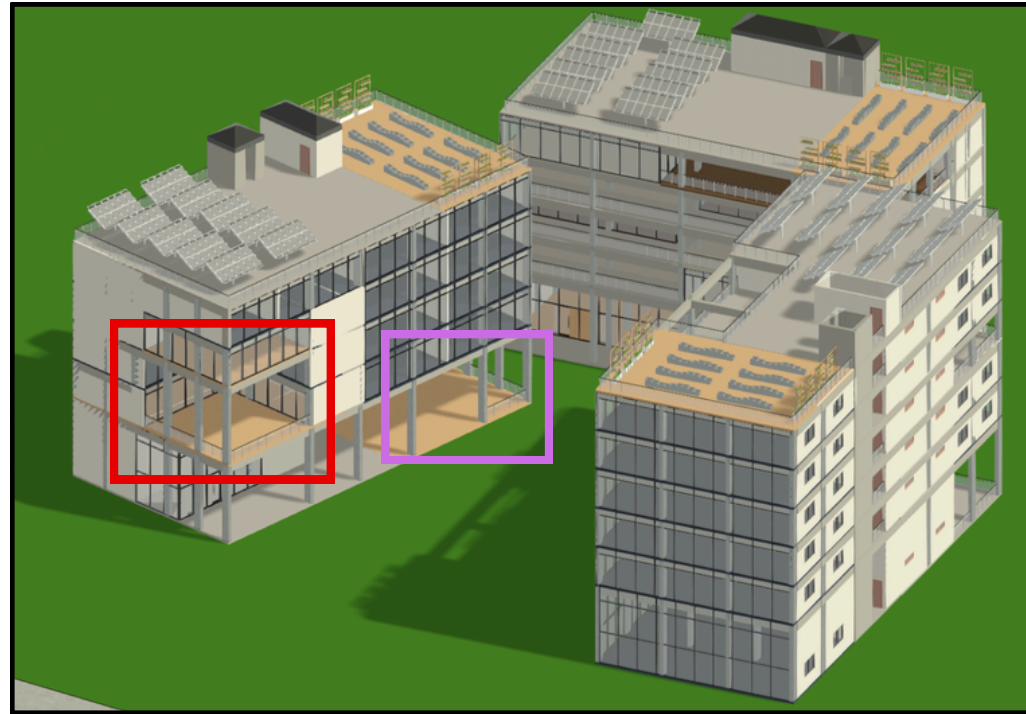
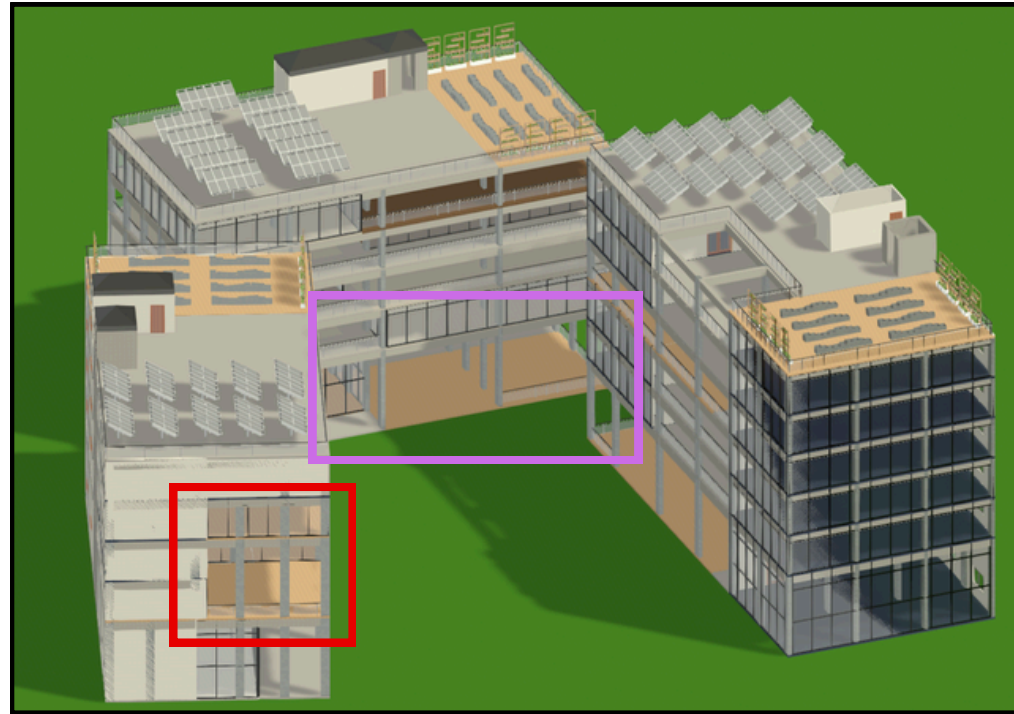
- Bridges were positioned to create direct circulation between the three programme blocks.
- Voids were introduced below and between volumes to improve airflow and daylight.
- Selected floors were recessed to create shaded terraces and outdoor learning spaces.
- Building heights were stepped to reduce bulk, improve solar access and expose roofs for PV.

4. Refined Final Mass

- Block and bridge positions were rationalised.
- The open courtyard improves collaboration and airflow.
- Voids and setbacks increase daylight and shade.
- Exposed roofs provide space for PV panels.
- Final mass balances connectivity and environmental performance.

PLACEMENT OF DOUBLE HEIGHT VOIDS

Massing Development



Double height void outlined in red spans across level 2 and 3, entire ceiling of first storey is stretched to twice the height (6000mm) of the typical storey.

Ground floor voids help **break down** the **building mass**, and creates a more **porous ground plane** that allows prevailing winds to penetrate deeper into the site. As visitors enter the space, it feels **expansive and open**, the **high ceilings** symbolize the never ending cycle of **learning and innovation**.

Subtracted void from **level 2 to 3** of the left block creates **visual interest** on the road frontage as well as **visual connection** between **levels**. The void helps to connect **interior activity** with the street and creates opportunities for **daylight** and **ventilation**.



FACADE

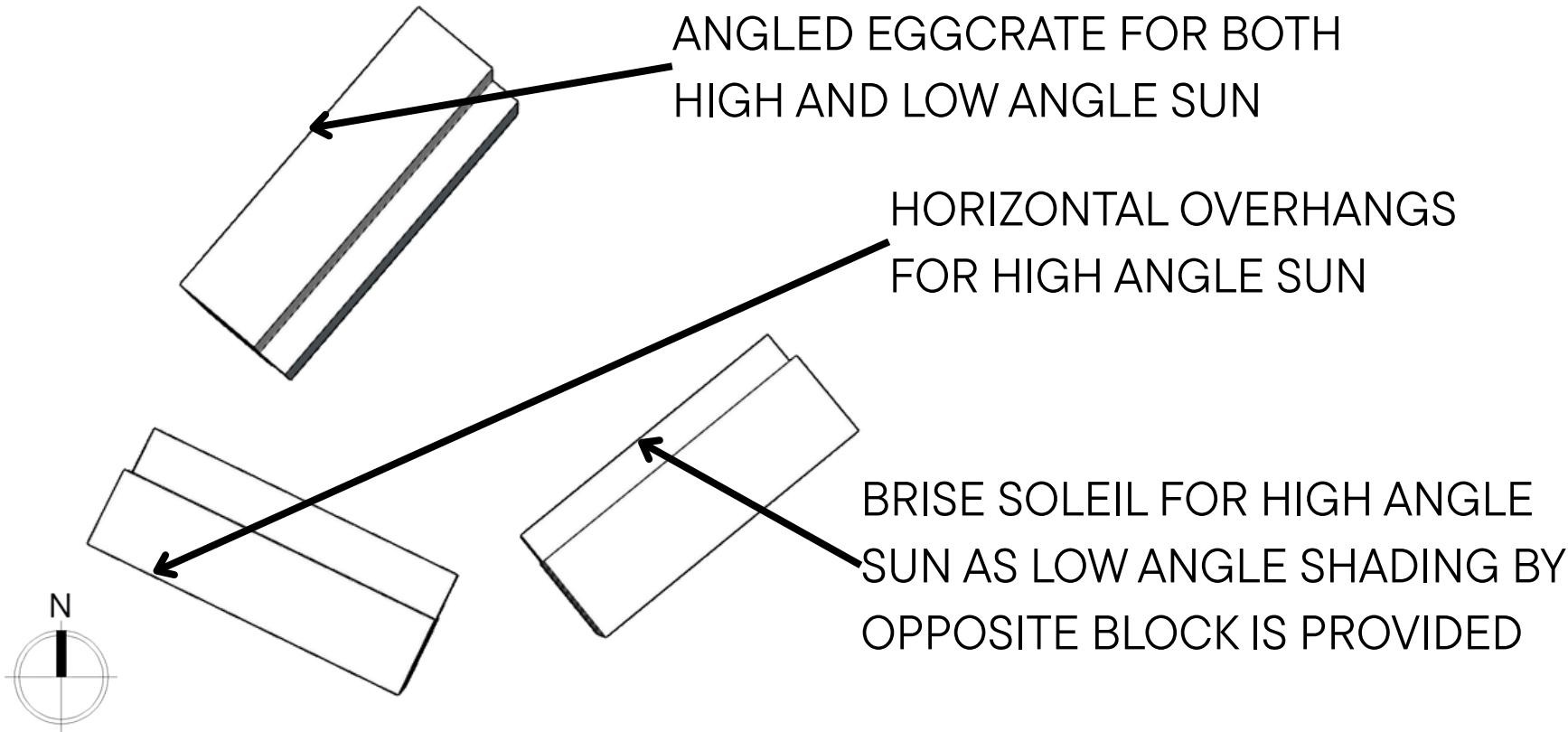
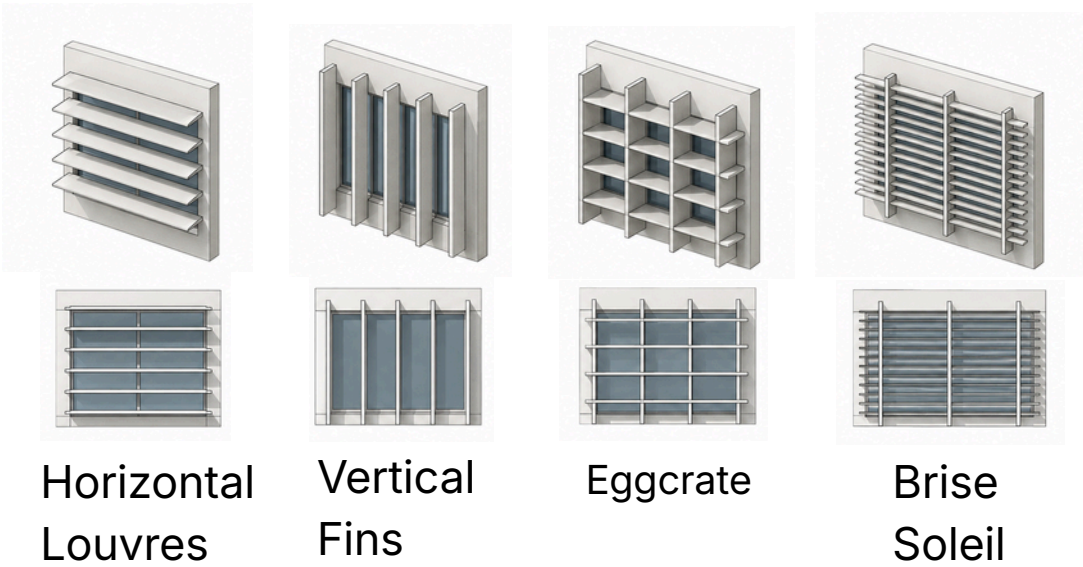
PROJECT FACADE

