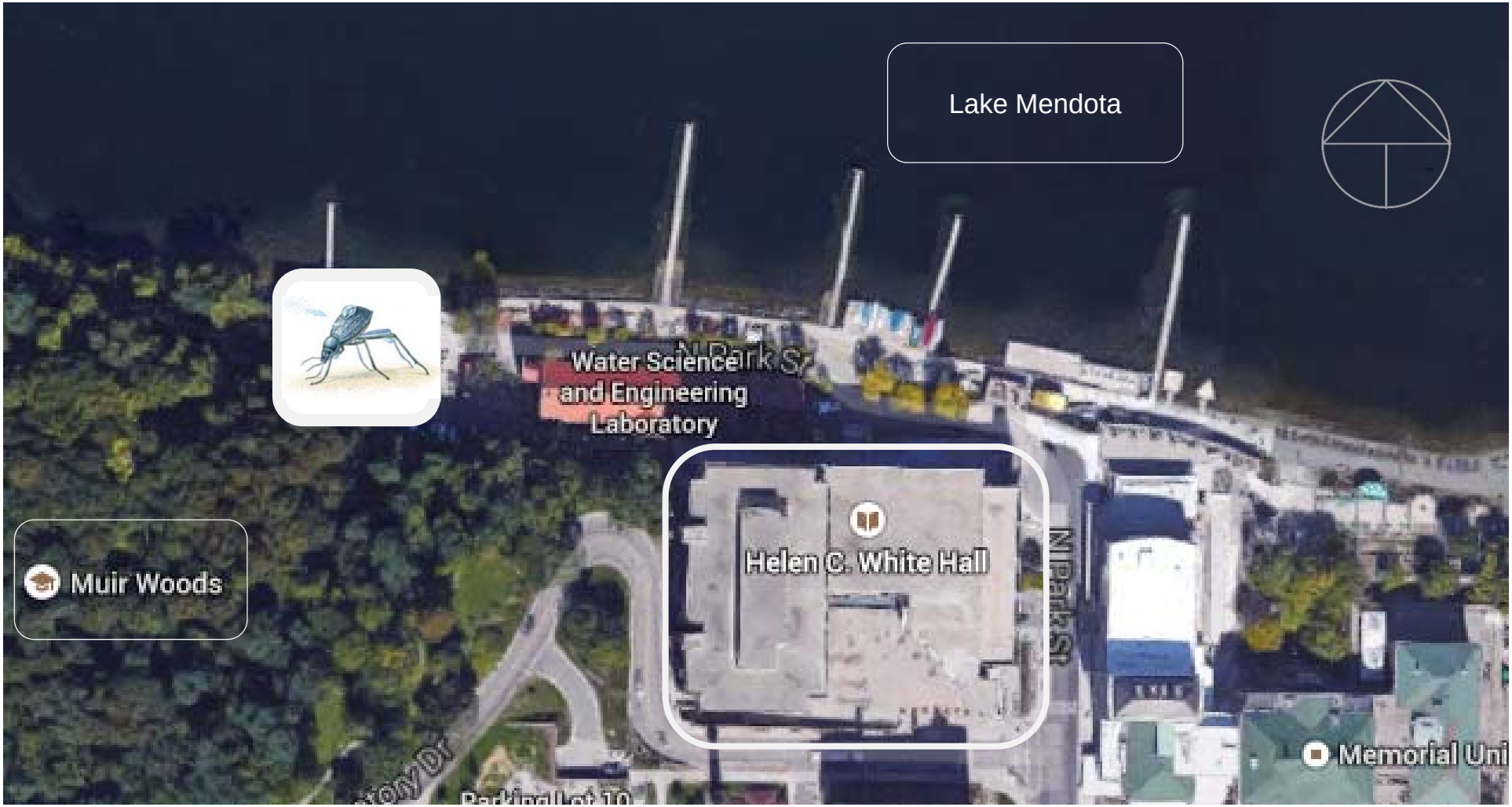

Nick, Construction Manager
Ali, Mechanical, Electrical and Plumbing
Lisa, Structural Engineer
Katja, Architect
Helsinki, Finland
Copenhagen, Denmark
Erfurt, Thunringia
Madison, Wisconsin,
Ljubljana
Slovenia
Stanford, California USA
Elisa, Life Cycle and Financial Manager
Nejc, Construction Manager
Cici, Structural Engineer
Andrej, Ljubljana
Dorian, Copenhagen
Jana, Frankfurt
Jackie, Stanford


Madison, WI
Location

Location


Lake Mendota
Water Science
and Engineering
Laboratory
Helen C. White Hall
Muir Woods
N Park St
Memorial Uni