TYPE OF FACADES FEATURES WHY THESE FACADES

- | | |
|--|---|
| <ul style="list-style-type: none">• FULL HEIGHT WINDOWS• RECESSIONS AND VOIDS | <ul style="list-style-type: none">• FULL HEIGHT WINDOWS MAKE USE OF SHADING PROVIDED BY OTHER BLOCKS TO MITIGATE HARSH SUNLIGHT BUT PROMOTE NATURAL AND DIFFUSED DAYLIGHTING• RECESSIONS AND VOIDS HELP CREATE SHADING OPPORTUNITIES TO REDUCE DIRECT SUNLIGHT |
|--|---|

POTENTIAL FACADE TREATMENT

TYPE OF FACADES FEATURES WHERE TO PLACE FEATURES



ZONING

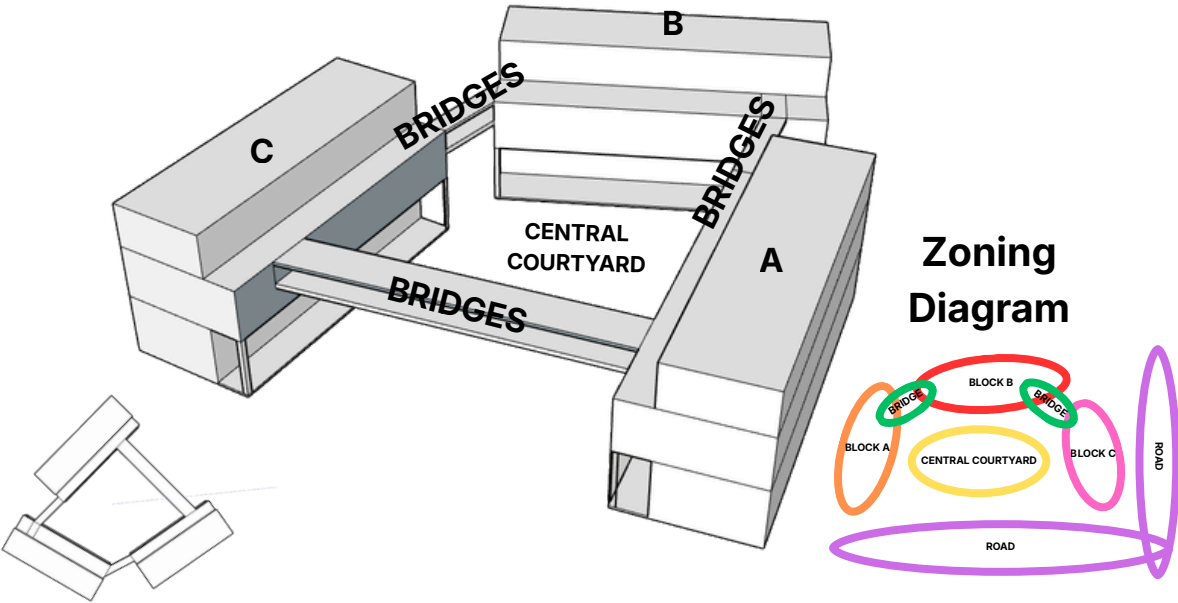
PROGRAMME SCHEDULE

Overview

All Needed Programmes:

Zone	Description	Approx. Area (m²)	Number of Required
1. Reception and arrival	Reception, coat check, wayfinding	80 m²	1
2. Large computer lab	Fixed seating for 40 workstations	150 m²	10
3. Flexible teaching studio	Lecture/performance stage, lectern, screen/projection	120 m²	5
4. Collaborative workspace	Open area with desks/collaboration spaces	150 m²	5
5. Innovation/ Maker space	Multipurpose learning room + flexible space	100 m²	3
6. Academic offices	Offices (2–3 desks), staff WC, kitchen	60 m²	10
7. Social learning zone	Open area with desks/collaboration spaces	100 m²	1
8. Core facilities	Public toilets incl. accessible WC, baby change	50 m²	Per floor
9. Plant and renewable infrastructure	Electrical room, renewable energy equipment, janitorial	50 m²	1

Type of Blocks Analysis:



Programme Analyses:

Programme	Brief requirement	Spatial and environmental needs	Important adjacencies	Best location	Placement rationale
Reception and arrival	1 × 80 m²	Highly visible, legible entrance; direct pedestrian access; open	Social learning, courtyard, vertical circulation and all three	Block C – ground floor	C is closest to the main site arrival, allowing visitors to
Large computer labs	10 × 150 m² = 1,500 m²	Regular column-free rooms; controlled daylight; minimal	Collaborative workspaces, toilets and bridge circulation	Block A	Enclosed labs are less dependent on quiet external
Flexible teaching studios	5 × 120 m² = 600 m²	Flexible rectangular proportions; good daylight; low	Collaborative workspaces, maker spaces, bridges and	Block B	The quieter rear edge and greenery support
Collaborative workspaces	5 × 150 m² = 750 m²	Open, visible and adaptable spaces; daylight and natural	Labs, studios, maker spaces, bridges and courtyard	2 in A, 2 in B, 1 in C	Distributing them prevents collaboration from becoming
Innovation/Maker spaces	3 × 100 m² = 300 m²	Robust flexible floorplate; higher servicing needs;	Teaching studios, collaboration spaces and service access	Block B – lower levels	This creates a direct teaching–making relationship. However,
Academic offices	10 × 60 m² = 600 m²	Privacy, controlled access, daylight and lower noise;	Reception, teaching studios and bridges	Block C – upper levels	C gives staff convenient oversight of arrival and access
Social learning zone	1 × 100 m²	Highly accessible, informal and visible; connection to outdoor	Reception, courtyard, bridges and collaboration spaces	Block C – ground floor/courtyard edge	Forms the public and community-facing heart of C
Core facilities	50 m² per floor	Central and easy to find; toilets stacked vertically; accessible	All occupied programmes and vertical circulation	Each occupied floor/block	Core facilities must serve users without long travel distances.
Plant and renewable infrastructure	1 × 50 m²	Restricted access; ventilation; maintenance access; proximity	Service route, roof PV system and electrical distribution	Block C – service-side ground floor/roof connection	C’s accessible road-side position simplifies maintenance

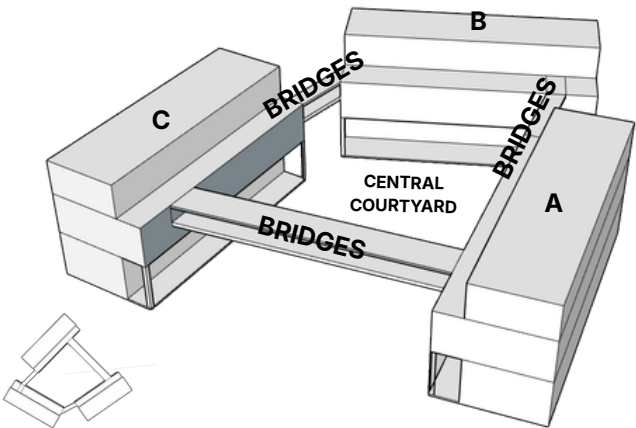
PROGRAMME SCHEDULE

Overview

Block Allocation Summary

Block	Programme identity	Main spaces	Environmental response
A	Digital Learning	10 computer labs + 2 collaborative workspaces	Enclosed digital rooms buffer road noise; collaboration faces the courtyard
B	Teaching and Innovation	5 teaching studios + 3 maker spaces + 2 collaborative workspaces	Quiet green-facing teaching environment; maker spaces contained on lower courtyard side
C	Community and Academic	Reception + 10 offices + social learning + 1 collaborative workspace + plant	Creates the visible public arrival and connects staff, students and community users
Bridges	Collaborative circulation	Movement, informal exchange and project display	Turns circulation into an active learning connection between specialised blocks
Central courtyard	Adaptive shared commons	Outdoor learning, temporary events, exhibitions and spill-out	Preserves flexibility while improving daylight, ventilation and visual connection between blocks

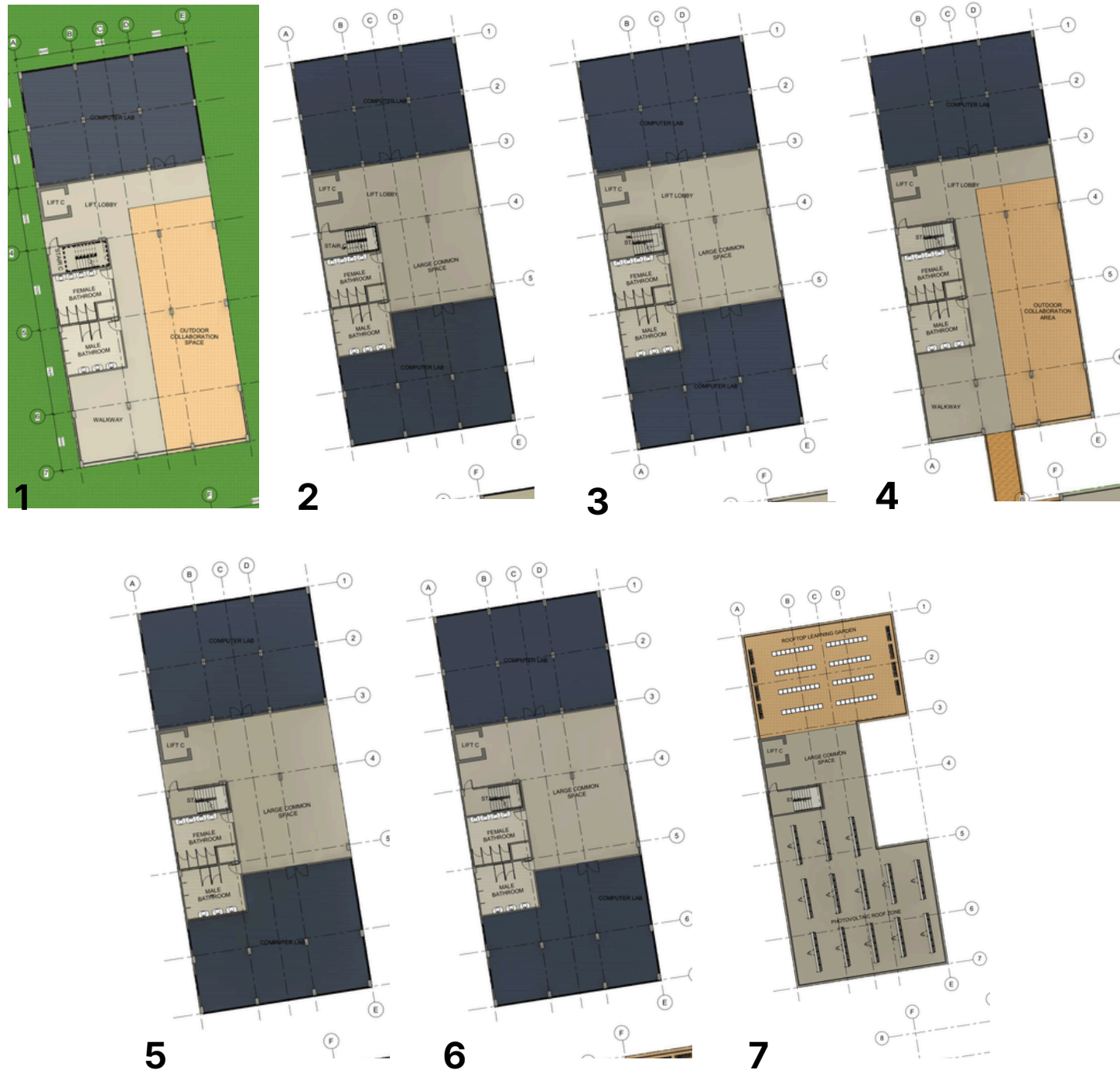
The central courtyard is intentionally left without a fixed programme so that it can adapt to exhibitions, outdoor teaching, temporary installations, community events and informal collaboration. Rather than introducing another enclosed room, the courtyard operates as a shared climatic and social space linking all three specialised blocks.



ZONING LAYOUT

In Depth Step-By-Step

LEVELS 1-7



BLOCK A - DIGITAL LEARNING

- Place toward the noisier Dover Road edge.
- 10 × computer labs: 1,500 m²
- 2 × collaborative workspaces: 300 m²
- Supporting core facilities
- Purpose: Concentrates digital learning and forms an acoustic buffer from road noise.

STEP BY STEP:

Level 1 – Lab 1 + Collaboration A1

We placed Lab 1 along the noisy 62–68 dBA road edge as an acoustic buffer. Collaboration A1 faces the courtyard for direct spill-out, with shade and planting to address weak 2.2 m/s ground wind and 35–40°C conditions.

Level 2 – Labs 2 and 3

Two labs flank the central lobby and common space, creating regular layouts and shared cooling, power and data routes. Controlled glazing reduces screen glare despite the Bridger's 55% daylight potential.

Level 3 – Labs 4 and 5

We repeated the two-lab layout to maintain efficient vertical servicing. The enclosed labs occupy the outer edges, while the common space faces the quieter courtyard.

Level 4 – Lab 6 + Collaboration A2

Collaboration A2 is placed beside the bridge to connect digital learning with Block B's teaching and maker spaces. As bridge junctions receive only 15–38% daylight, the darker landing supports circulation and display while the main workspace sits farther into the brighter courtyard-facing area.

Level 5 – Labs 7 and 8

The labs remain mechanically controlled, while stronger upper-level airflow supports natural ventilation in the common space. Courtyard-facing areas maintain visual connection between the blocks.

Level 6 – Labs 9 and 10

The final two labs complete the required ten-lab programme. The common space benefits from approximately 2.9–3.2 m/s upper-level wind and functions as a naturally ventilated breakout zone.

Level 7 – Learning roof

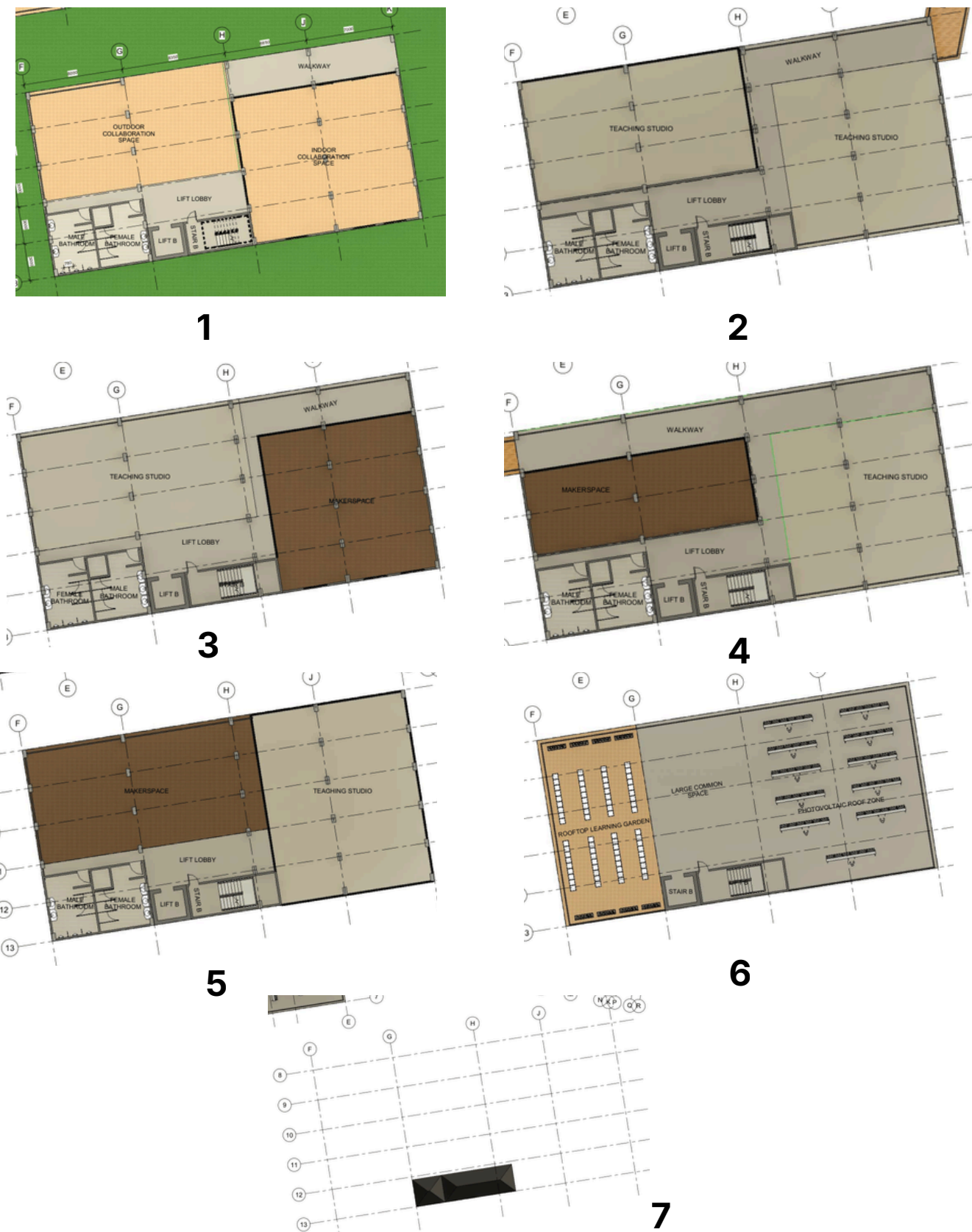
We placed PV on the most exposed roof areas, which receive approximately 1,825–1,832 kWh/m². The garden sits beside the lift and common space, with shade provided against eight average sun hours and stronger 3.2–3.6 m/s winds.