OPEN HOUSE INVITATION

May 8

FRIDAY

1-2pm

680 Park St
Madison, WI

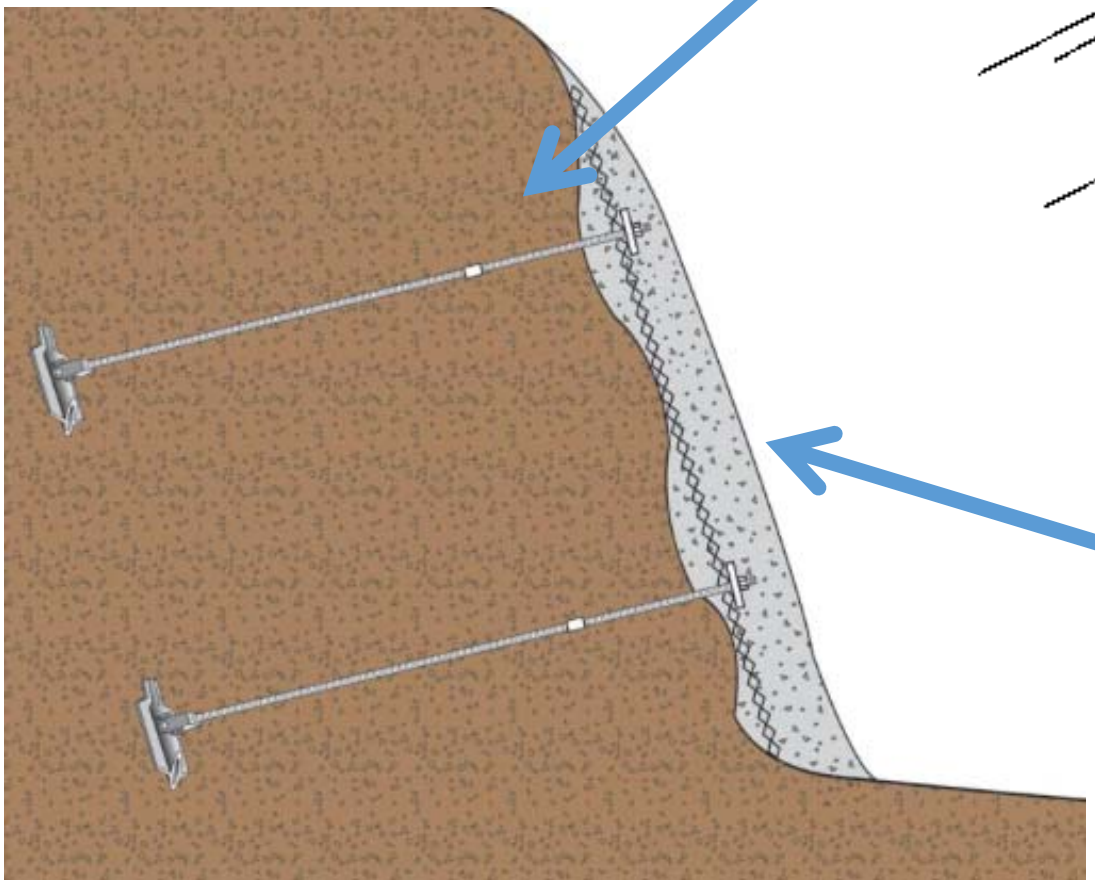
HYDROPHILIC
Shell

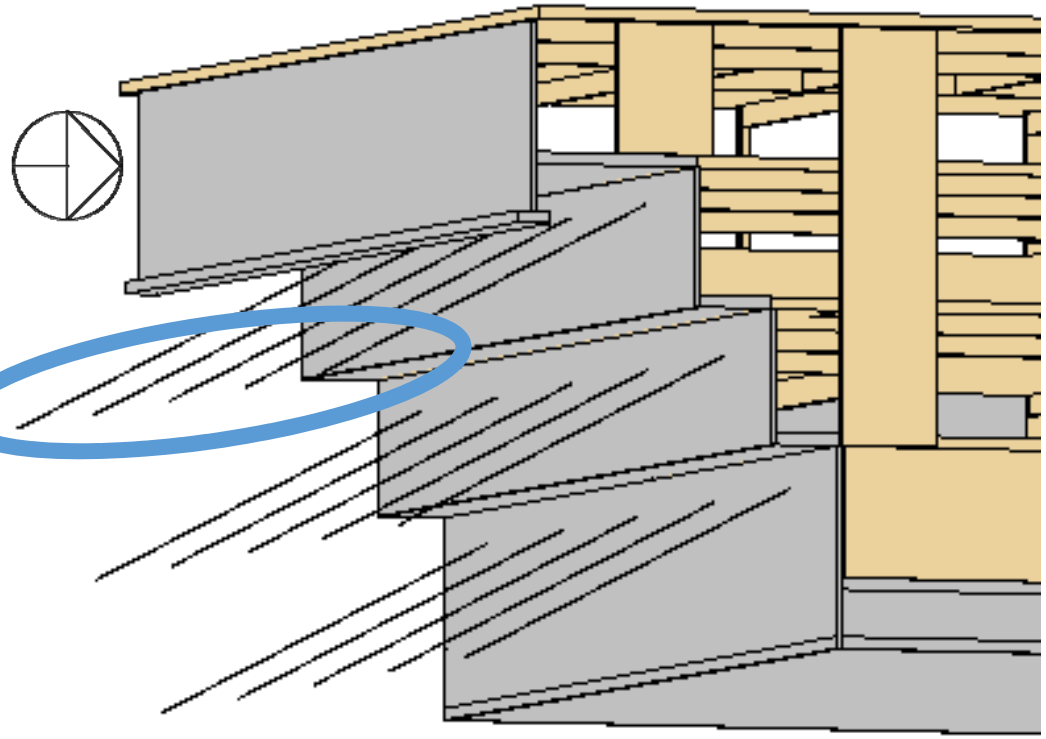
TEAM ATLANTIC 2015

Spring Quarter Presentation

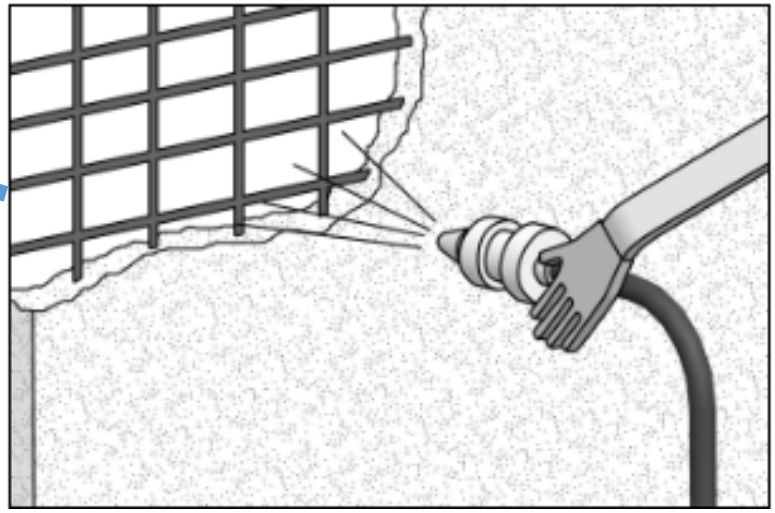
Extirior

Soil Nail Wall

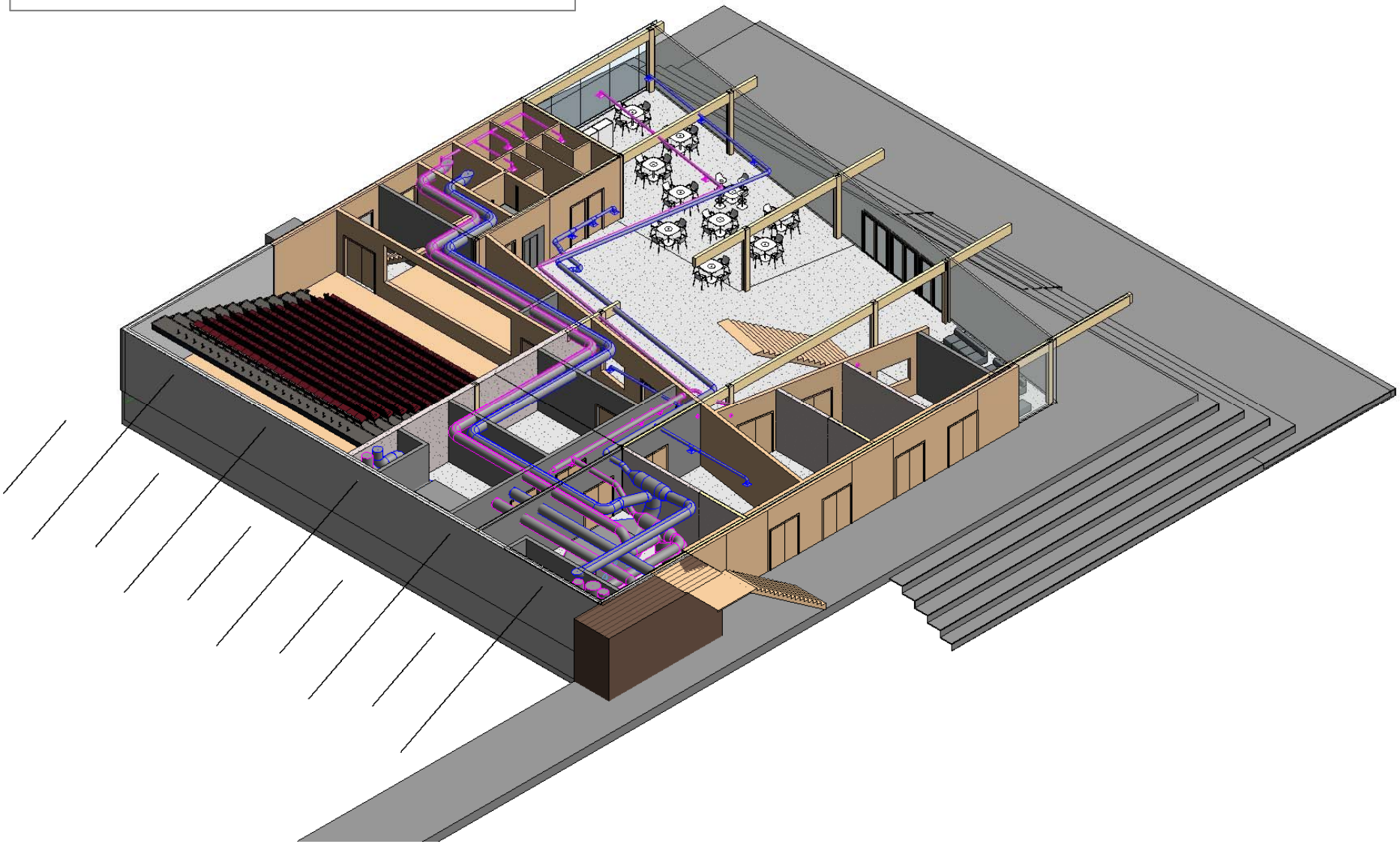




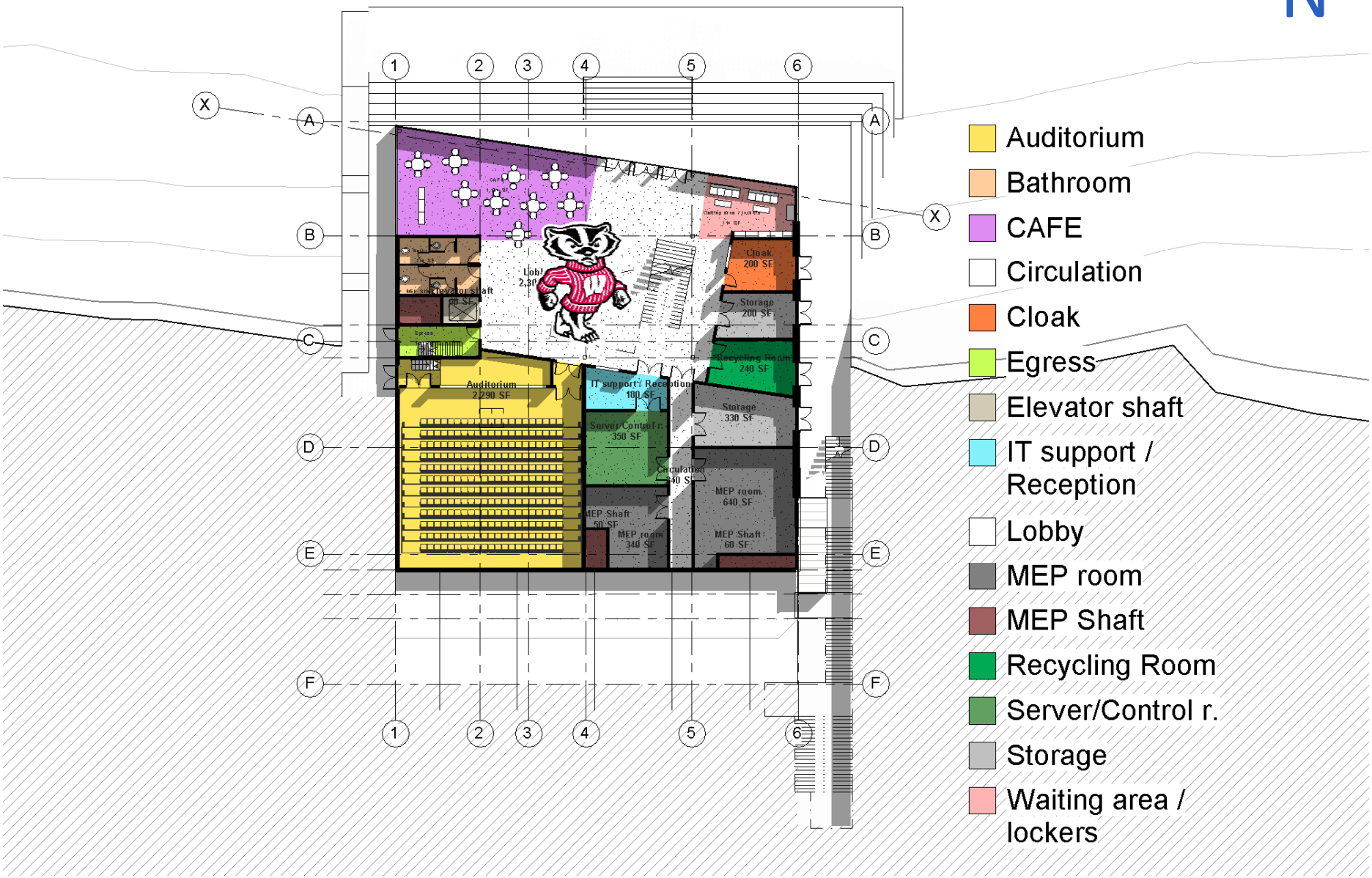
Shotcrete Wall

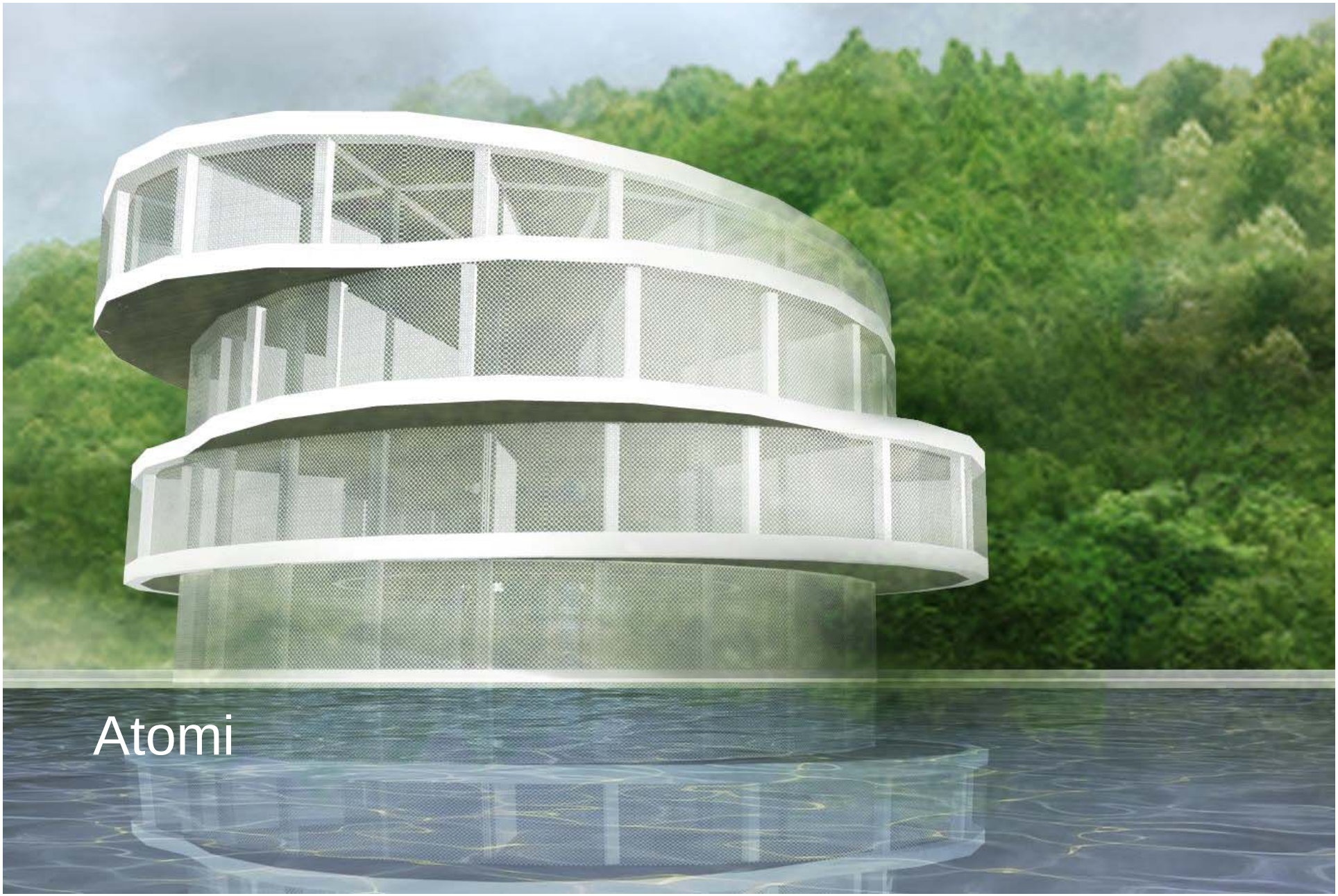


1. Level



1. Level

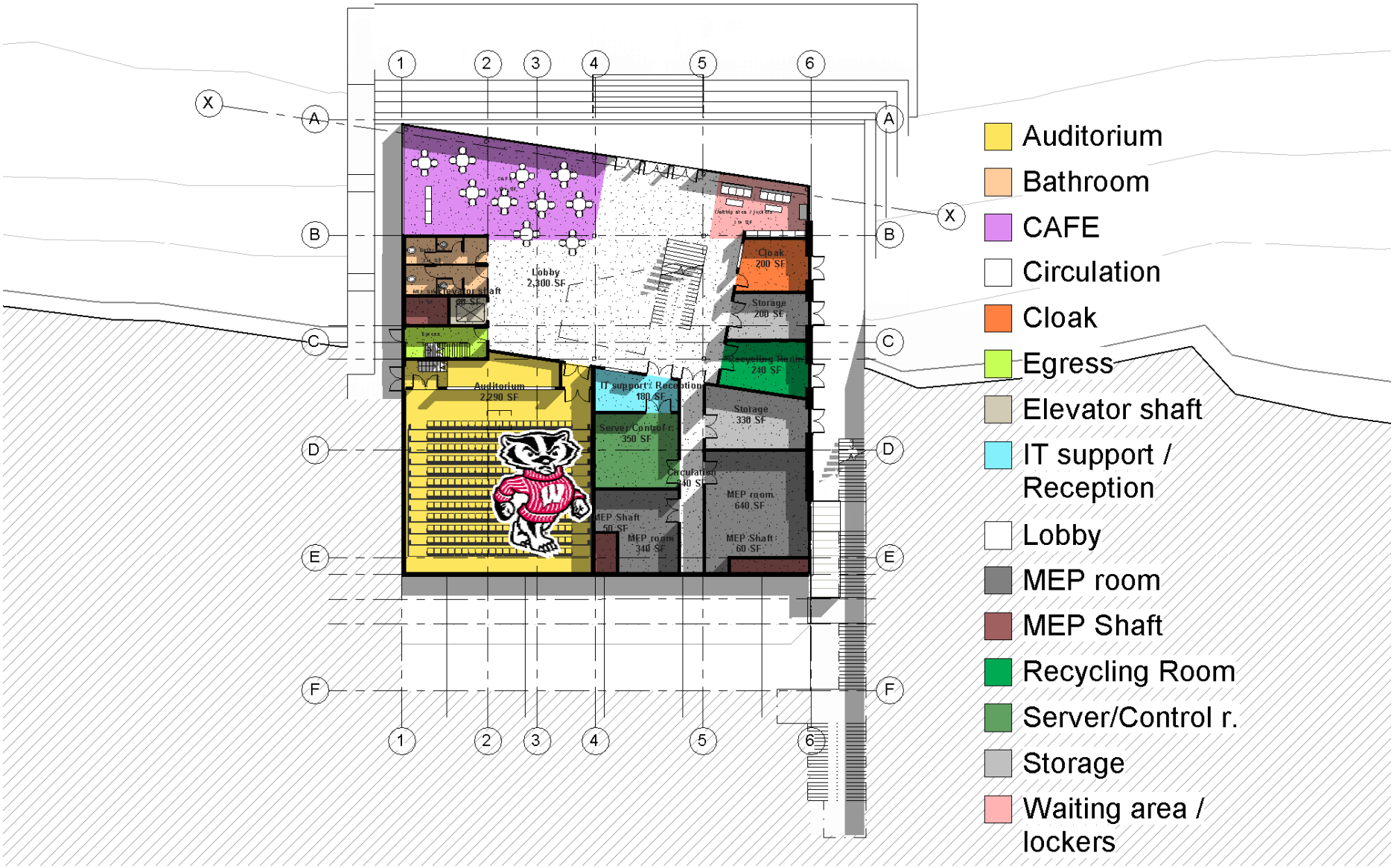

N
Auditorium
Bathroom
CAFE
Circulation
Cloak
Egress
Elevator shaft
IT support / Reception
Lobby
MEP room
MEP Shaft
Recycling Room
Server/Control r.
Storage
Waiting area / lockers
Auditorium 2,290 SF
Cloak 200 SF
Storage 200 SF
Recycling Room 240 SF
IT support / Reception 180 SF
Storage 330 SF
Server/Control r. 350 SF
Circulation 40 SF
MEP room 640 SF
MEP Shaft 60 SF
MEP Shaft 60 SF
MEP room 340 SF
Elevator Shaft 88 SF
1
2
3
4
5
6
A
B
C
D
E
F
X


Atomi


Shell

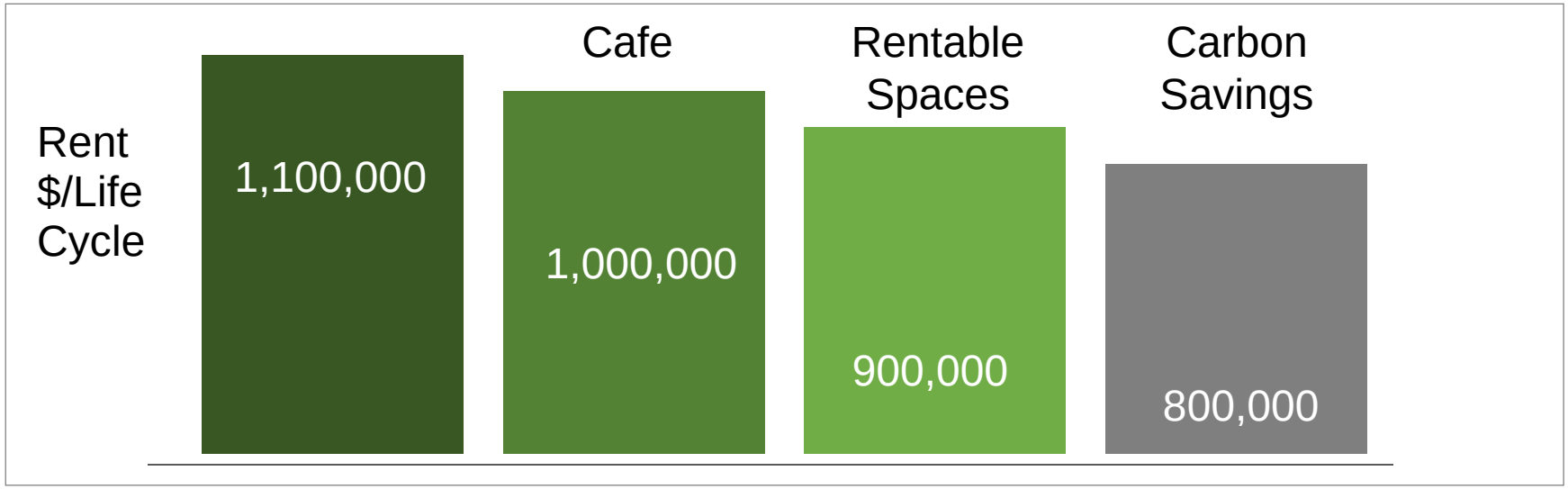
Lake View

1. Level


N
Auditorium
Bathroom
CAFE
Circulation
Cloak
Egress
Elevator shaft
IT support / Reception
Lobby
MEP room
MEP Shaft
Recycling Room
Server/Control r.
Storage
Waiting area / lockers
Lobby 2,300 SF
Cloak 200 SF
Storage 200 SF
Recycling Room 240 SF
Auditorium 2,290 SF
IT support / Reception 180 SF
Server/Control r. 350 SF
Storage 330 SF
Circulation 290 SF
MEP room 640 SF
MEP Shaft 60 SF
MEP room 340 SF
MEP Shaft 60 SF

Auditorium Picture

Rent


Rent $/Life Cycle
1,100,000
Cafe
1,000,000
Rentable Spaces
900,000
Carbon Savings
800,000

The Story of Water

WARKA
Water

Shading
Fins

KAUST
King Abdullah University of Science and Technology

King Abdullah
University

Transform Air
into Water

Solid, Liquid,
Vapour

The Beetle

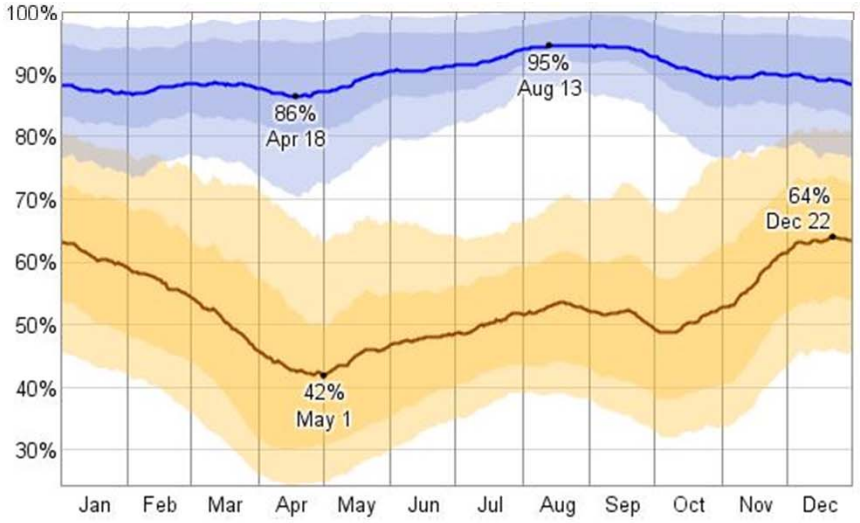
DETAILS

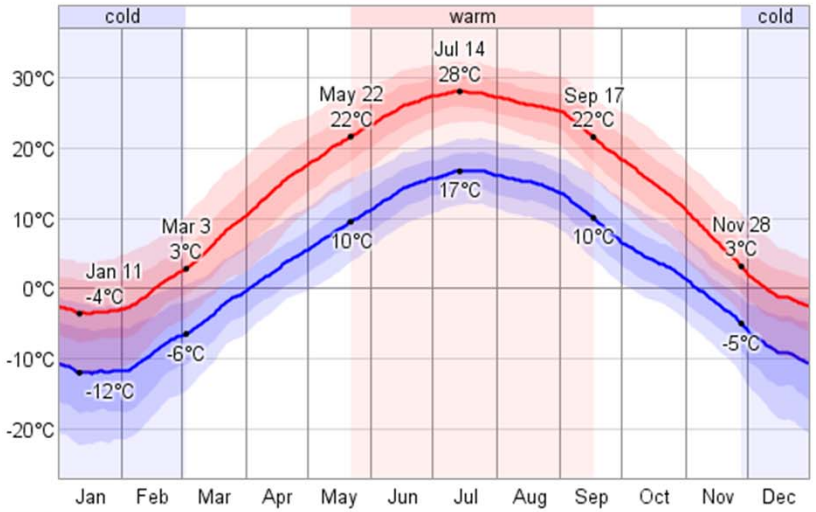
HYDROPHILIC
Shell

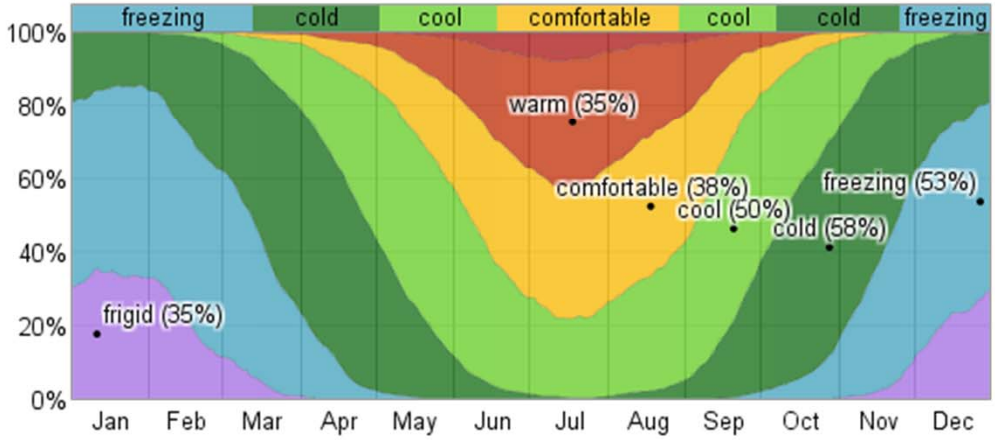
Mechanical Room Picture

Warm and Cold Weather

Average max. humidity: 95 %
Average min. humidity: 42 %

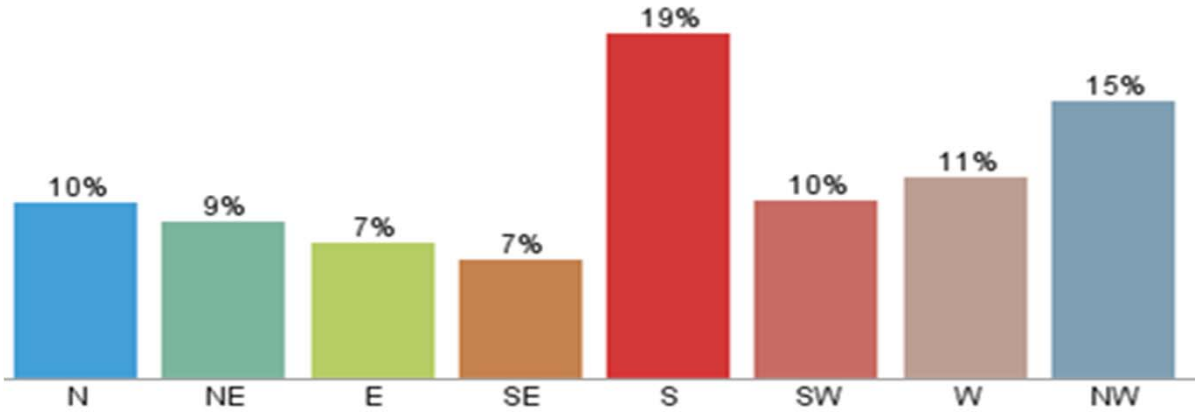






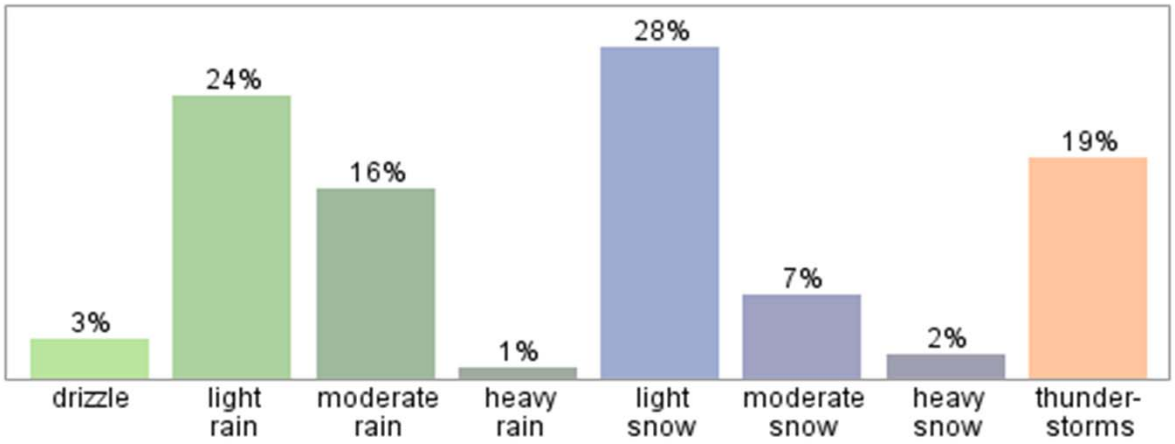
Average max. temperature: 28 °C
Average min. temperature: -12 °C

Rain

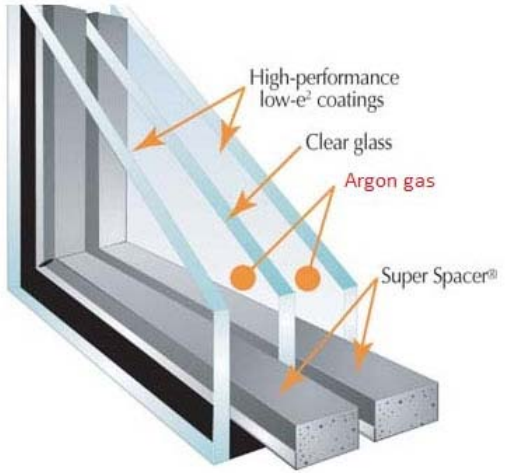


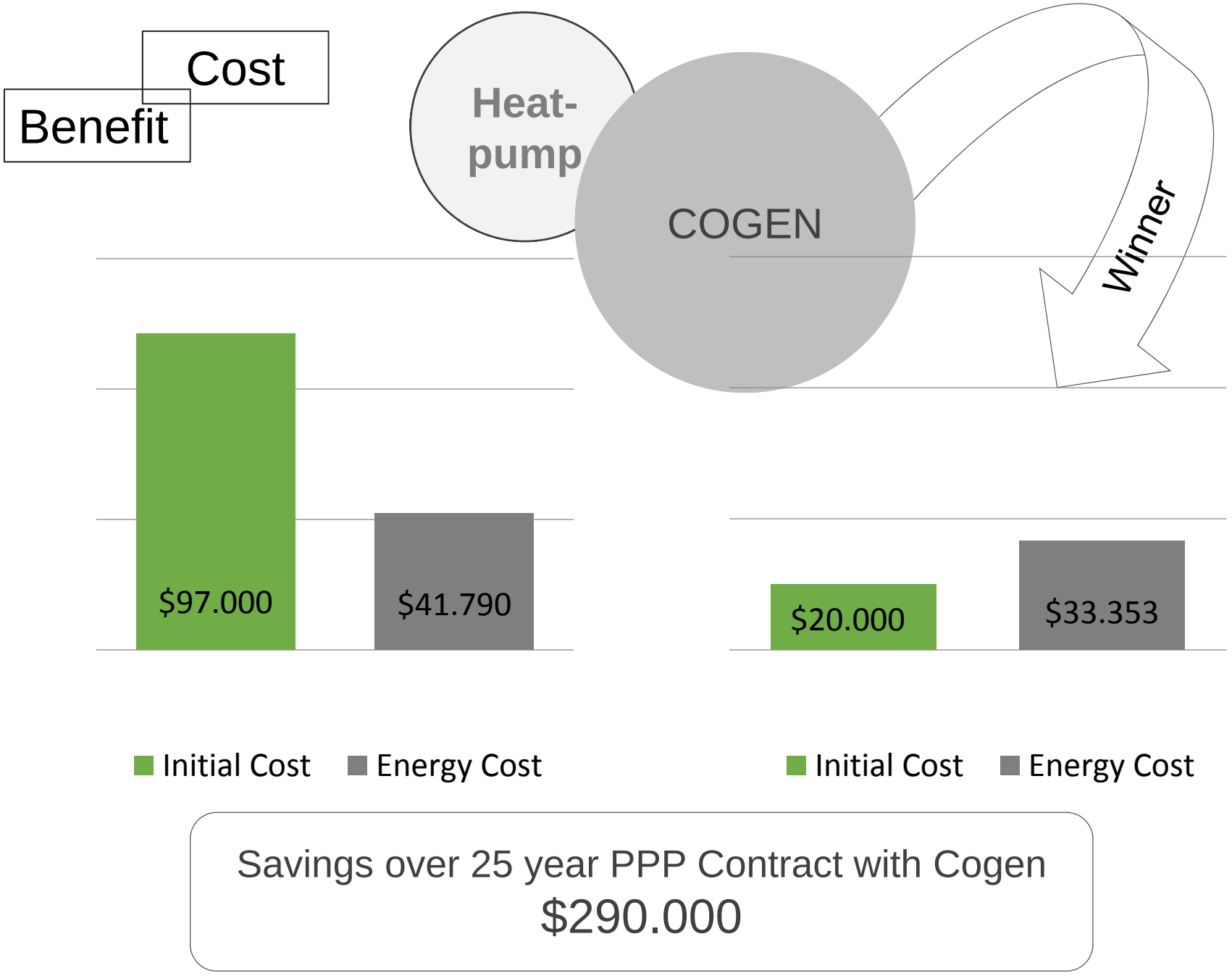
Wind mostly from
S-SW
W-NW

Average yearly rainfall: 34.5 in
Average yearly snowfall: 38.2 in



Heating Issue





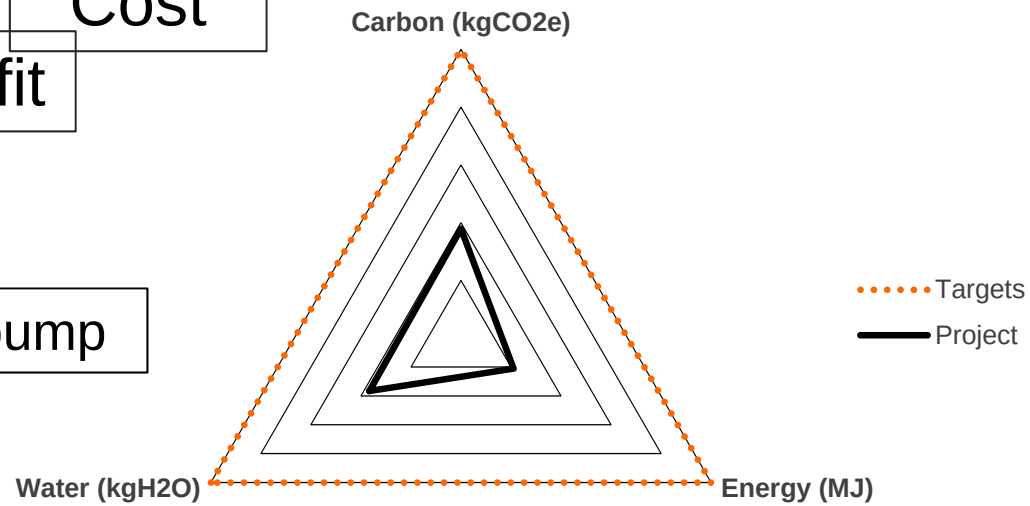
Savings over 25 year PPP Contract with Cogen

$290.000

Cost

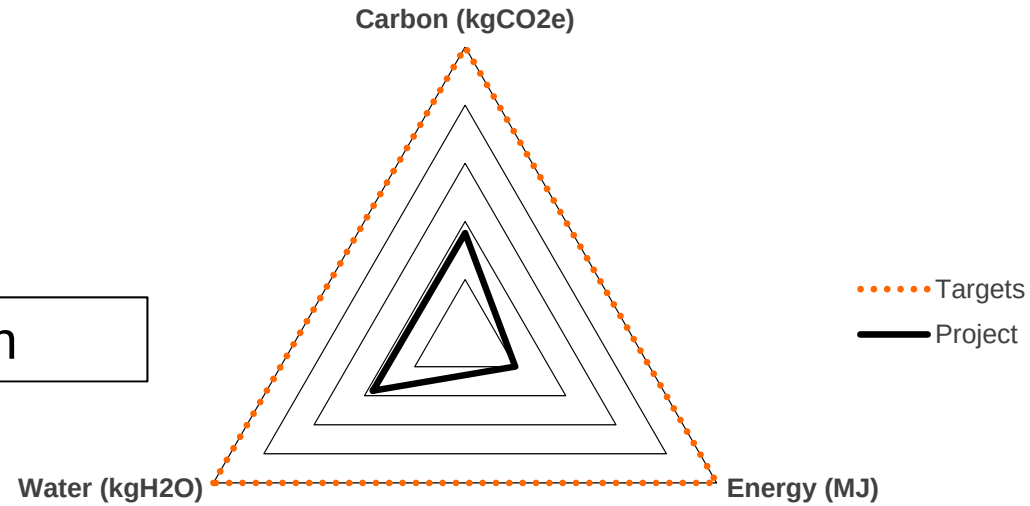
Benefit

Heatpump



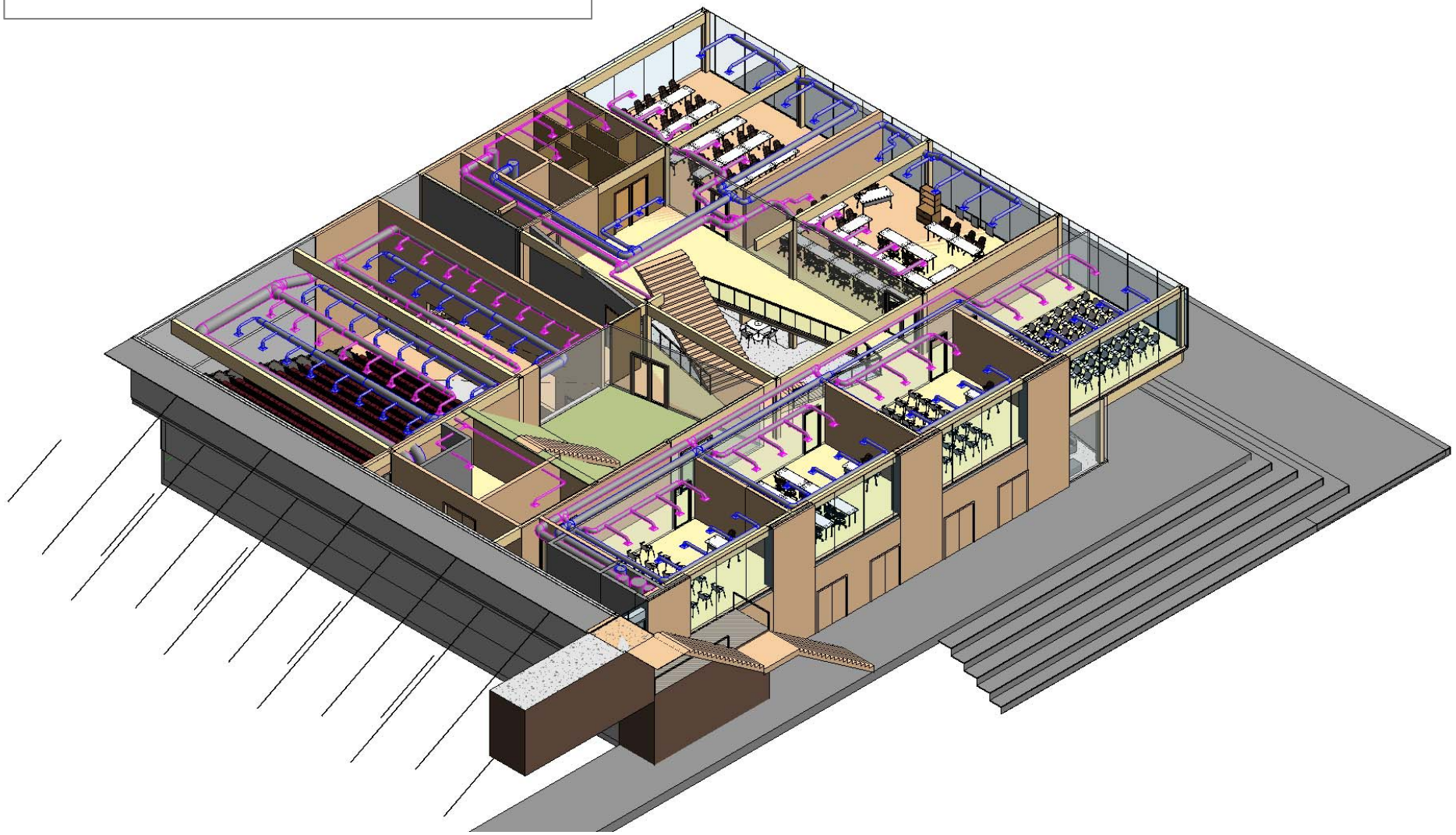
Electricity:
136.000 kWh
Heating:
24.100 Kwh

Cogen

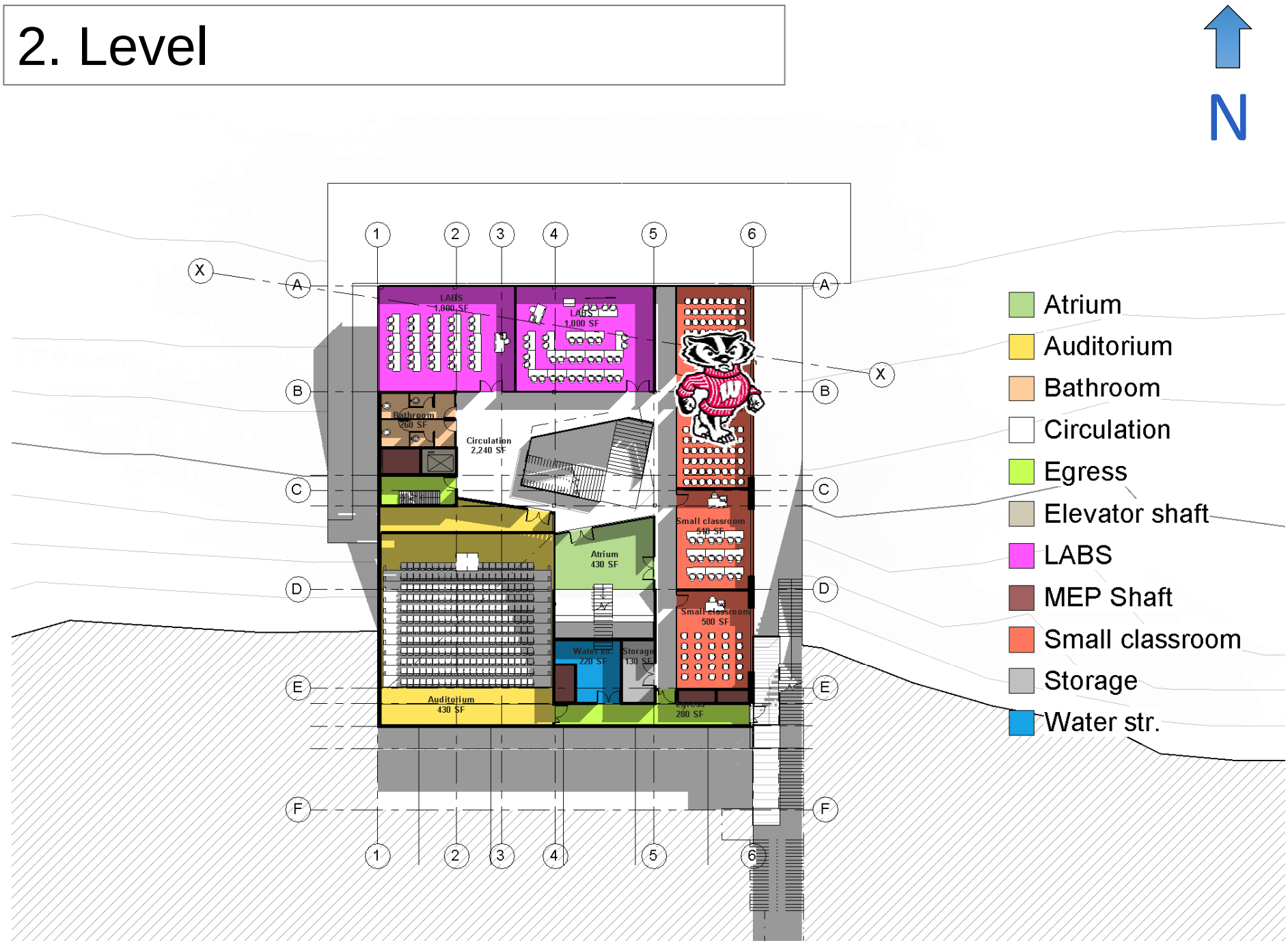


Electricity:
124.000 kWh
Heating:
19.000 Kwh

2. Level



2. Level


N
1
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5
6
X
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B
C
D
E
F
LABS
1,000 SF
LABS
1,000 SF
Bathroom
260 SF
Circulation
2,240 SF
Atrium
430 SF
Small classroom
510 SF
Small classroom
500 SF
Water str.
220 SF
Storage
130 SF
Auditorium
430 SF
280 SF
Atrium
Auditorium
Bathroom
Circulation
Egress
Elevator shaft
LABS
MEP Shaft
Small classroom
Storage
Water str.

Small Classroom

CLT Benefits

A

CM

MEP

LCFM

Cross Laminated Timber

CLT Benefits

Space Creator

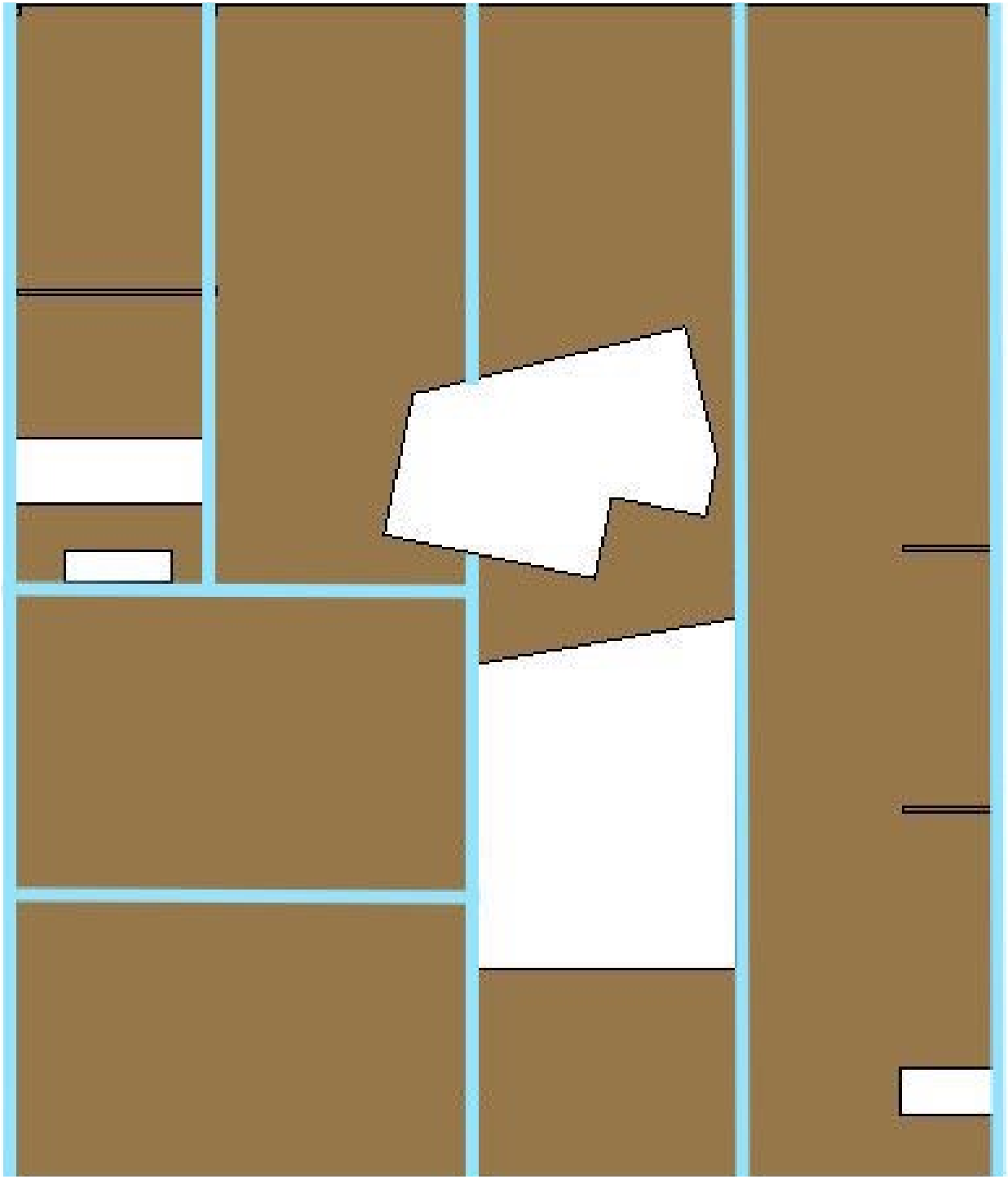
6 times lighter then concrete building

Thermal performance

Revenue Enhancement

CLT Benefits

CLT PANEL PREFABRICATION



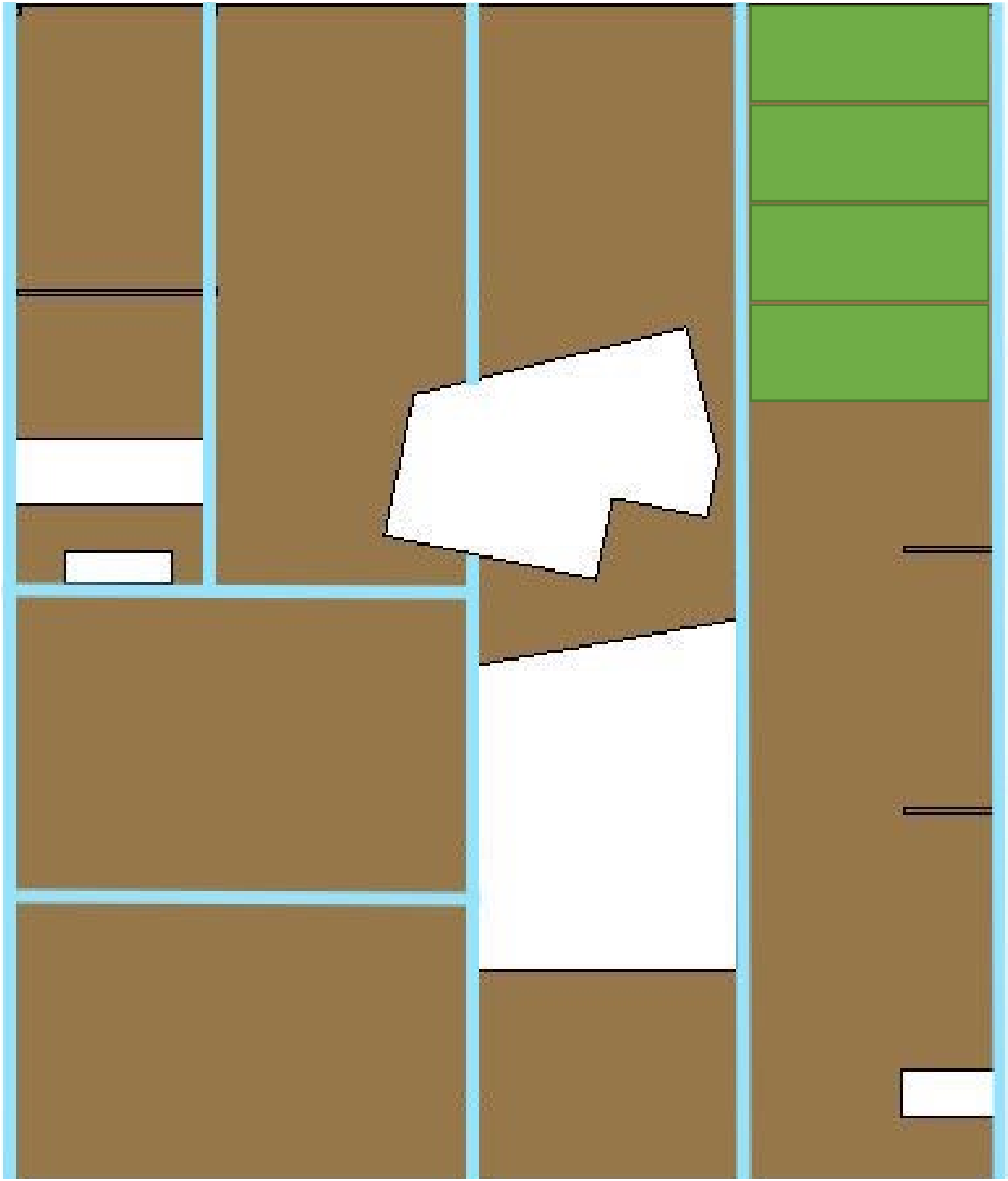
Beam

CLT Floor Panel

START!