Programme Schedule

ZONING LAYOUT

In Depth Step-By-Step

LEVELS 1-7



BLOCK B - TEACHING AND INNOVATION

- Place along the quieter site edge.
- 5 × flexible teaching studios: 600 m²
- 3 × innovation/maker spaces: 300 m²
- 2 × collaborative workspaces: 300 m²
- Supporting core facilities
- Purpose: Allows teaching, experimentation and making to interact directly.

STEP BY STEP:

Level 1 – Collaboration B1 and B2

Indoor and outdoor collaboration occupy the quieter southern edge and face the courtyard. The outdoor area is positioned near a wind opening and shaded from the hotter courtyard centre.

Level 2 – Teaching Studios 1 and 2

We placed the studios along the quieter green-facing edge for concentration, views and diffused daylight. Horizontal shading controls the site's high solar exposure.

Level 3 – Teaching Studio 3 + Maker Space 1

Pairing teaching and making allows students to move directly between instruction and prototyping. The maker space sits nearer Lift B and the service risers for equipment and material movement.

Level 4 – Teaching Studio 4 + Maker Space 2

Level 4 becomes the main interdisciplinary floor because its bridges connect the digital, teaching and academic blocks. The maker space stacks above Level 3, while the studio faces the quieter courtyard/green edge.

Level 5 – Teaching Studio 5 + Maker Space 3

The final teaching-maker pair supports advanced project work. Stacking the maker spaces reduces duplicated electrical, ventilation and service routes.

Level 6 – Innovation roof

The learning garden connects to the common space and uses stronger 2.9–3.2 m/s upper-level airflow. PV occupies the most exposed roof area, while shaded courtyard-facing portions support outdoor learning.

Level 7

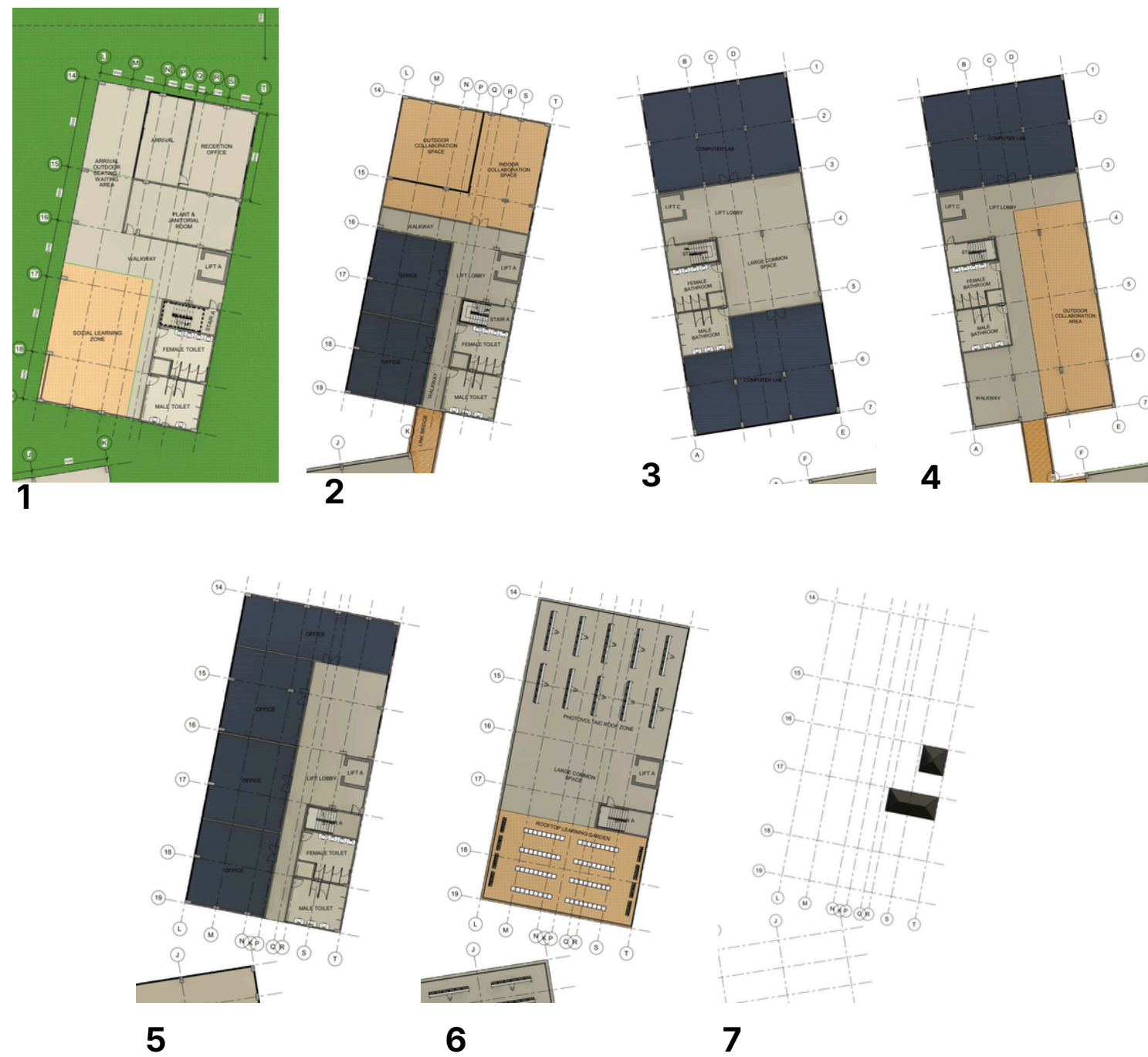
No enclosed programme is added, preventing unnecessary floor area and preserving roof infrastructure access.

Programme Schedule

ZONING LAYOUT

In Depth Step-By-Step

LEVELS 1-7



BLOCK C - COMMUNITY AND ACADEMIC

- Place closest to the main pedestrian arrival.
- Reception and arrival: 80 m²
- 10 × academic offices: 600 m²
- Social learning zone: 100 m²
- 1 × collaborative workspace: 150 m²
- Plant and renewable infrastructure: 50 m²
- Supporting core facilities
- Purpose: Block C occupies the Dover Road and principal arrival edge. Public and service functions form the road-side layer, while social learning, collaboration and offices face the quieter courtyard.

STEP BY STEP:

Level 1 – Arrival, social learning and plant

Reception faces the main arrival route for clear wayfinding, while social learning opens toward the quieter courtyard. Plant, toilets and vertical circulation occupy the road/service side, buffering public spaces from noise and connecting to the roof PV system.

Level 2 – Collaboration C1 + Offices 1 and 2

The indoor and outdoor areas form one integrated collaborative workspace beside the Block B bridge. Offices occupy the more private side, away from concentrated bridge movement.

Level 3 – Offices 3, 4 and 5

The offices face the quieter courtyard for daylight and views. The lift, stair and toilets buffer them from the road-facing façade.

Level 4 – Offices 6, 7 and 8

Private offices are separated from the main bridge route, while the shared area supports staff breakout, waiting and project display without becoming a second formal collaboration space.

Level 5 – Offices 9 and 10 + staff support

The final two offices complete the ten-office requirement. The remaining area provides the required staff kitchen, WC, meeting, storage and printing facilities.

Level 6 – Community roof

The garden is placed beside the common space and lift access, while PV occupies the exposed roof zone. Shade, planting and permeable wind screens improve comfort under stronger upper-level wind and solar exposure.

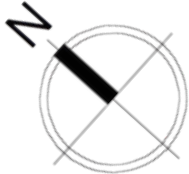
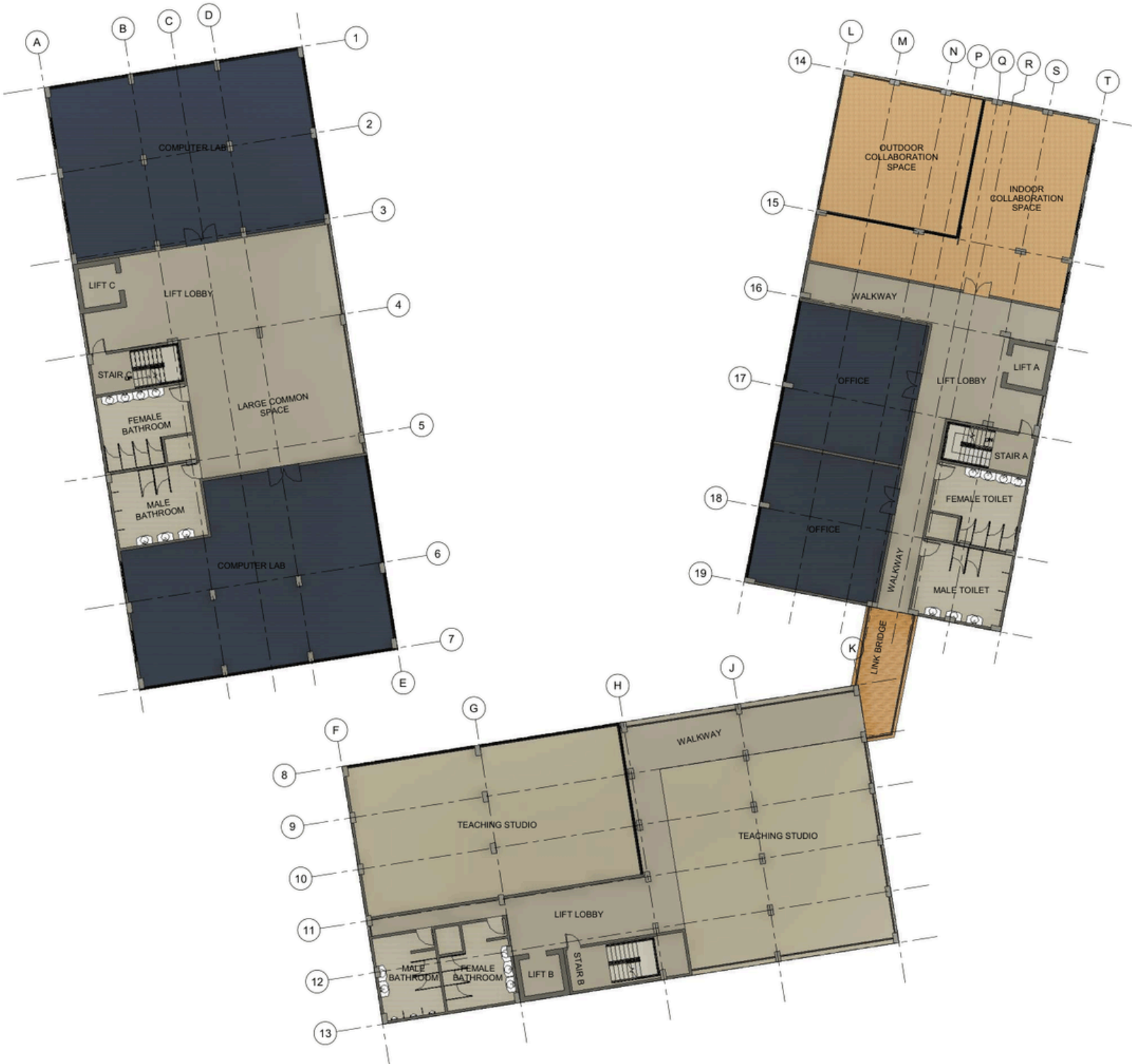
Level 7

No additional enclosed programme is required; remaining elements are limited to roof and vertical-circulation infrastructure.

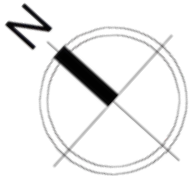
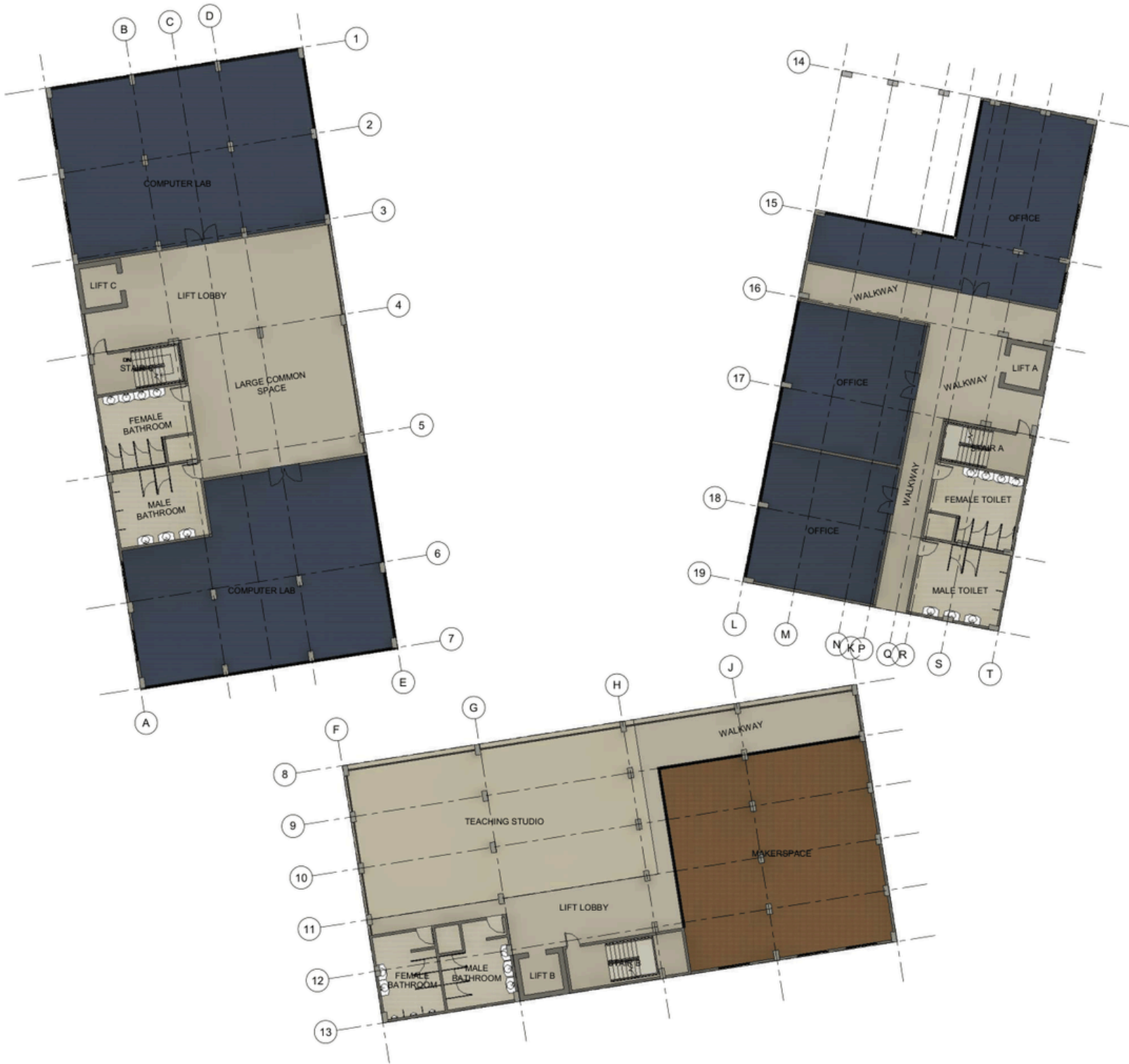
FINAL DRAWINGS AND RENDERS