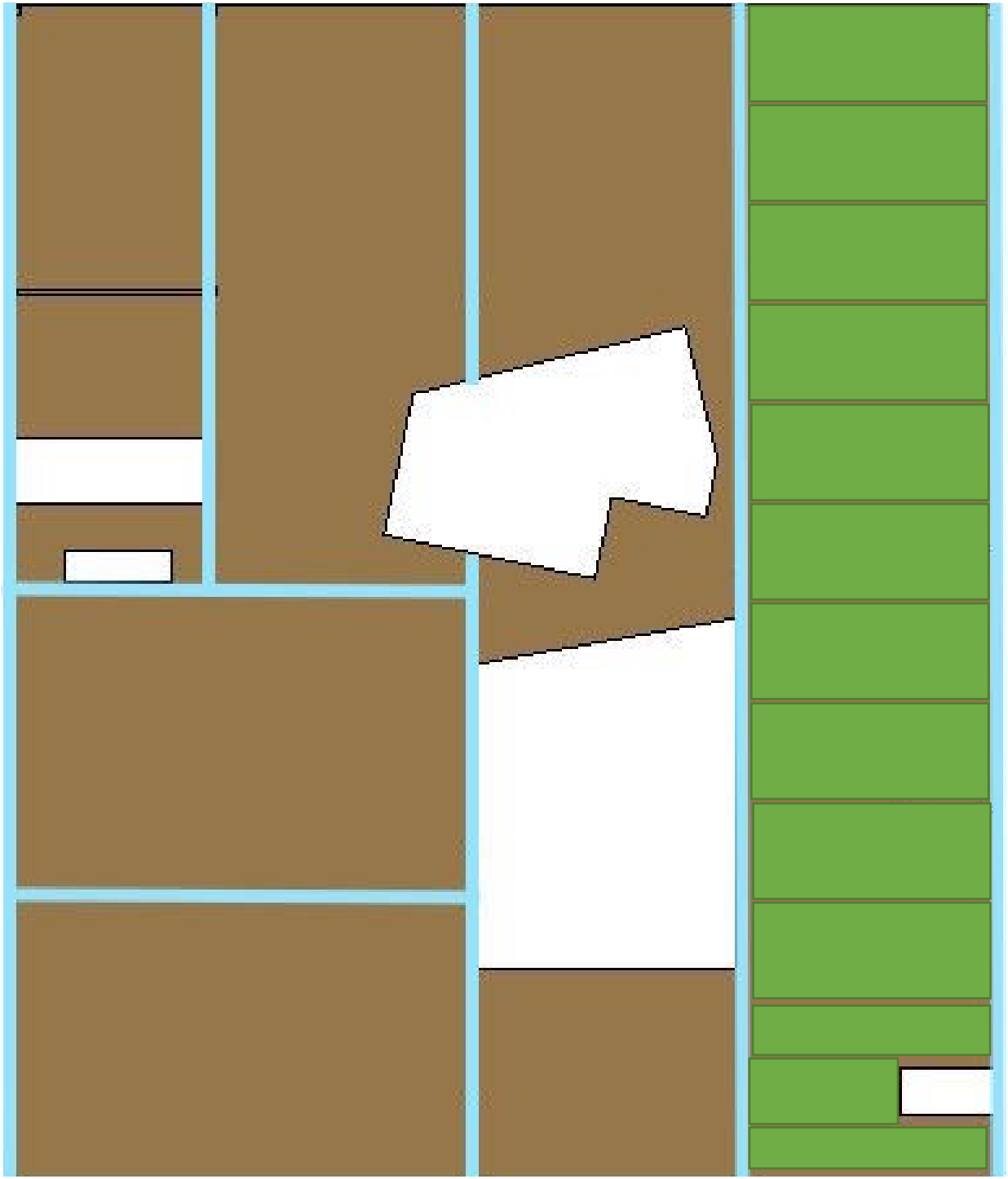
CLT Panel

Beam



CLT Floor Panel

DAY 1



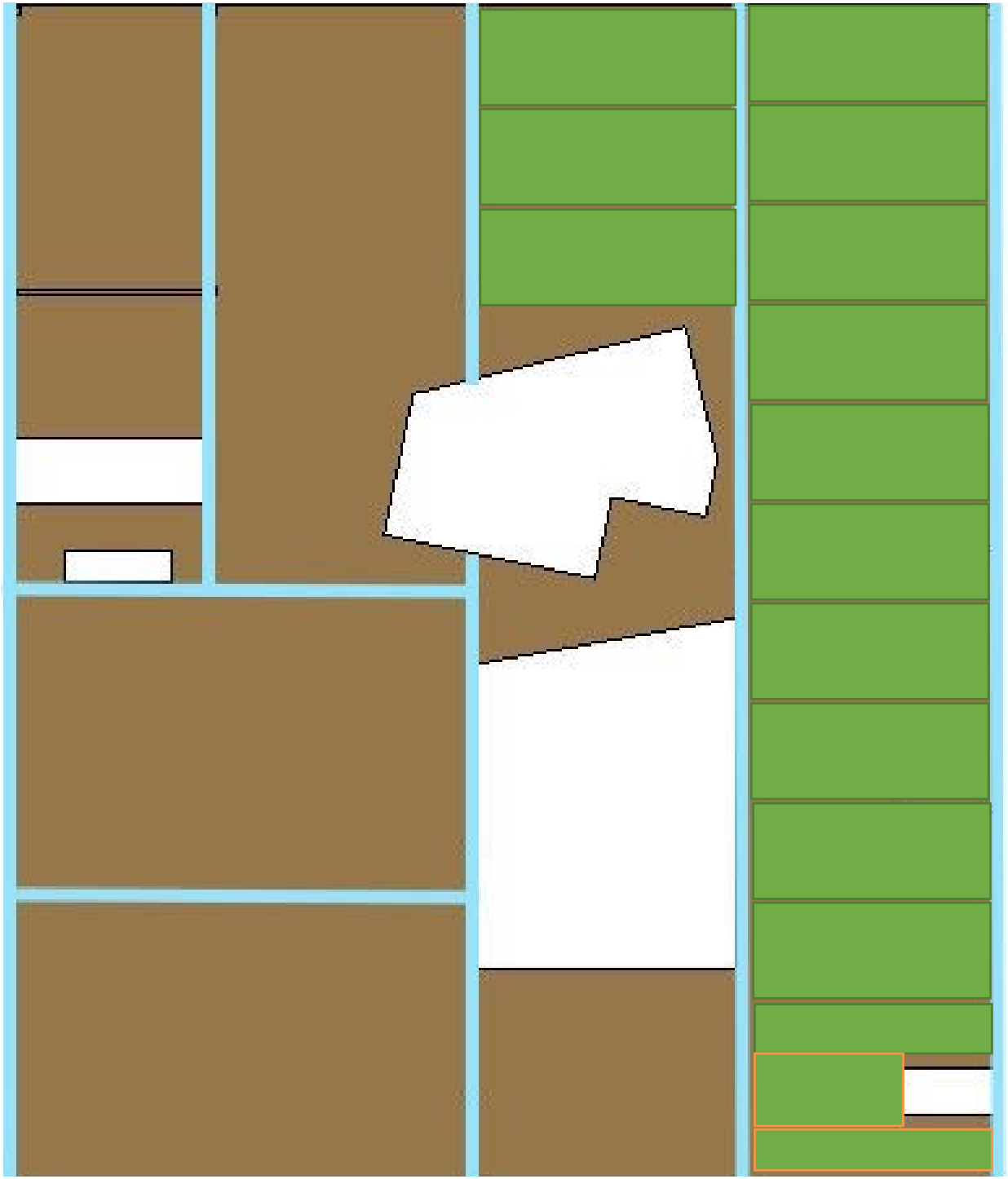
LATENCY

CLT Panel

Beam

CLT Floor Panel

DAY 2

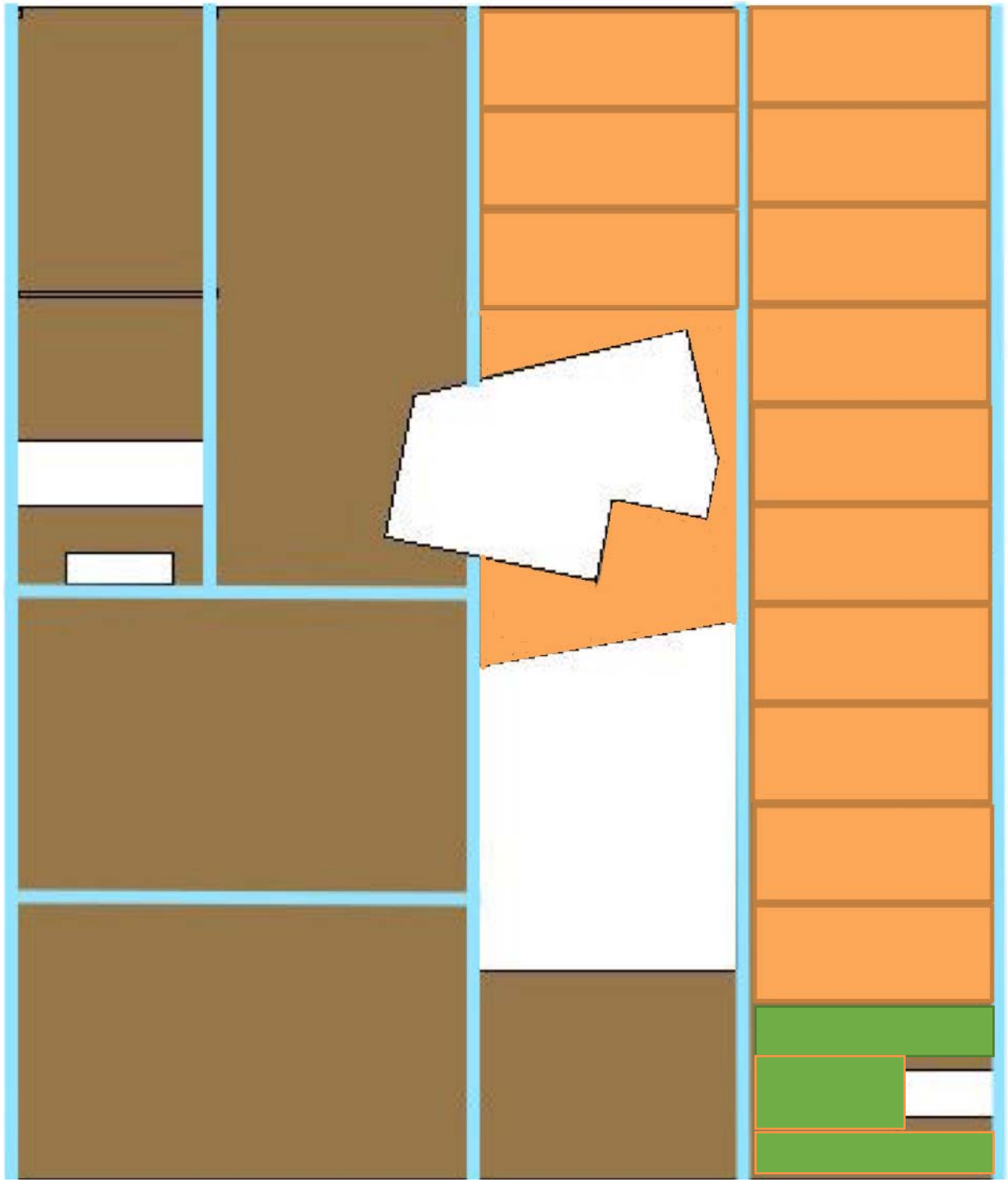


CLT Panel

Beam

CLT Floor Panel

DAY 2



CLT Panel

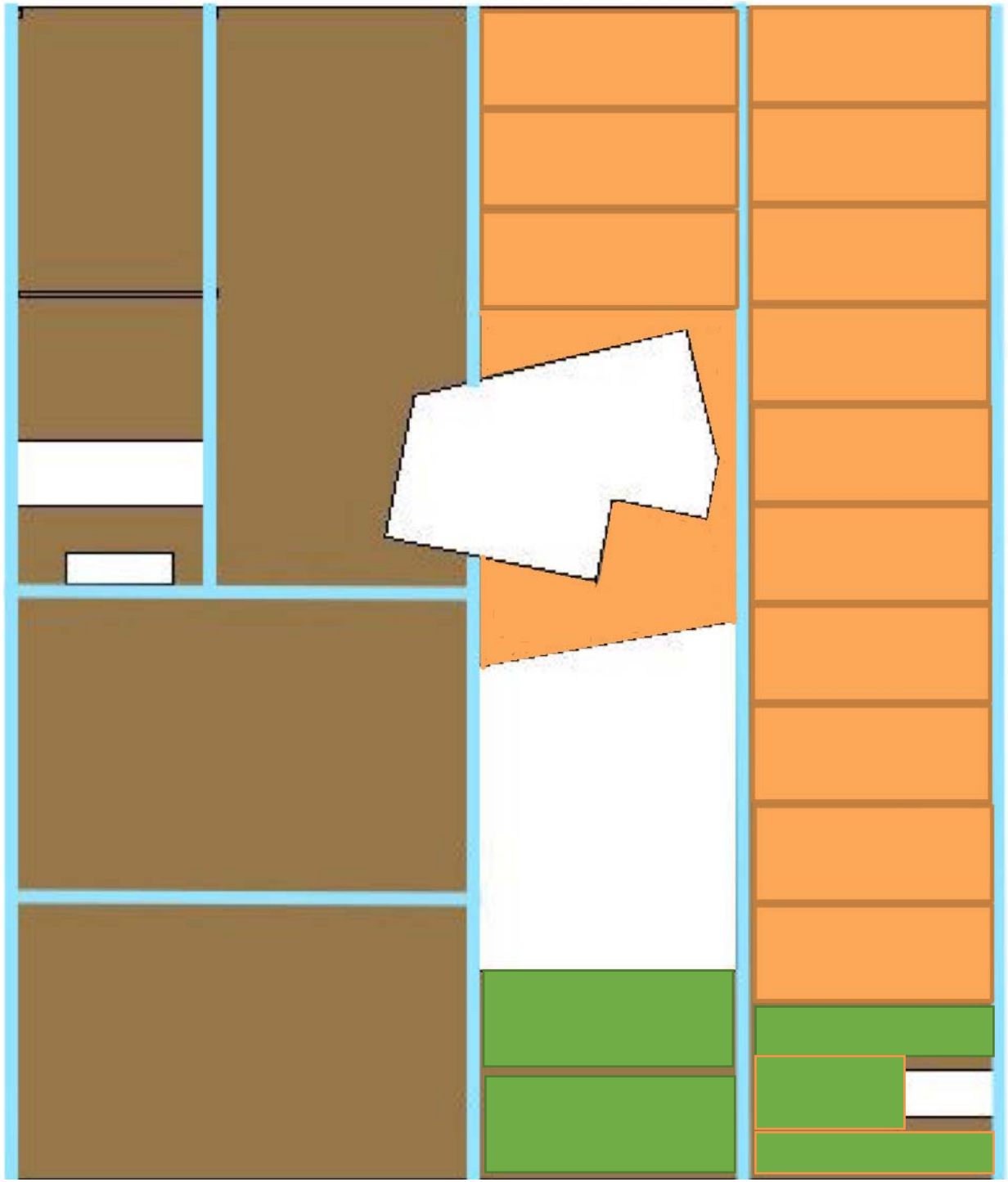
Beam

CLT Floor Panel

DAY 2

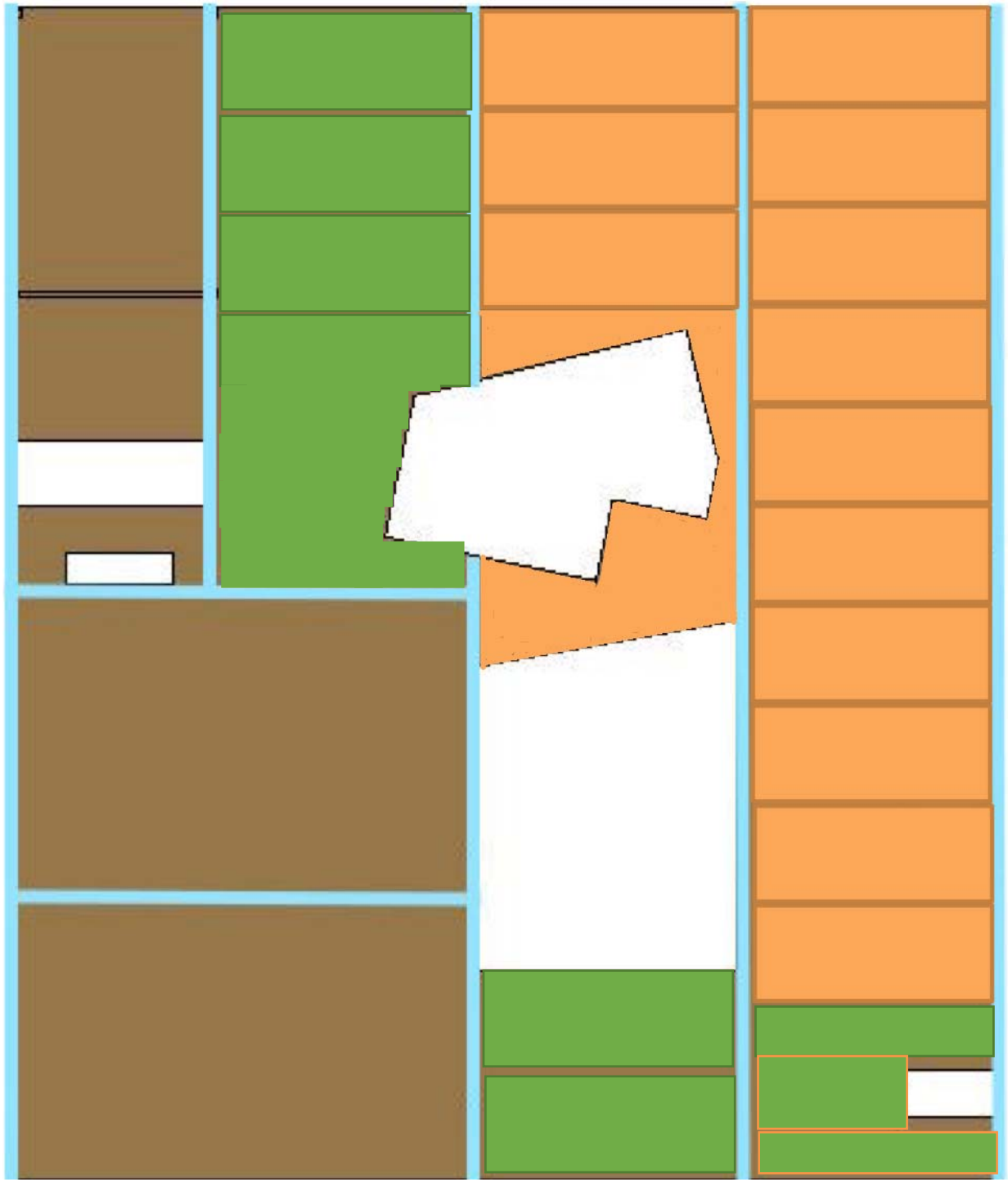
CLT Panel

Beam



CLT Floor Panel

DAY 3

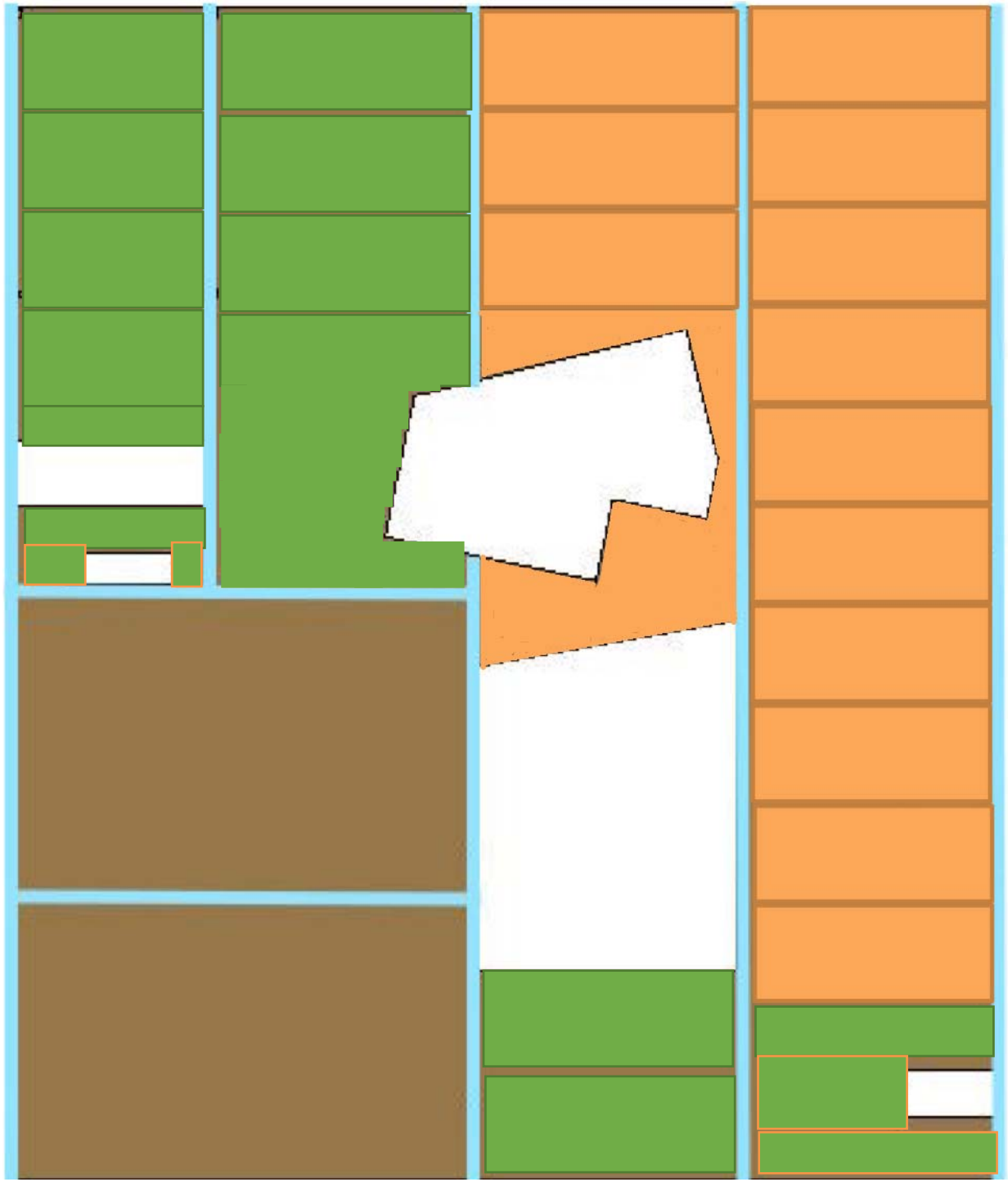


CLT Panel

Beam

CLT Floor Panel

DAY 3

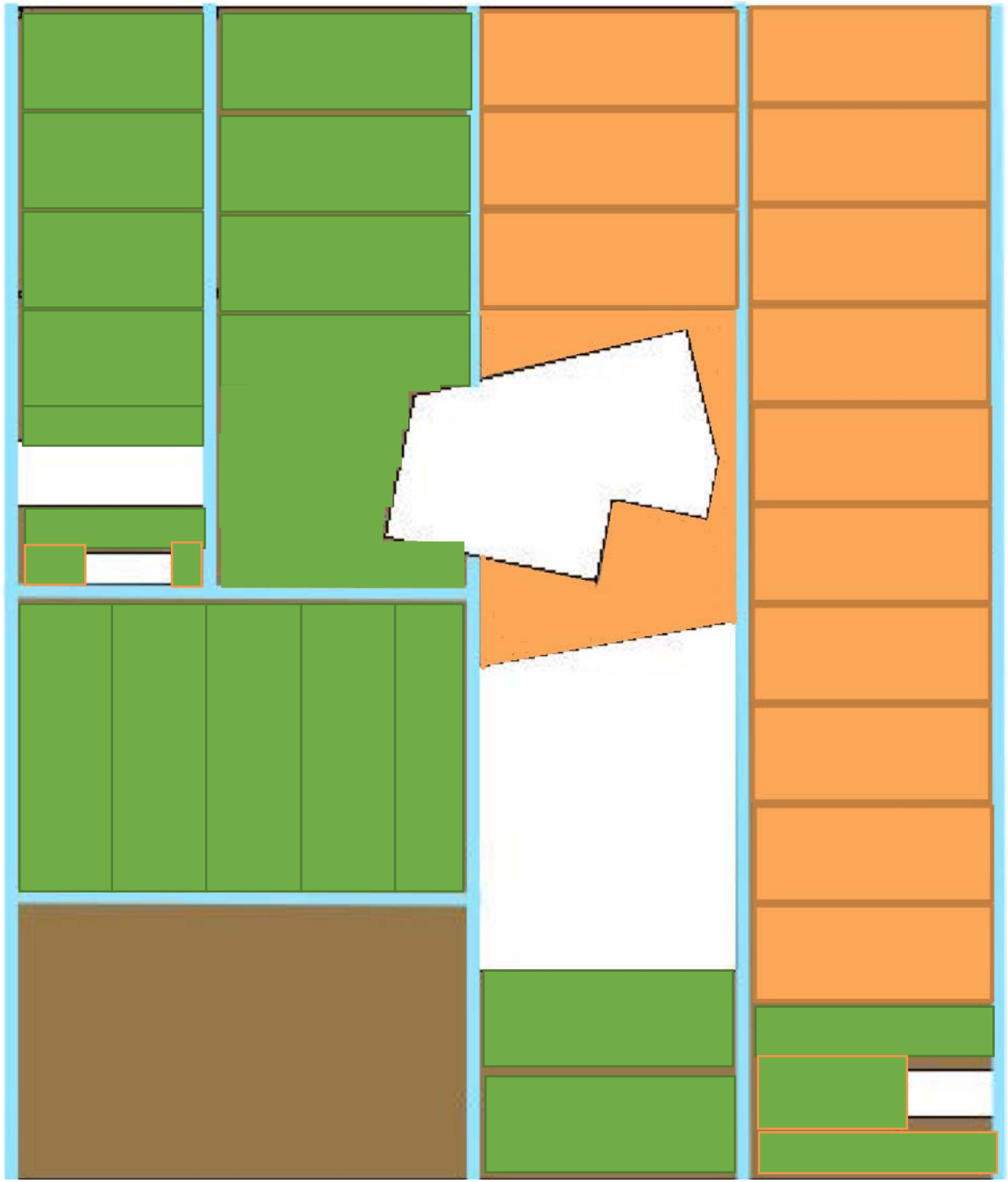


CLT Panel

Beam

CLT Floor Panel

DAY 4

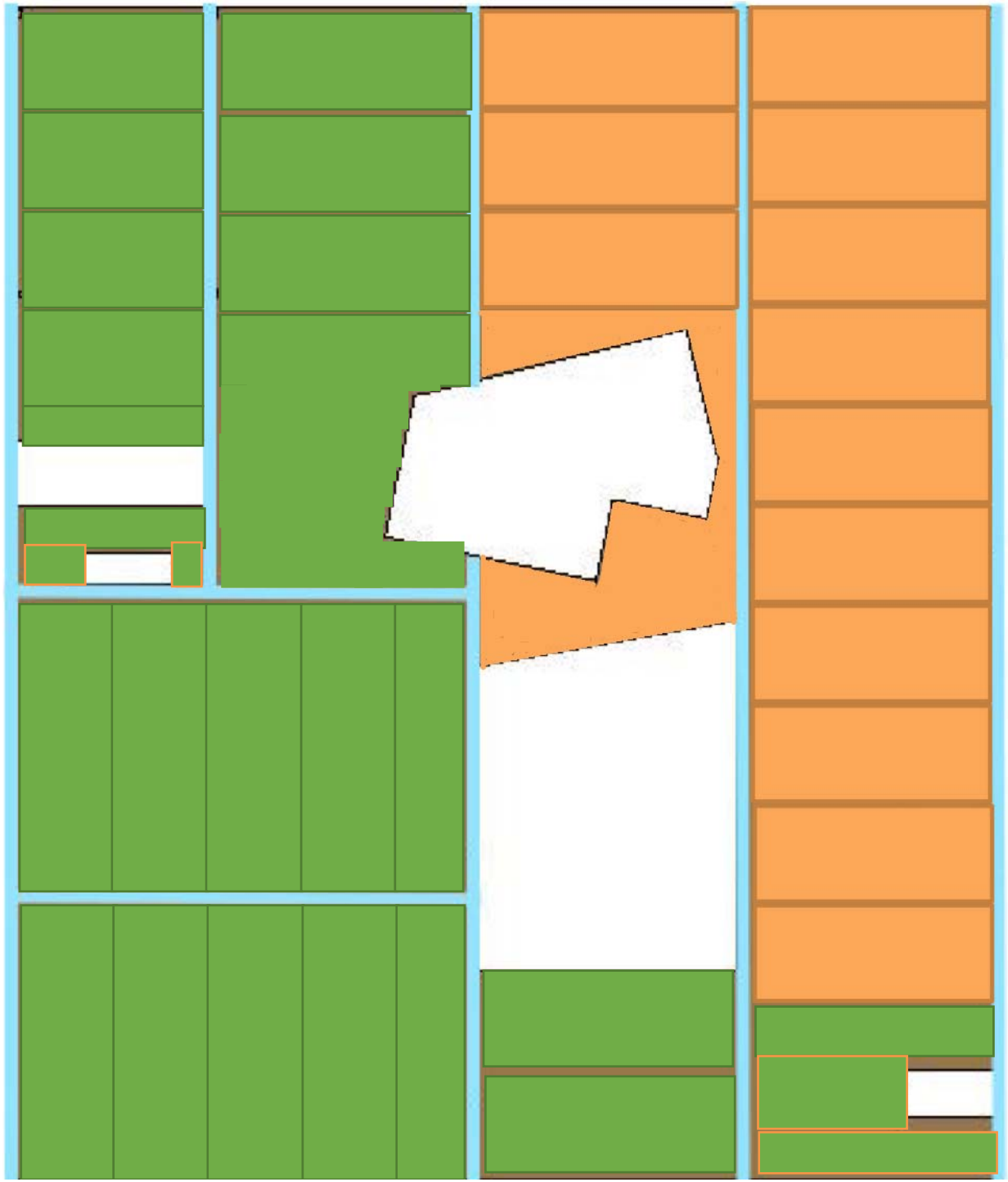


CLT Panel

Beam

CLT Floor Panel

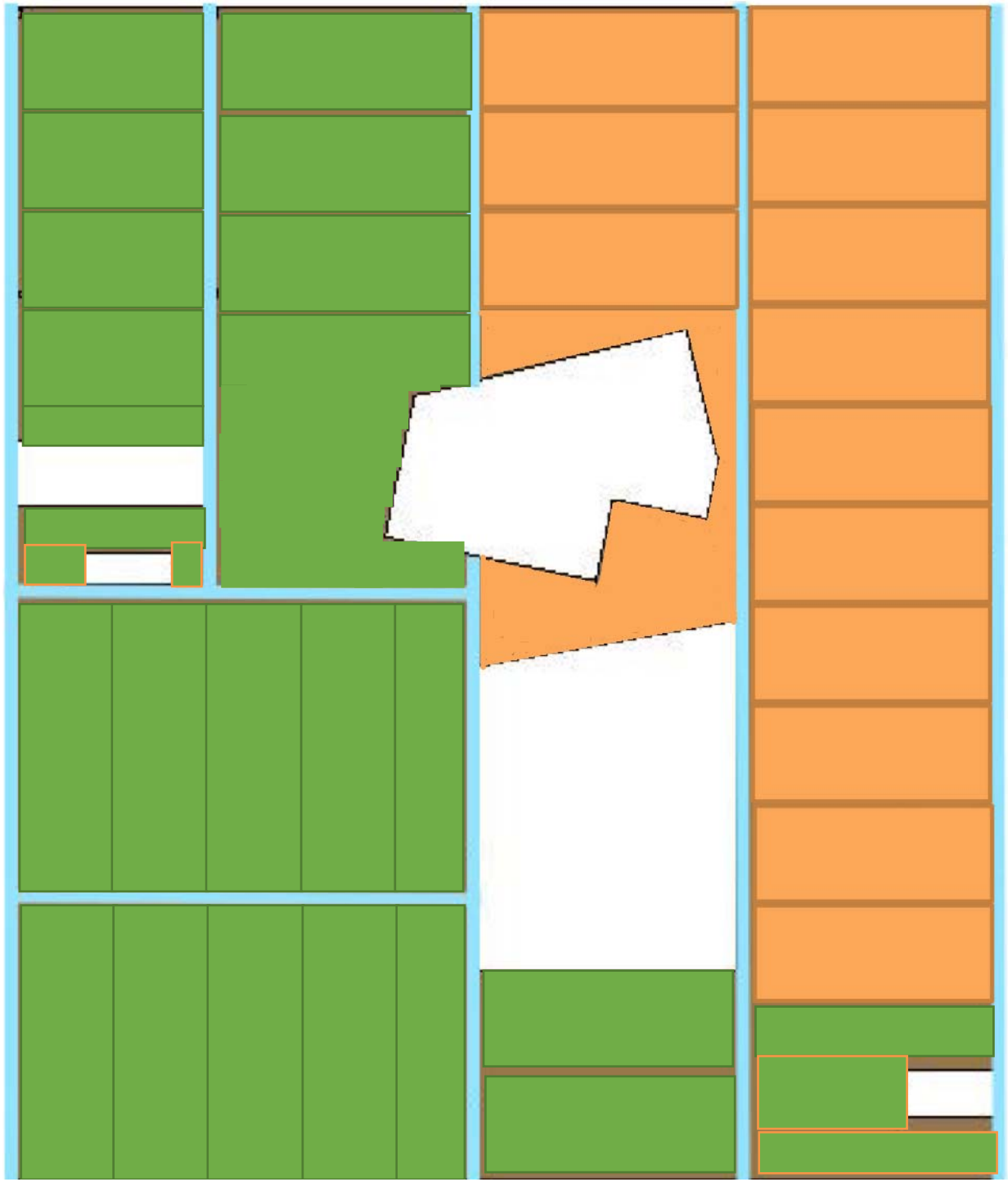
DAY 4



CLT Panel

Beam

CLT PANEL PREFABRICATION

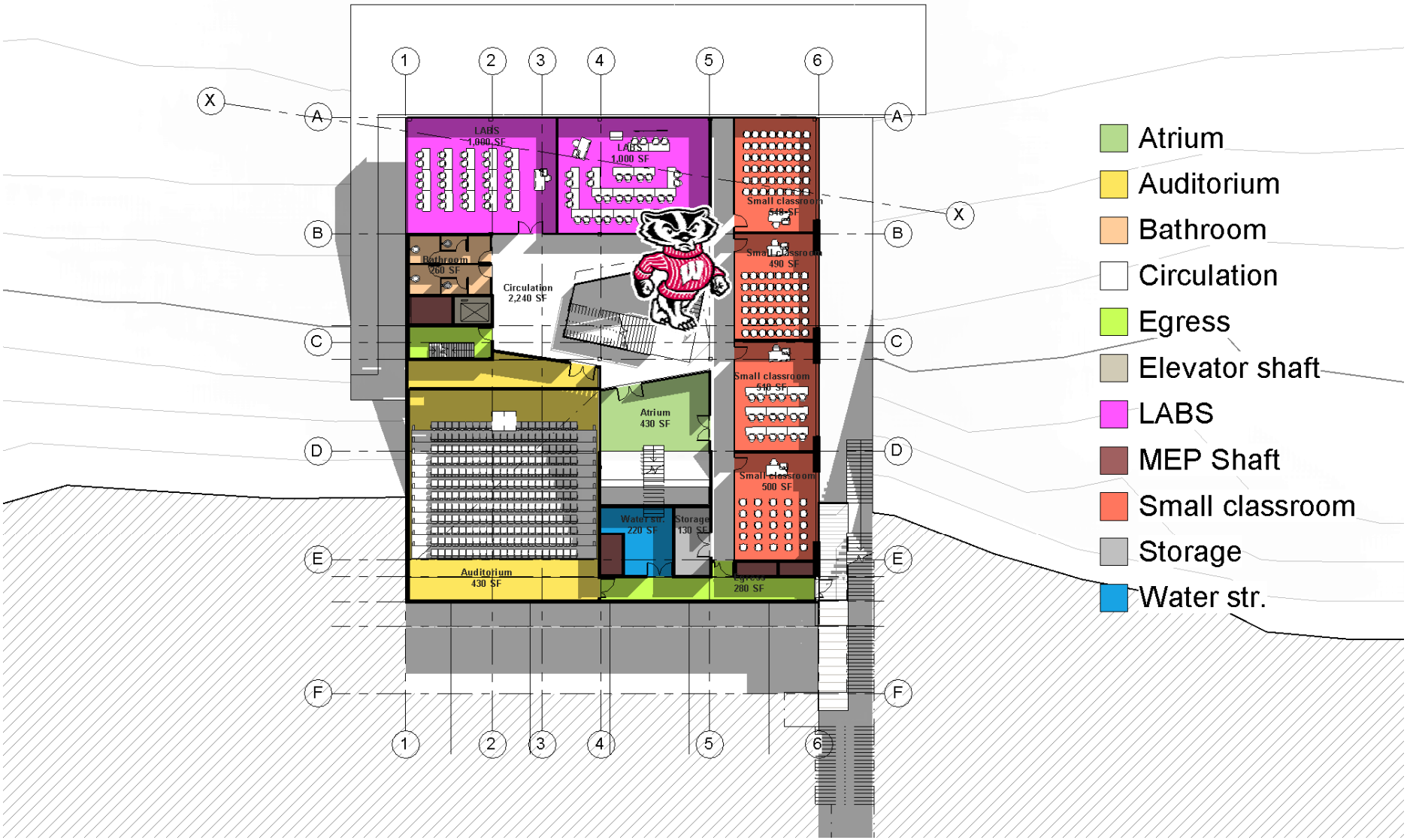


LATENCY

CLT Panel

Beam

2. Level


1
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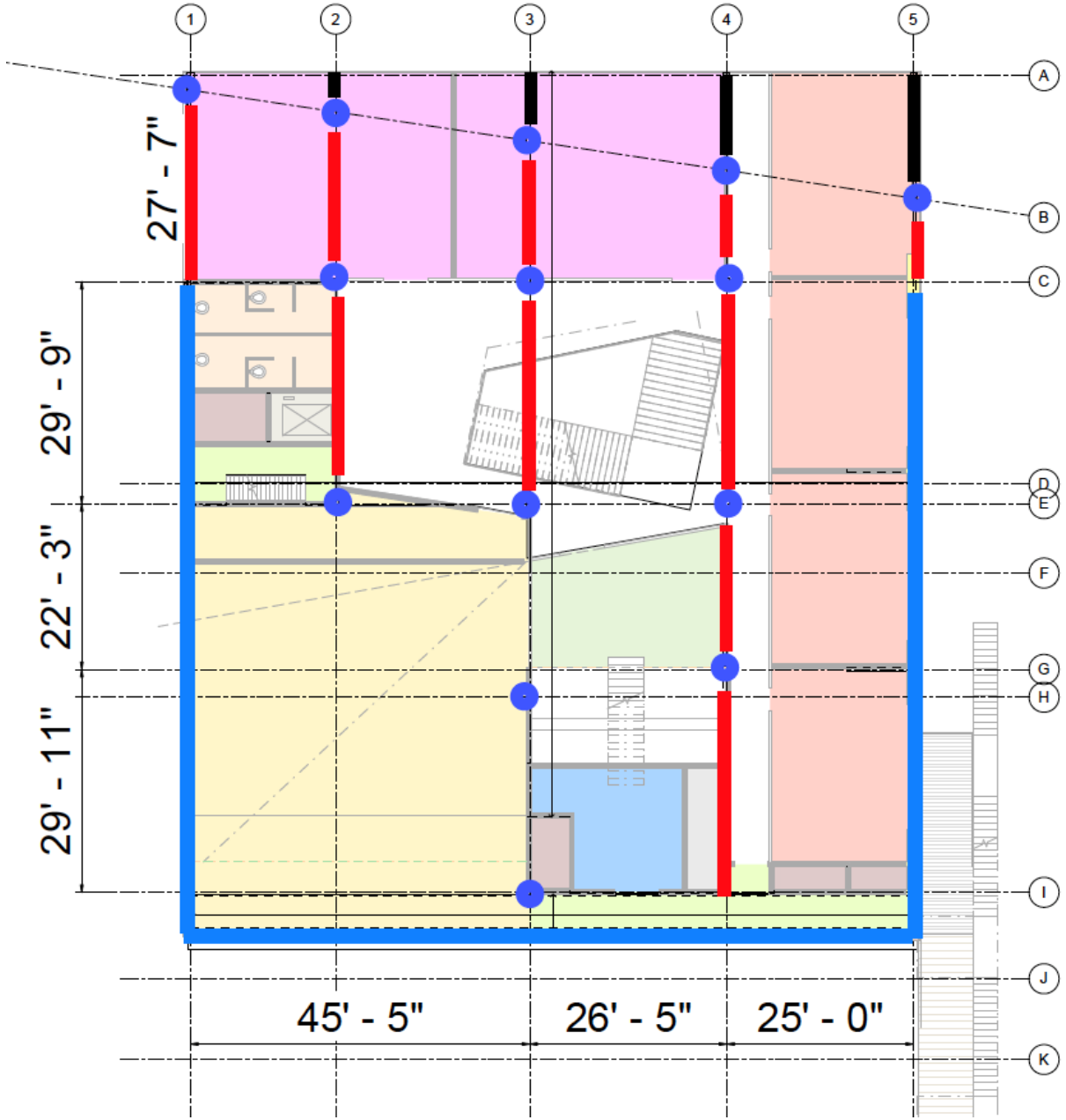
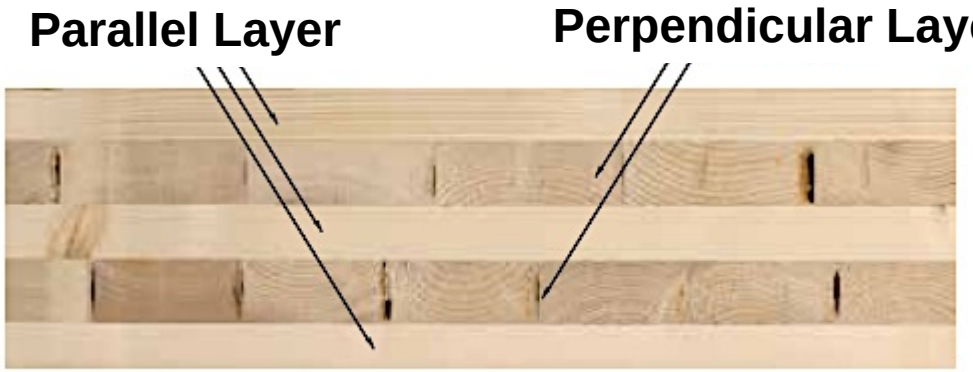
4
5
6
X
A
B
C
D
E
F
LABS
1,000 SF
LABS
1,000 SF
Small classroom
Small classroom
490 SF
Bathroom
260 SF
Circulation
2,240 SF
Small classroom
510 SF
Atrium
430 SF
Small classroom
500 SF
Water str.
220 SF
Storage
130 SF
Auditorium
430 SF
280 SF
Atrium
Auditorium