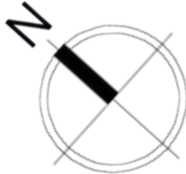
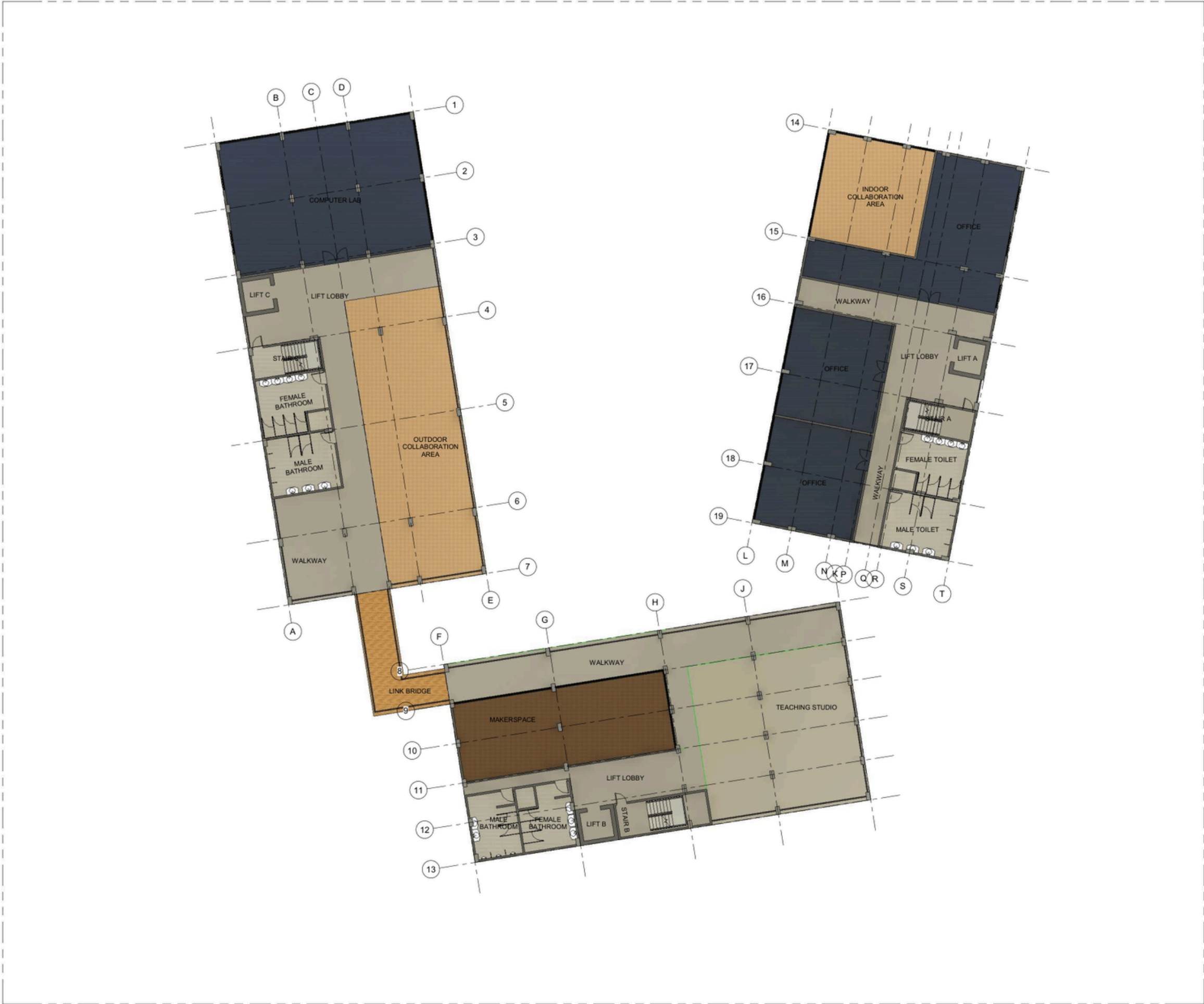
SECOND STOREY PLAN



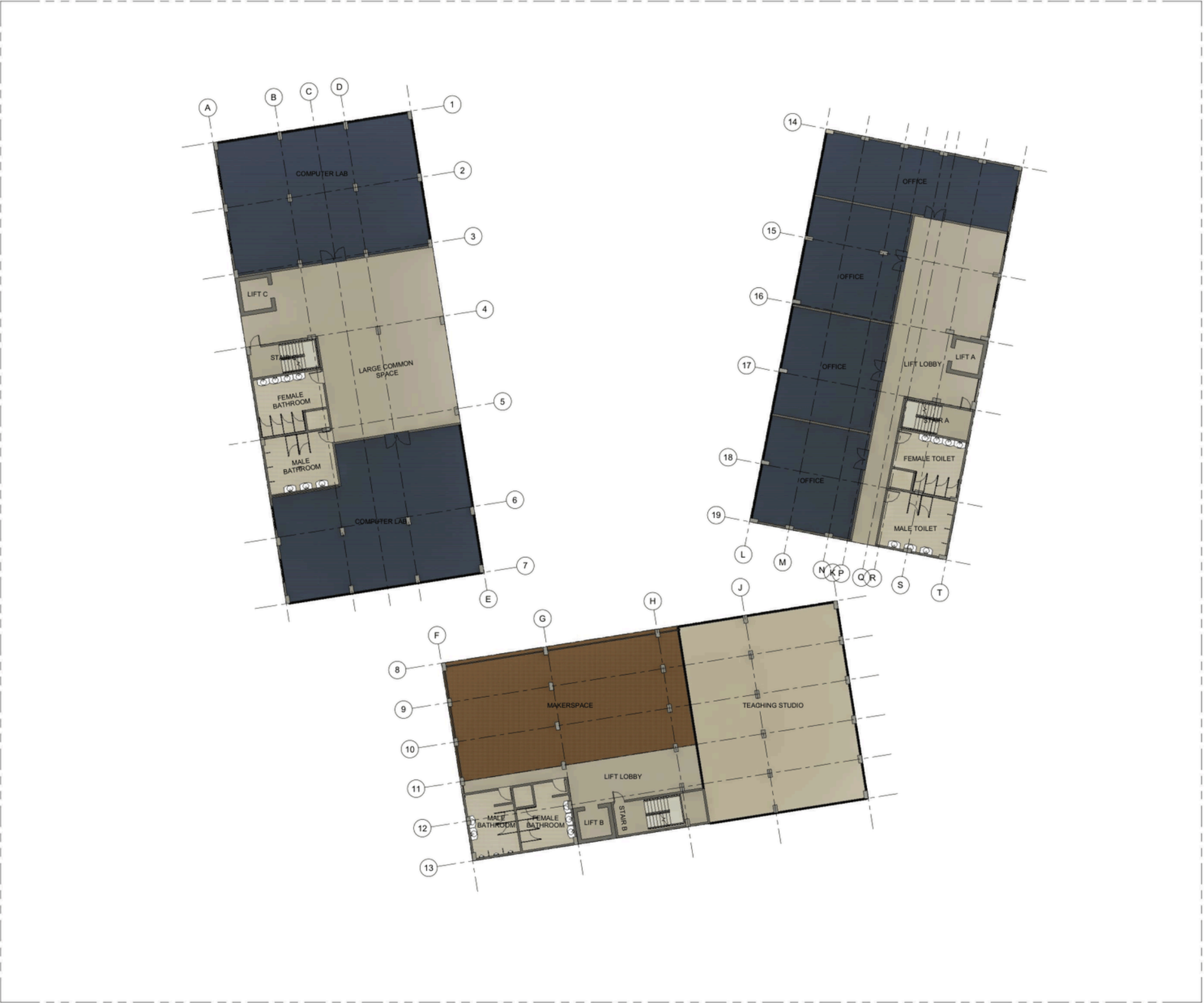
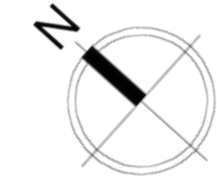
THIRD STOREY PLAN



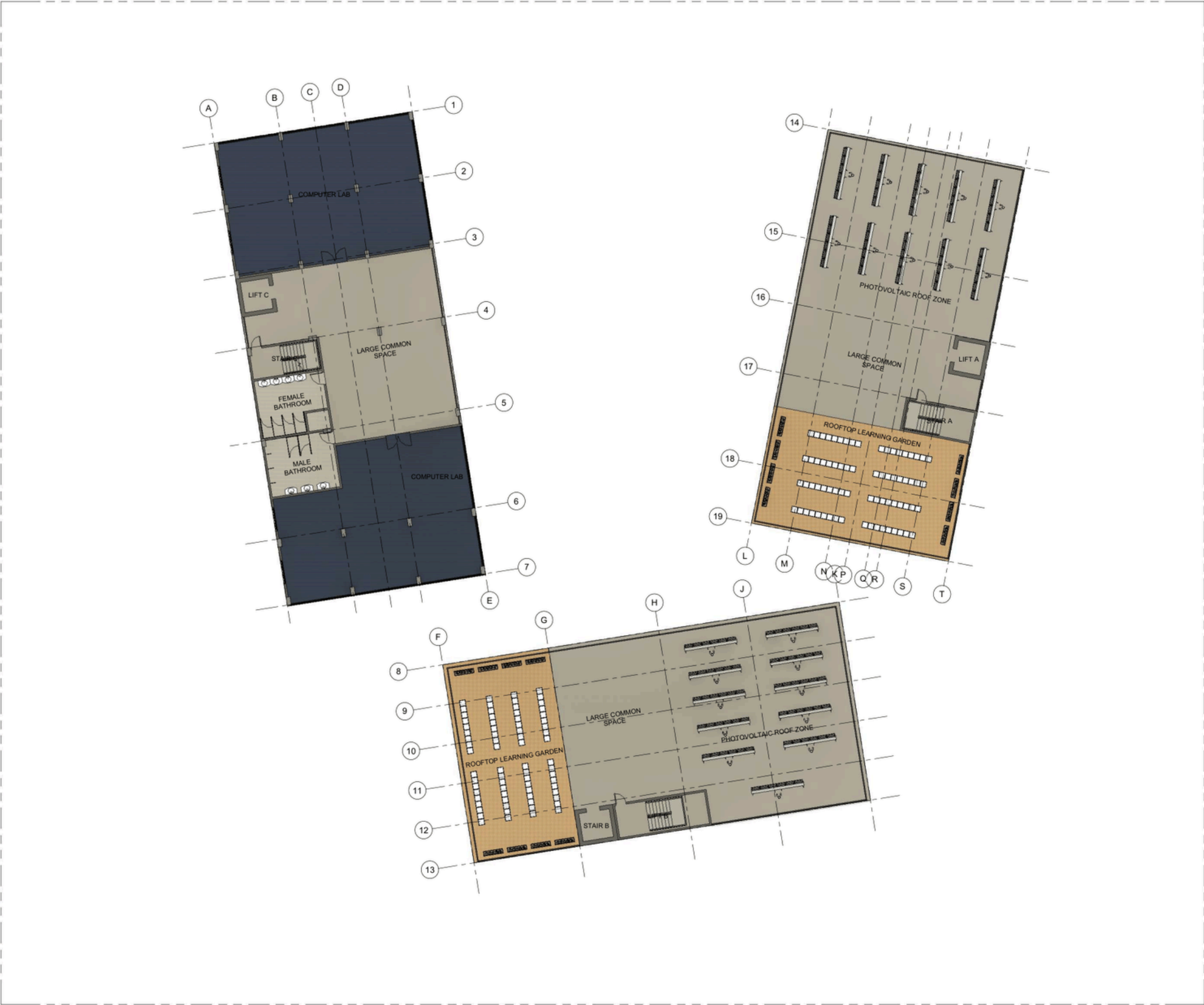
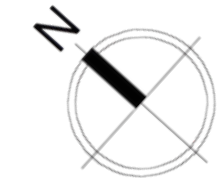
FOURTH STOREY PLAN