Bathroom
Circulation
Egress
Elevator shaft
LABS
MEP Shaft
Small classroom
Storage
Water str.

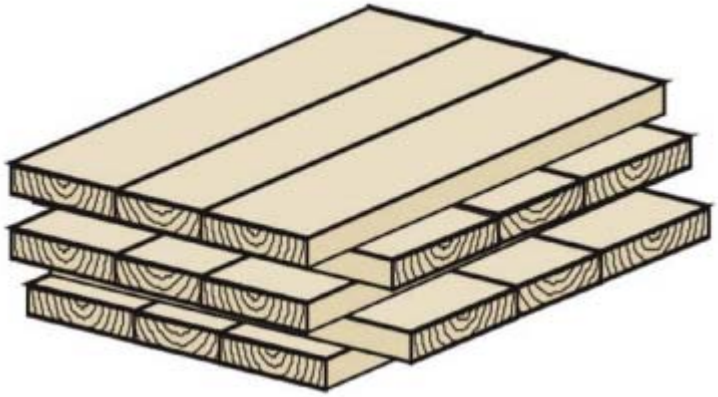
Structural Plan- First Level



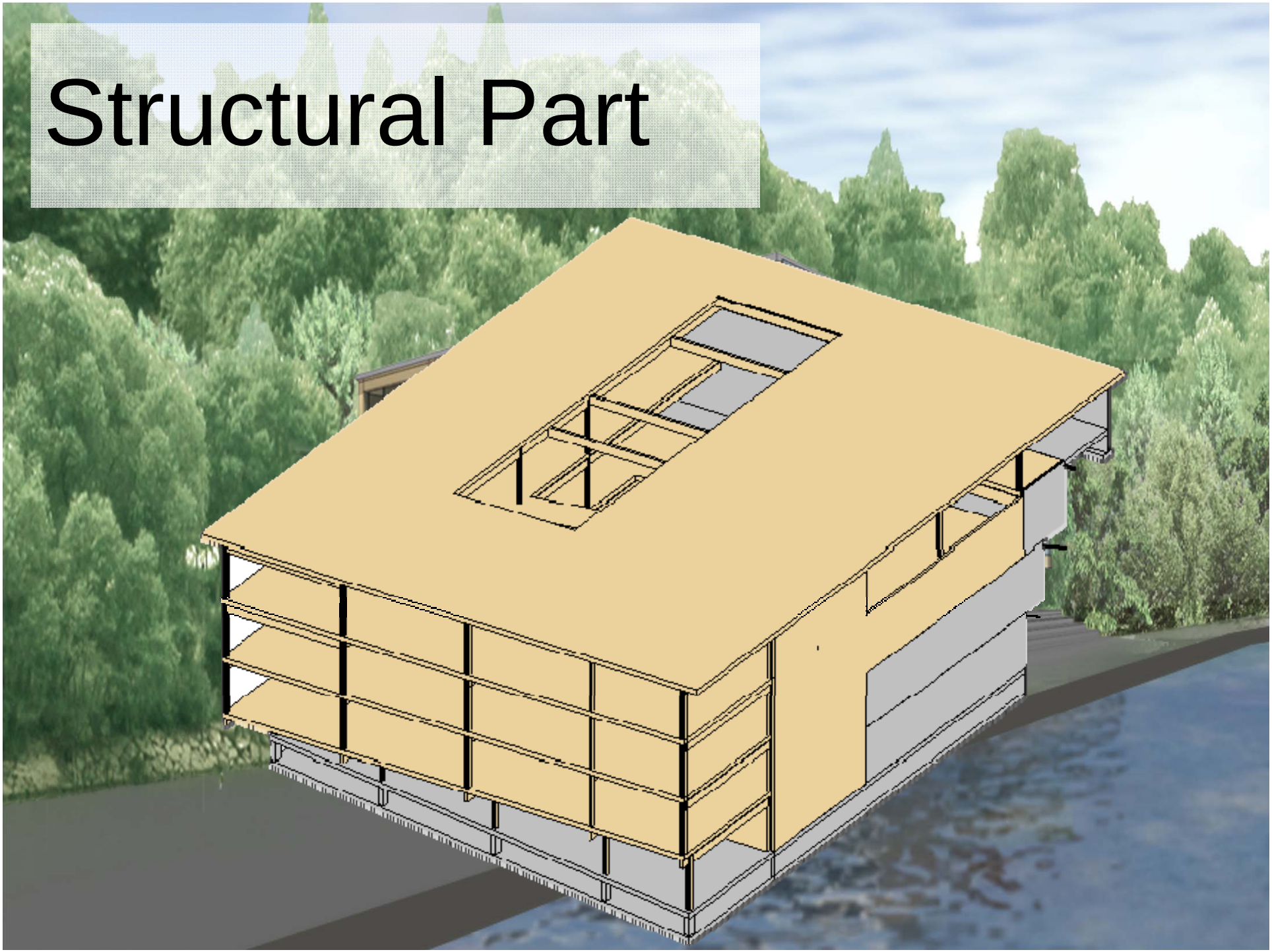
Cross Laminated Timber (CLT)



Strength Axis of CLT



Structural Part



Section Size

GLT Column 10 X 19

Bearing Wall

CLT SLT5 (6.66”)

Concrete (5”)

GLT Beam

Auditorium 8 ¾ X 28 ½

Typical 6 ¾ X 21

Roof 6 ¾ X 32 ½

Cantilever 8 ¾ X 28 ½

Shear Wall

CLT SLT5

Concrete (5”)

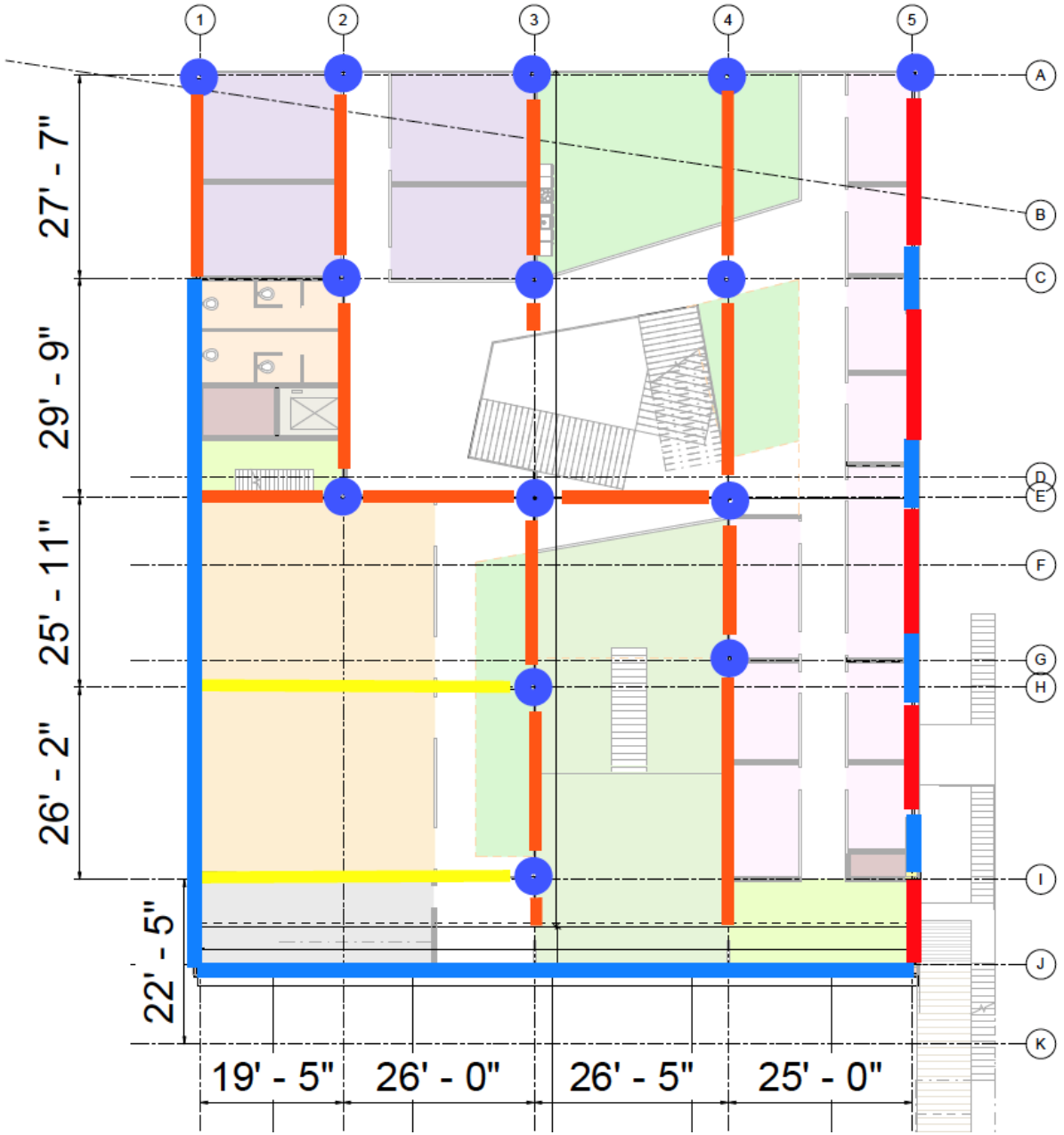
Floor

CLT SLT9

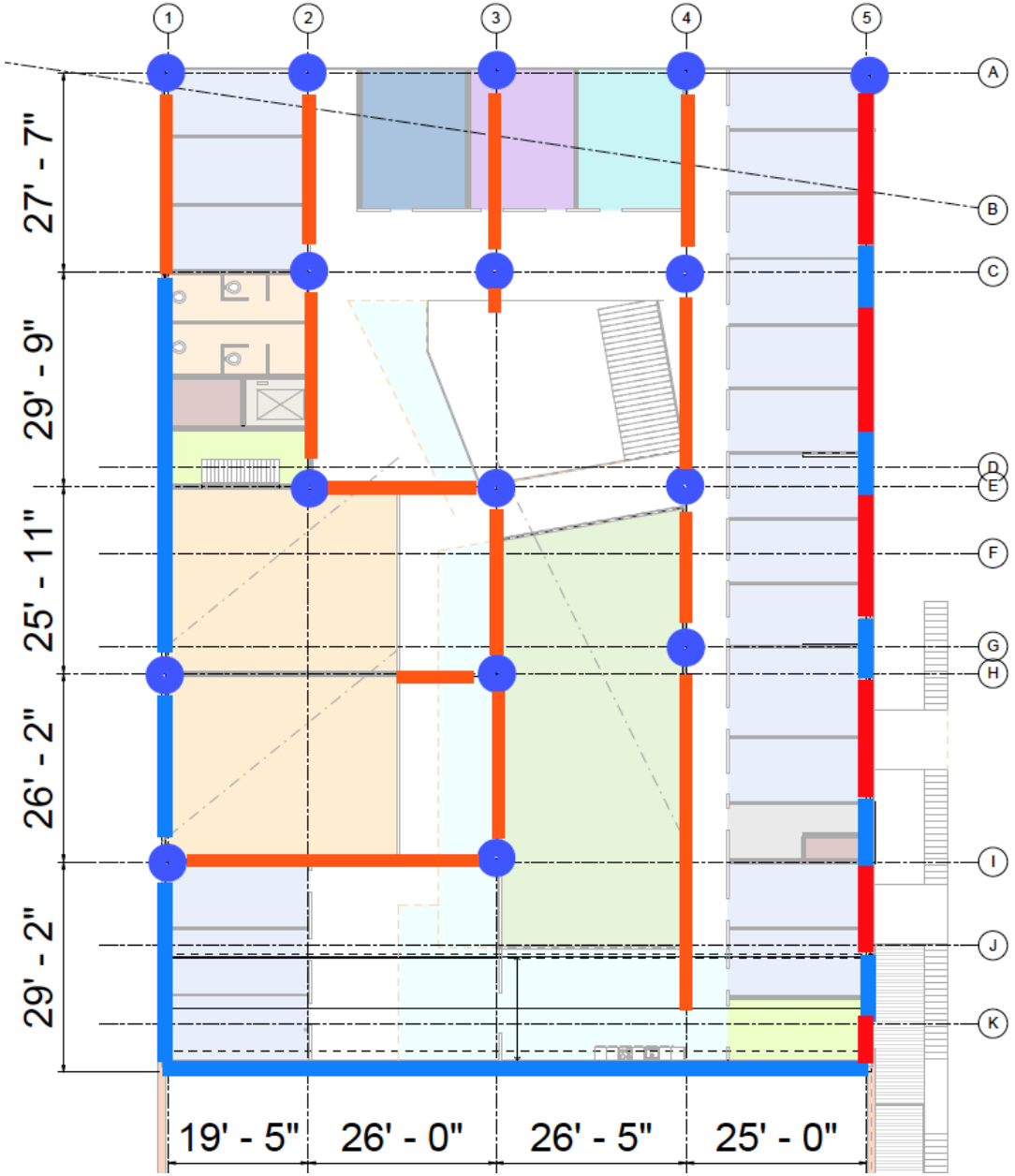
(12.18”)

Concrete (5”)

Structural Plan – Second Floor

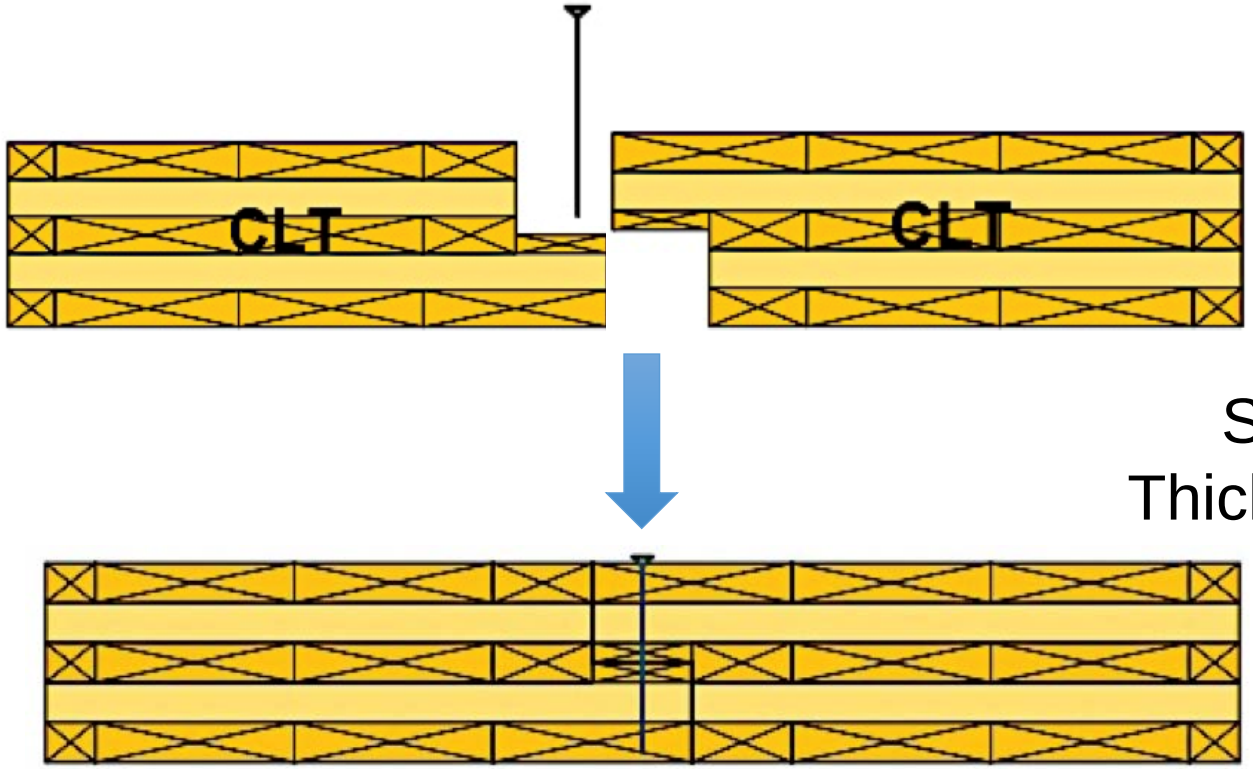


Structural Plan – Third Floor



CLT Connection

Panel to Panel

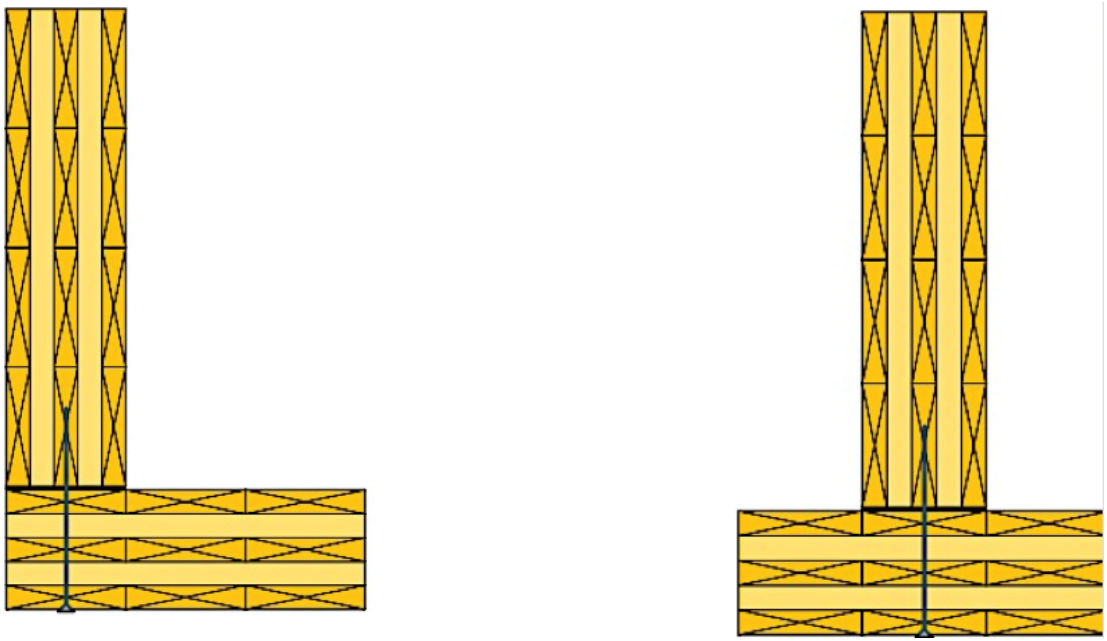


SLT 9 Panel
Thickness 12.18 in

Half-Lapped

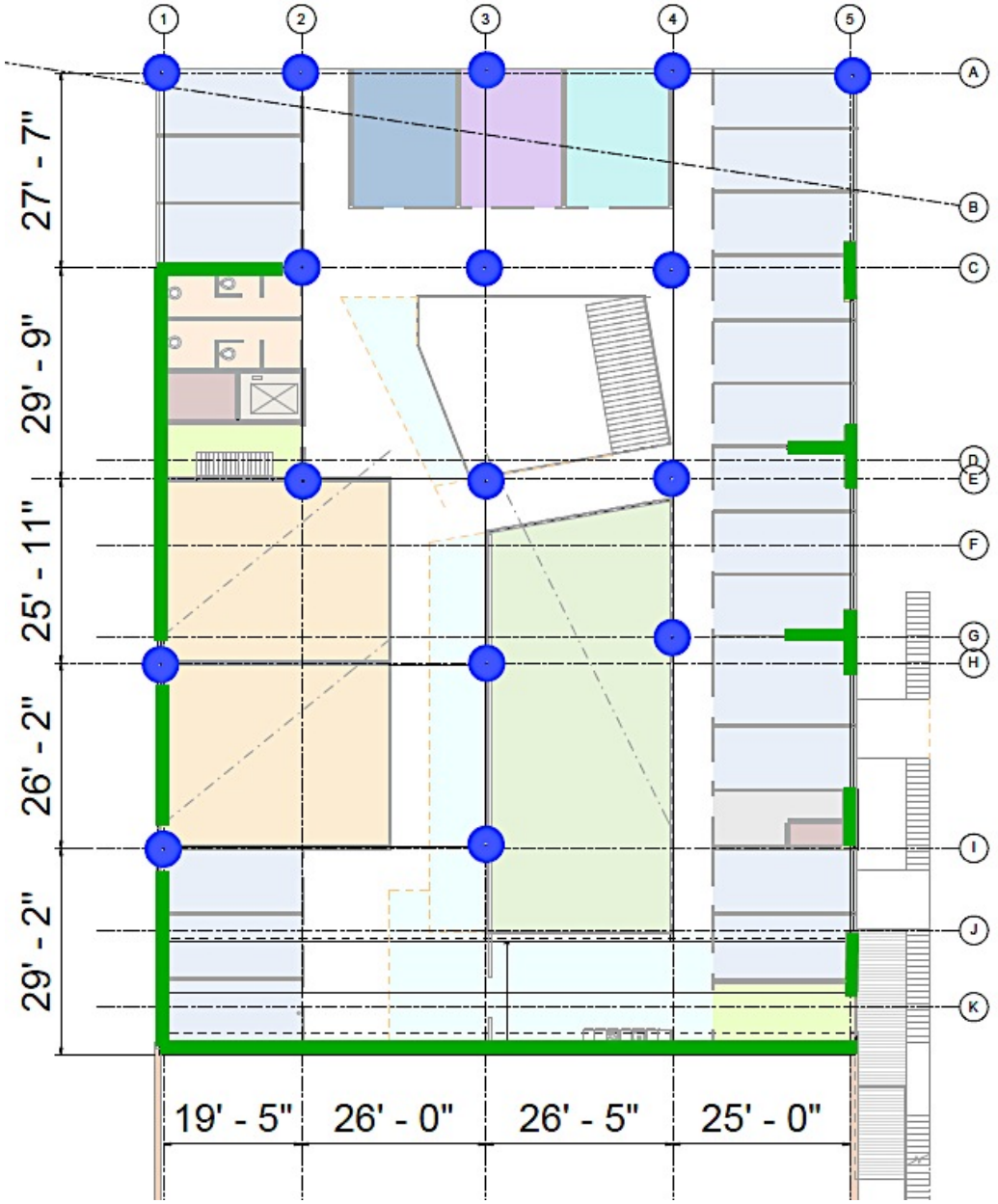
CLT Connection

Wall to Wall



Self-tapping Driven

CLT Benefits - Lateral System



Section Size

GLT Column 10 X 19

Bearing Wall

CLT SLT5 (6.66”)

Concrete (5”)

GLT Beam

Auditorium 8 ¾ X 28 ½

Typical 6 ¾ X 21

Roof 6 ¾ X 32 ½

Cantilever 8 ¾ X 28 ½

Shear Wall

CLT SLT5

Concrete (5”)

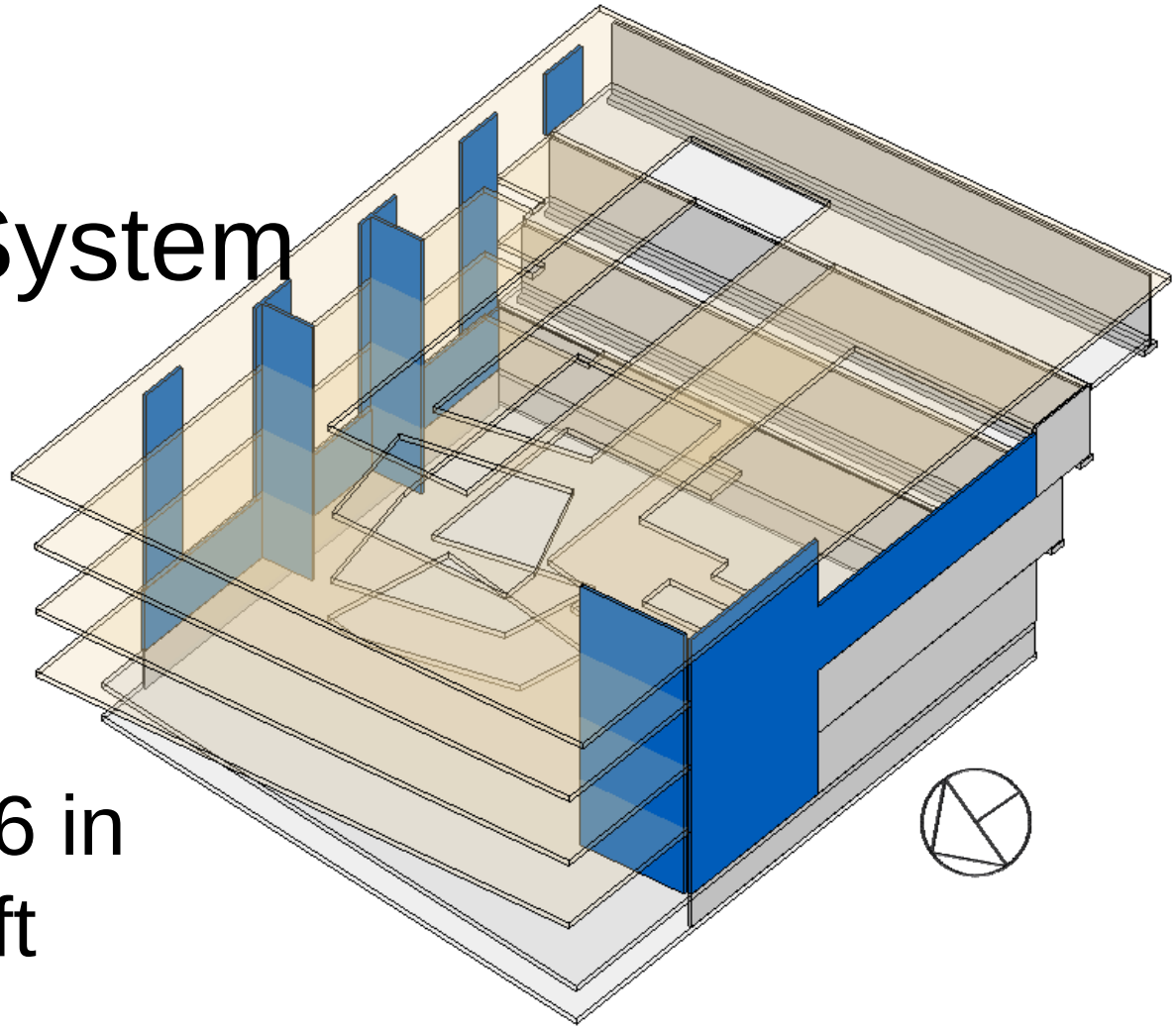
Floor

CLT SLT9

(12.18”)

Concrete (5”)

CLT Benefits
- Lateral System



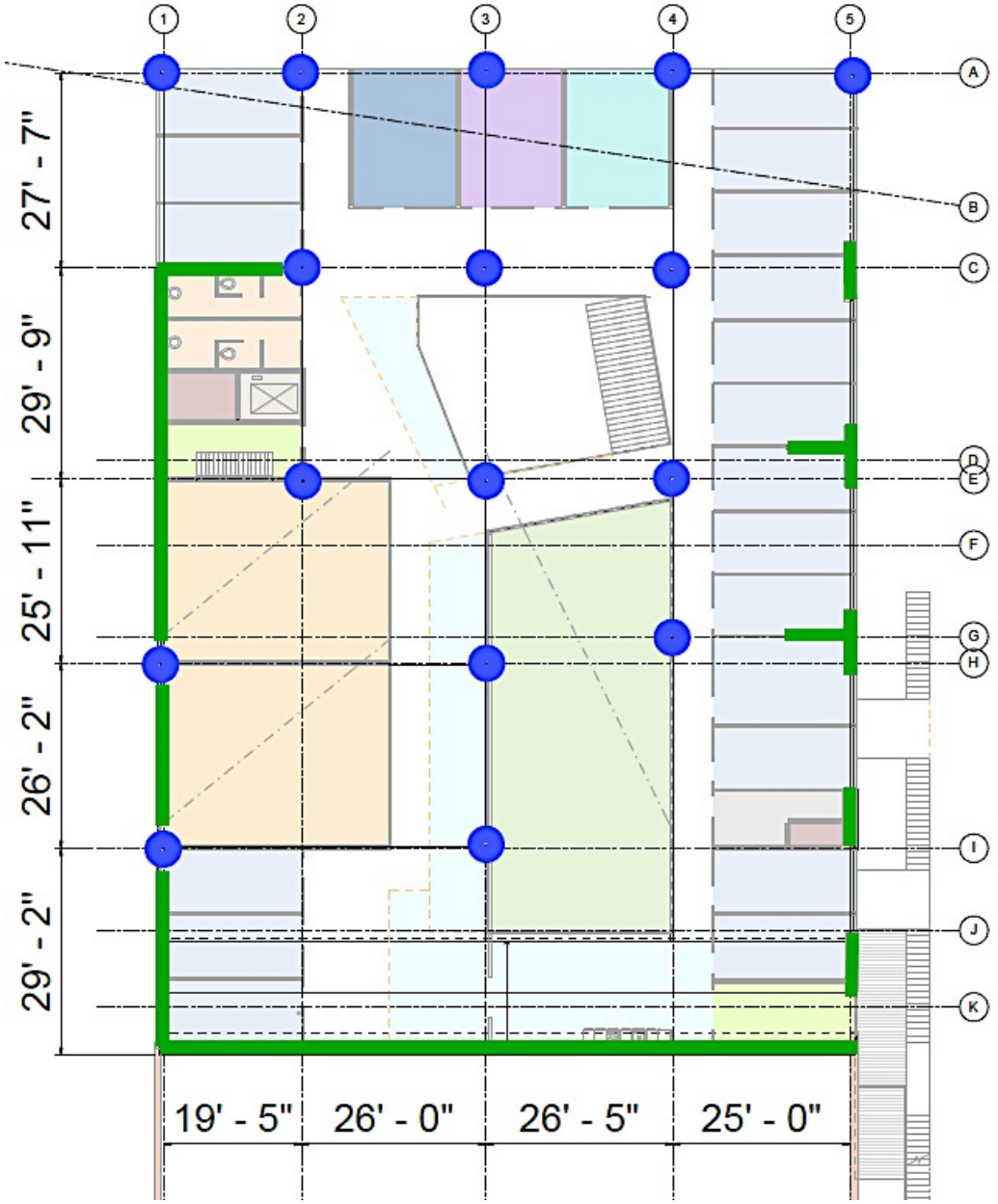
CLT SLT5

- Thickness 6.66 in
- Vr = 5812 lbs/ft

Shear Wall and Diaphragm Applications

CrossLam® In-Plane Shear Loading				
Panel d (in)	SLT3 3.90	SLT5 6.66	SLT7 9.42	SLT9 12.18
		Vr (lbs/ft)		
	2906	5812	8718	11624