FIFTH STOREY PLAN

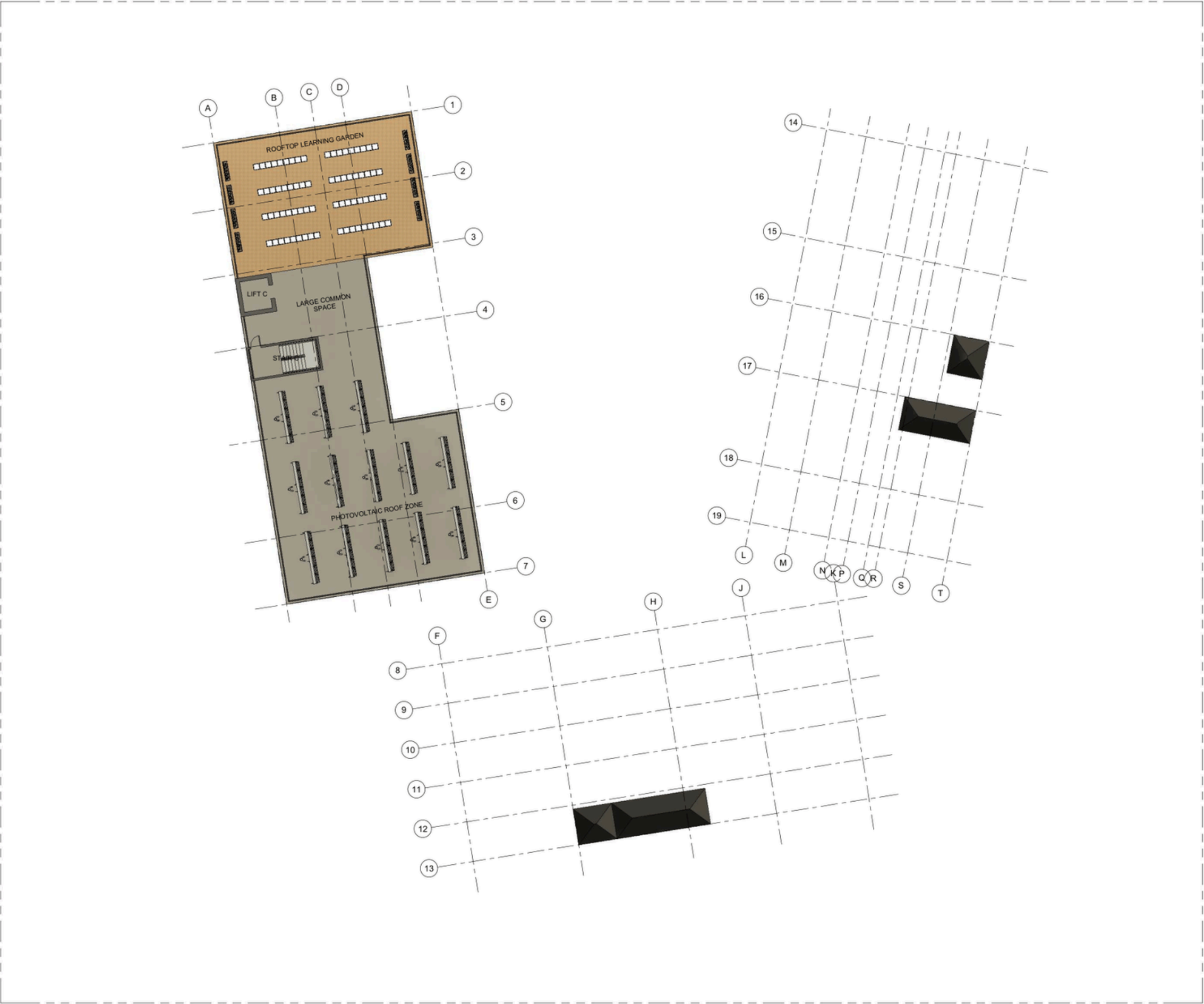
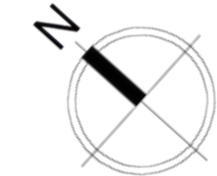


SIXTH STOREY PLANS

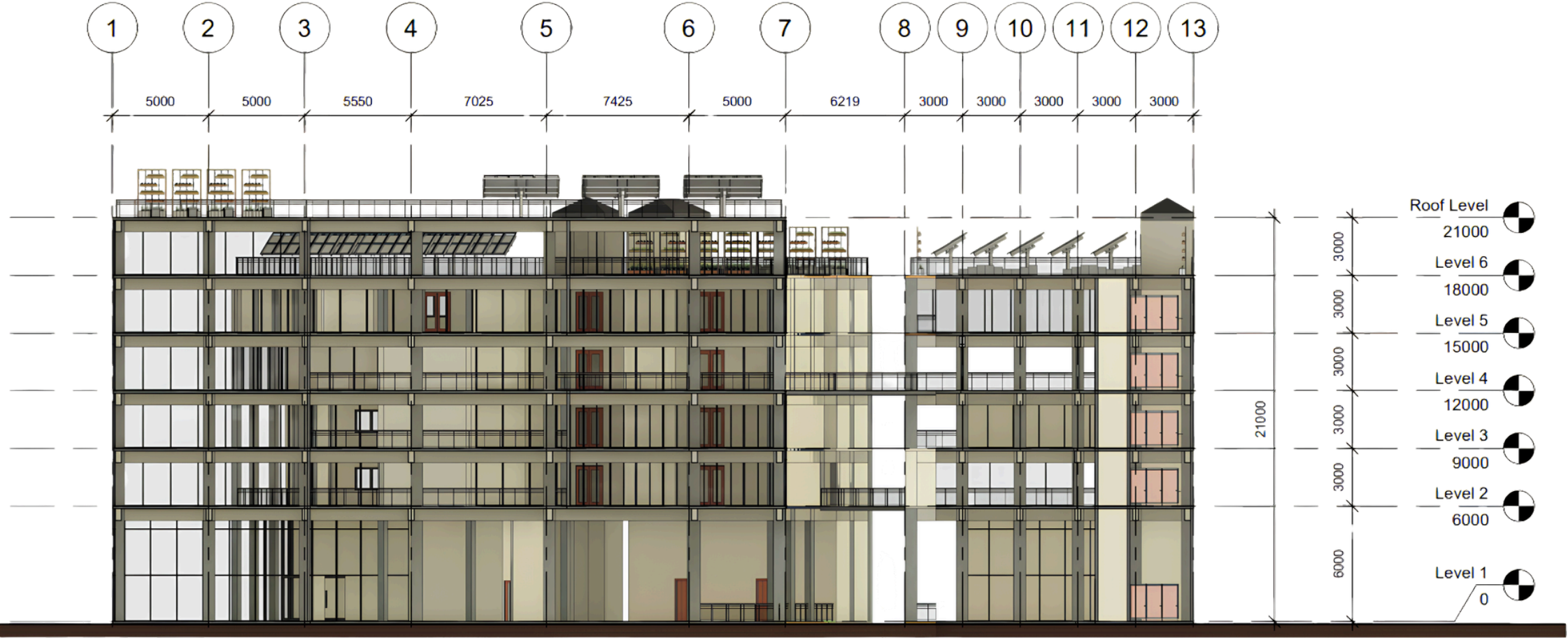


Final Submission

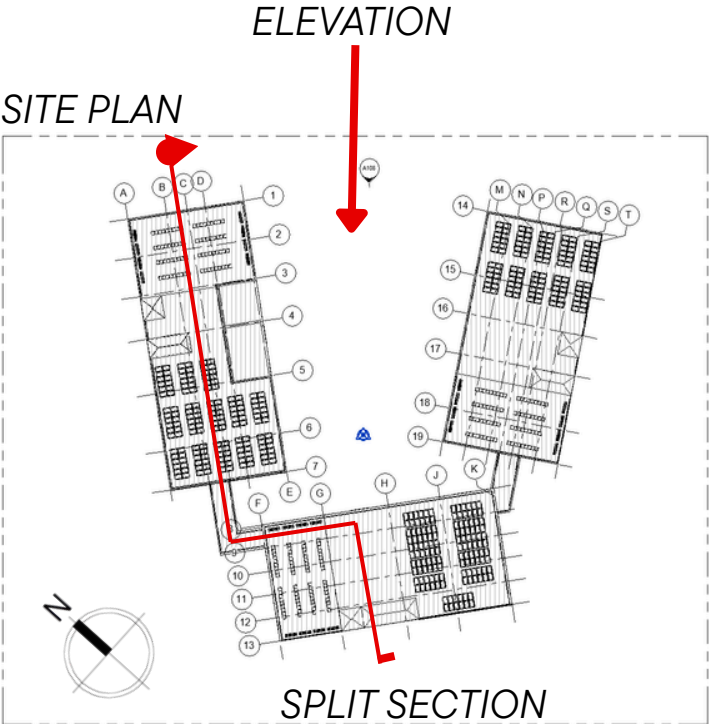
ROOF PLANS



SECTION



ELEVATION



Final Submission

3D EXTERIOR RENDERS



INTERIOR RENDERS



REQUIREMENTS

AREA BREAKDOWN PER ROOM FOR ALL FLOORS

Properties

Schedule

Schedule: Area Schedule (Gross Building) Edit Type

Identity Data

View Template: <None>

View Name: Area Schedule (Gross Building)

Dependency: Independent

IFC Parameters

Export to IFC: By Type

Other

Fields: Edit...

Filter: Edit...

Sorting/Grouping: Edit...

Formatting: Edit...

Appearance: Edit...

Project Browser - BUILDATHON 2026_Tough...

Search

Views (all)

Structural Plans

Floor Plans

Level 1

Level 2

Level 3

Level 4

Level 5

Level 6

ROOF LEVEL

Site

Ceiling Plans

Level 1

3D Views

Area Plans (Gross Building)

Level 1

Level 2

Level 3

Level 4

Level 5

Level 6

<Area Schedule (Gross Building)>

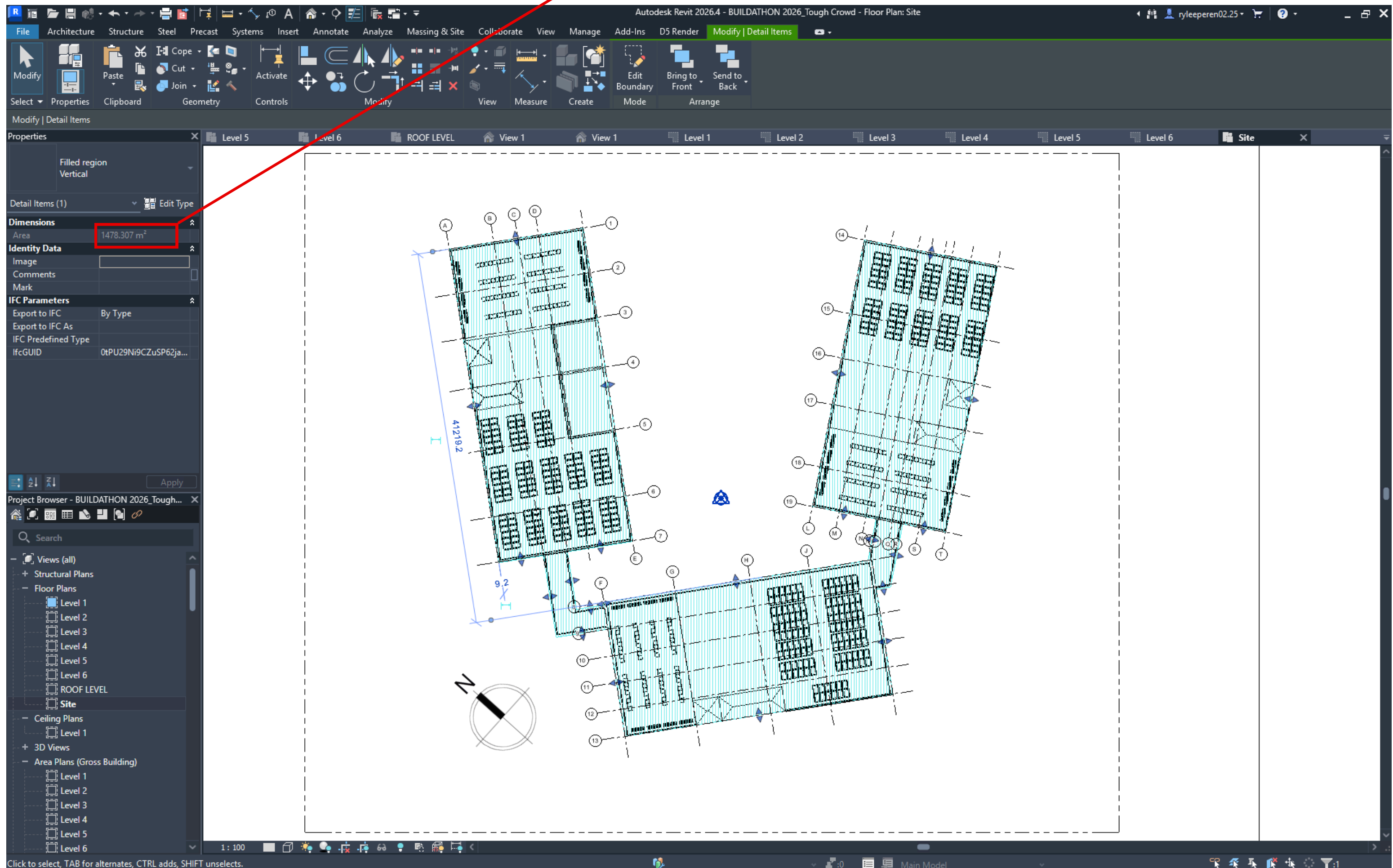
A Level	B Name	C Area
Level 1	COLLABORATION	165 m²
Level 1	COLLABORATION	144 m²
Level 1	COMPUTER LAB	154 m²
Level 1	PLANT &	52 m²
Level 1	RECEPTION	85 m²
Level 1	SOCIAL LEARNING	109 m²
Level 1	TOILET	42 m²
Level 1	TOILET	62 m²
Level 1	TOILET	62 m²
Level 2	COLLABORATION	169 m²
Level 2	COMPUTER LAB	154 m²
Level 2	COMPUTER LAB	152 m²
Level 2	OFFICE	63 m²
Level 2	OFFICE	65 m²
Level 2	TEACHING STUDIO	143 m²
Level 2	TEACHING STUDIO	146 m²
Level 2	TOILET	41 m²
Level 2	TOILET	48 m²
Level 2	TOILET	49 m²
Level 3	COMPUTER LAB	154 m²
Level 3	COMPUTER LAB	152 m²
Level 3	MAKERSPACE	164 m²
Level 3	OFFICE	103 m²
Level 3	OFFICE	64 m²
Level 3	OFFICE	64 m²
Level 3	TEACHING STUDIO	153 m²
Level 3	TOILET	41 m²
Level 3	TOILET	48 m²
Level 3	TOILET	49 m²
Level 4	COLLABORATION	160 m²
Level 4	COMPUTER LAB	154 m²
Level 4	MAKERSPACE	99 m²
Level 4	OFFICE	101 m²
Level 4	OFFICE	65 m²
Level 4	OFFICE	63 m²
Level 4	TEACHING STUDIO	144 m²
Level 4	TOILET	41 m²
Level 4	TOILET	49 m²
Level 4	TOILET	49 m²
Level 5	COMPUTER LAB	154 m²
Level 5	COMPUTER LAB	152 m²
Level 5	MAKERSPACE	160 m²
Level 5	OFFICE	64 m²
Level 5	OFFICE	76 m²
Level 5	OFFICE	65 m²
Level 5	OFFICE	63 m²
Level 5	TEACHING STUDIO	200 m²
Level 5	TOILET	41 m²
Level 5	TOILET	48 m²
Level 5	TOILET	49 m²
Level 6	COMPUTER LAB	154 m²
Level 6	COMPUTER LAB	152 m²
Level 6	TOILET	48 m²

Zoom in or out using the Ctrl + mouse wheel or Ctrl + [+/-]. To reset to the original zoom level (100%), press Ctrl + 0.

100%

BUILDING FOOTPRINT

1478.307 SQM



RATIONALE (100-150 WORD DESIGN JUSTIFICATION TEXT)

Threefold transforms an **exposed** Dover site into a **climate-responsive learning and innovation hub connecting nearby schools, Singapore Polytechnic, residents and one-north**. Selected from **six** massing options, **the Bridger** achieved the **strongest overall balance: first for north and south-east wind capture, second for south winds, 55% daylight potential, eight average sun hours and 2.74 million kWh of potential solar energy**. **Digital-learning spaces** buffer the **62–68 dBA** Dover Road edge, while **quieter teaching, collaboration and academic** areas face a **shared courtyard**. The three blocks' **orientation, spacing, double-height voids and shaded bridges channel prevailing breezes, improve daylight and turn circulation into visible collaborative space**. **Recessed full-height glazing** maintains **visual connection and diffuse daylight** while **reducing direct heat gain**. **Green roofs, planted commons and rooftop photovoltaics** further **support passive cooling and renewable-energy generation**. At **1,478.307 m²**, **Threefold** also satisfies the **1,500 m² maximum footprint** while delivering the **full programme**.

145 WORDS

END

Thank you, from a Tough Crowd