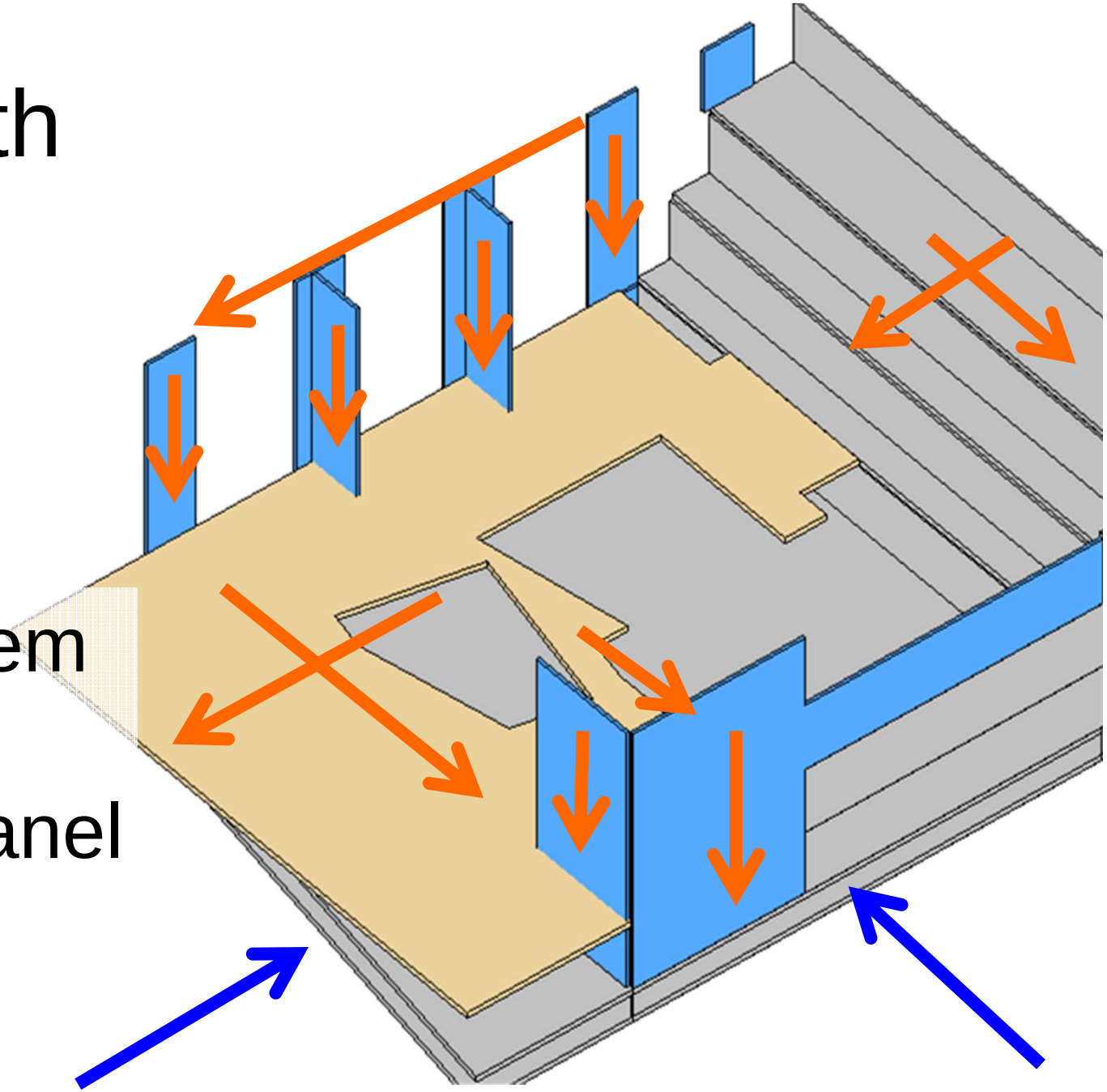
CLT Benefits - Lateral System



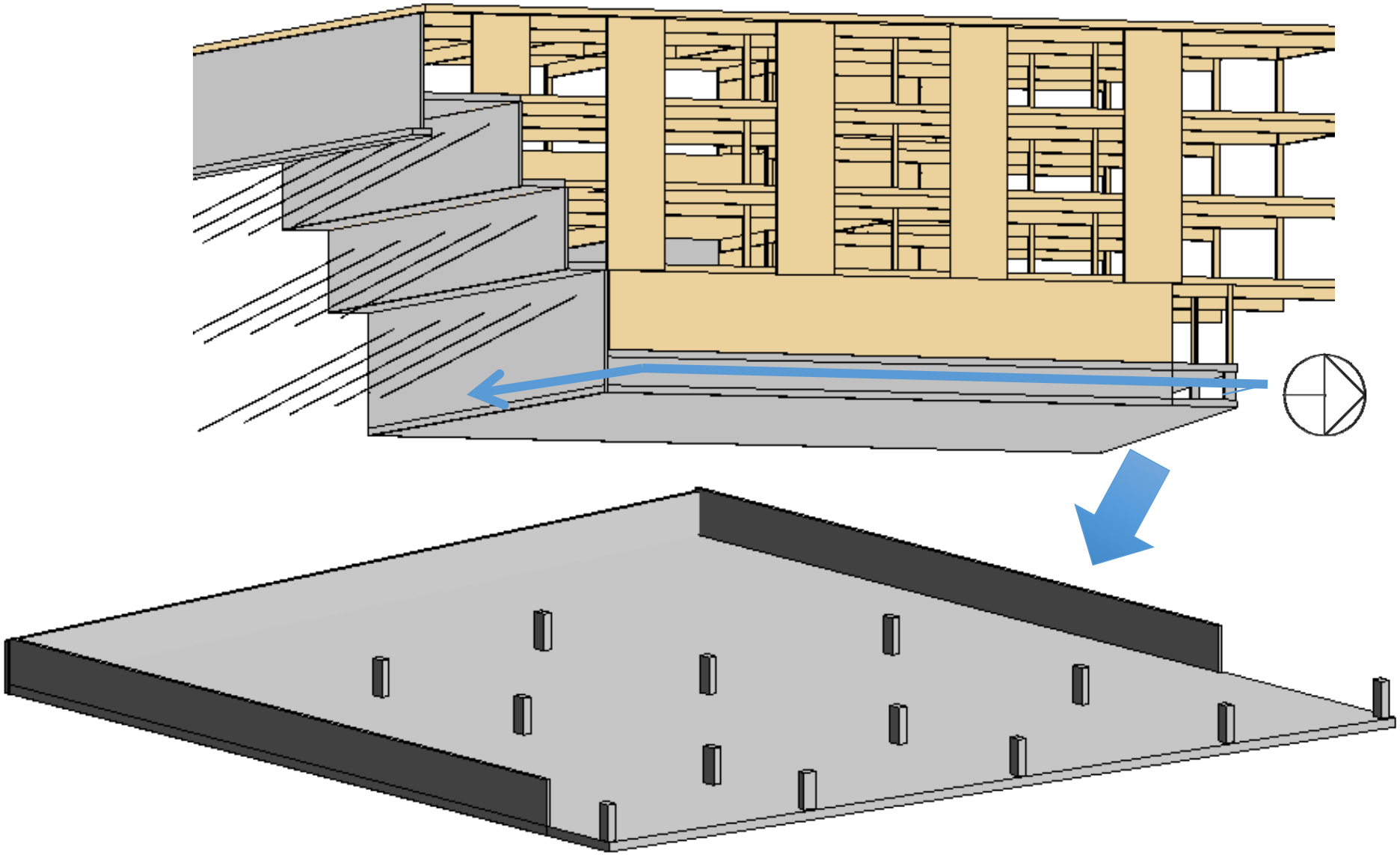
Load Path

Lateral System

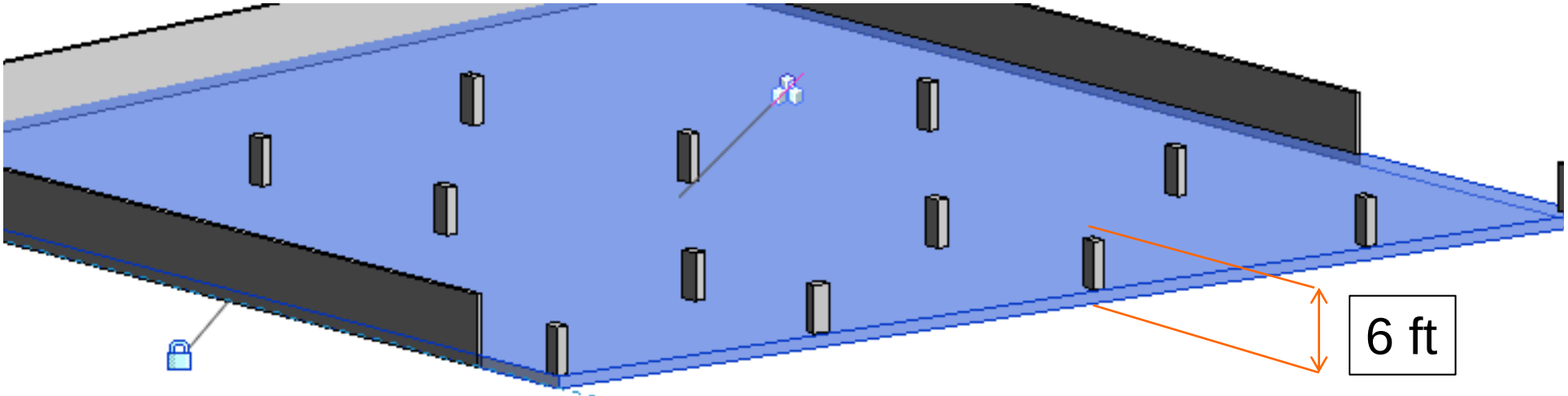
- Wall
- Floor Panel

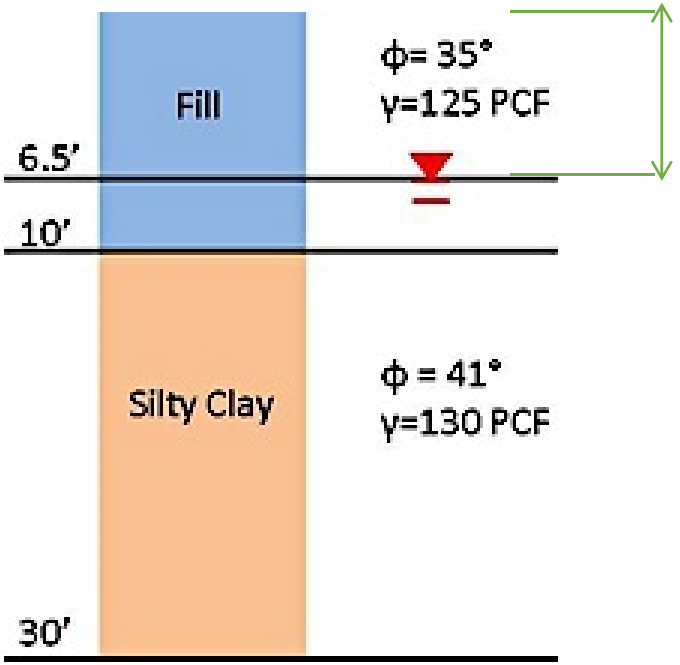


CLT Benefits- Foundation



CLT Benefits- Foundation

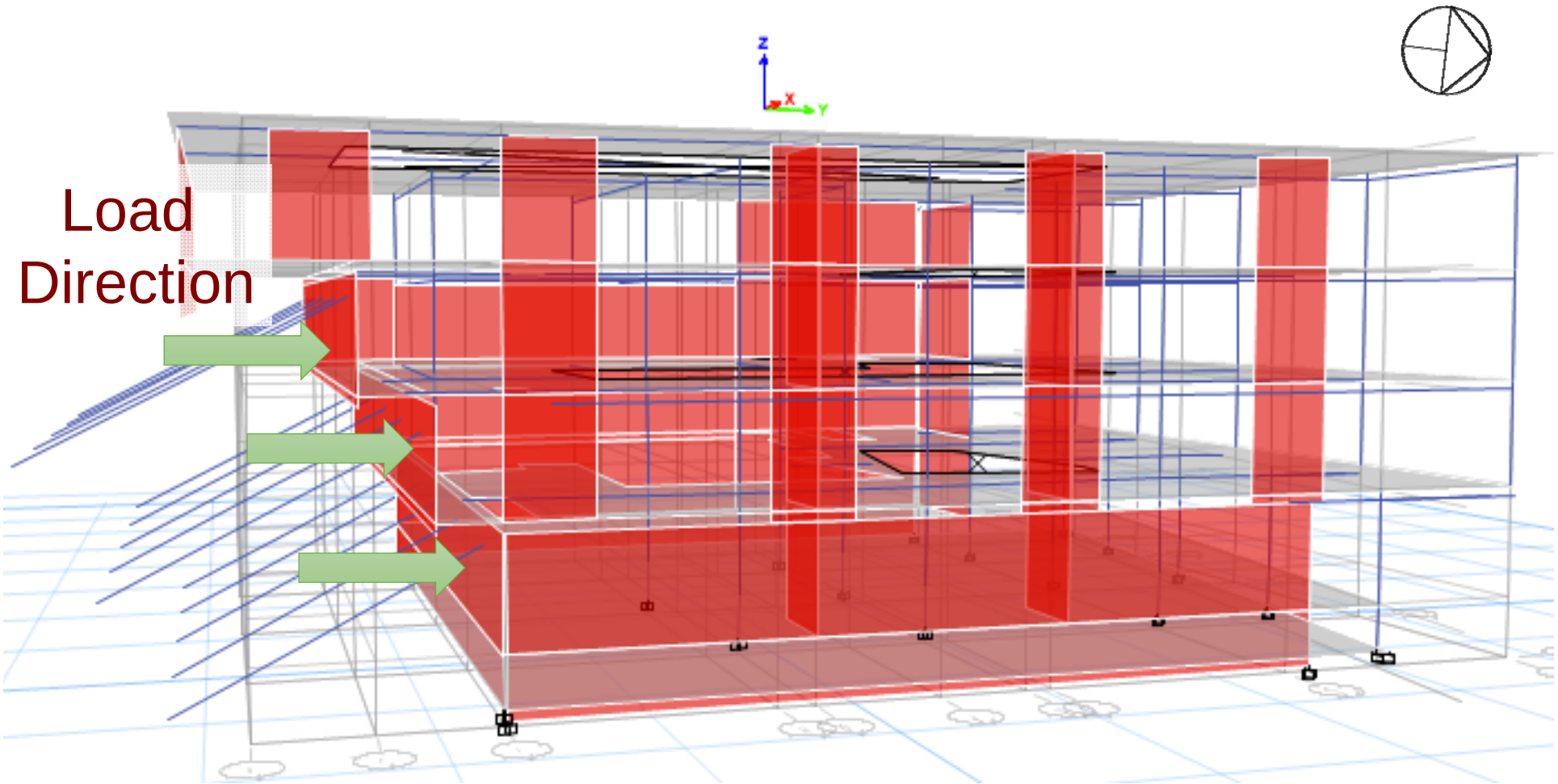




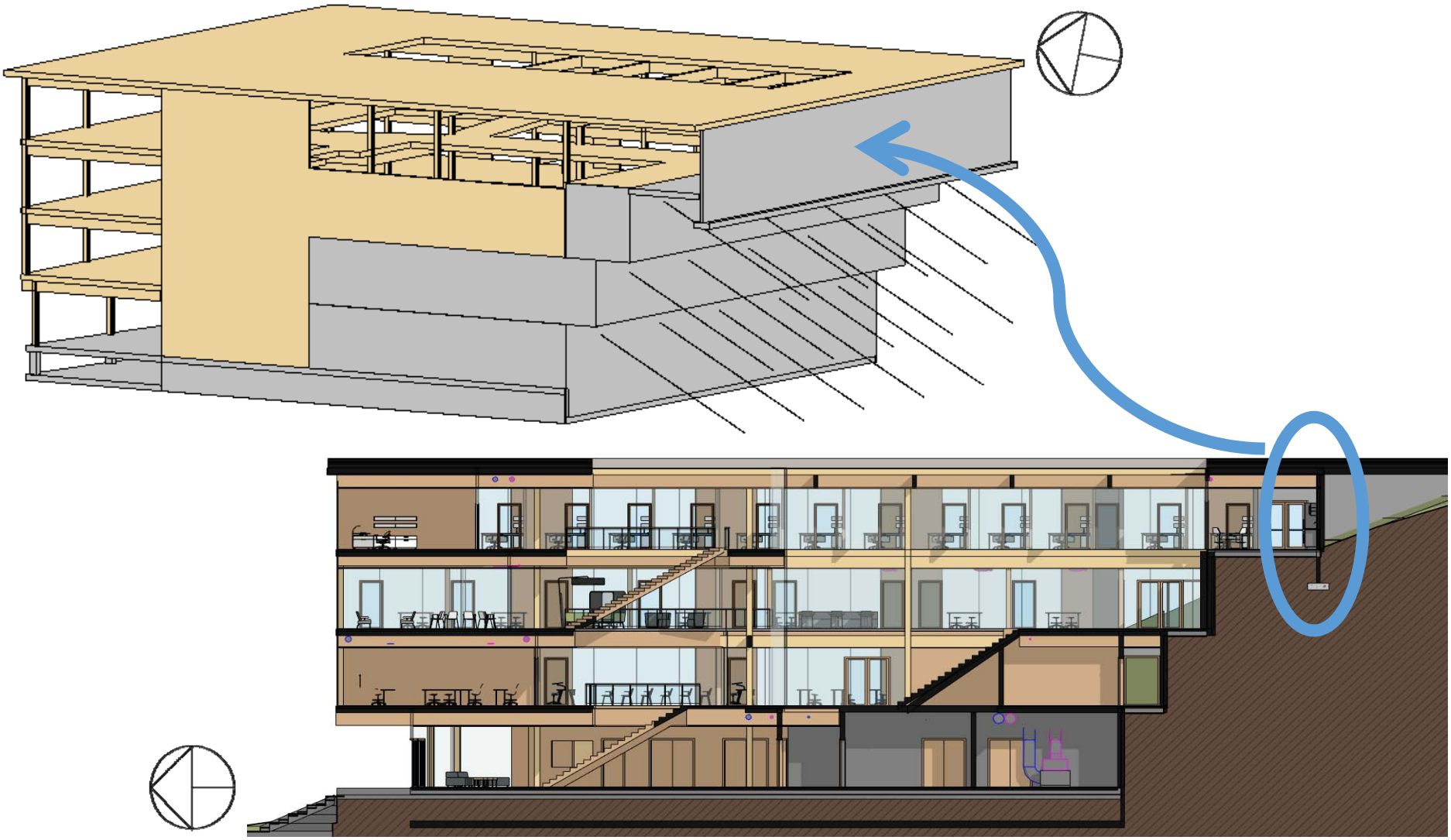
6.5 ft

ABOVE WATER TABLE

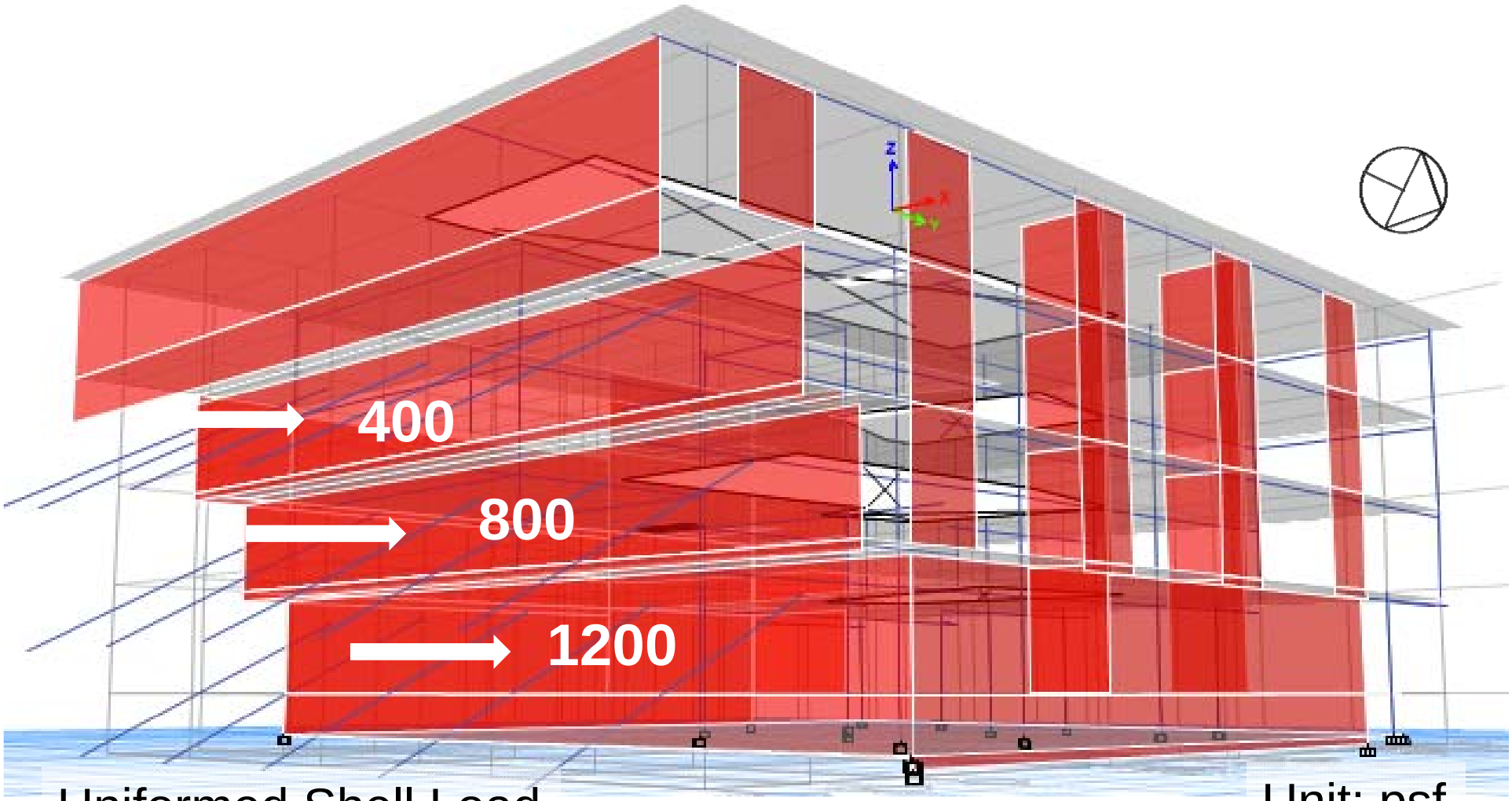
ETABS Analysis



Retaining Wall



Soil Pressure



Uniformed Shell Load

Unit: psf

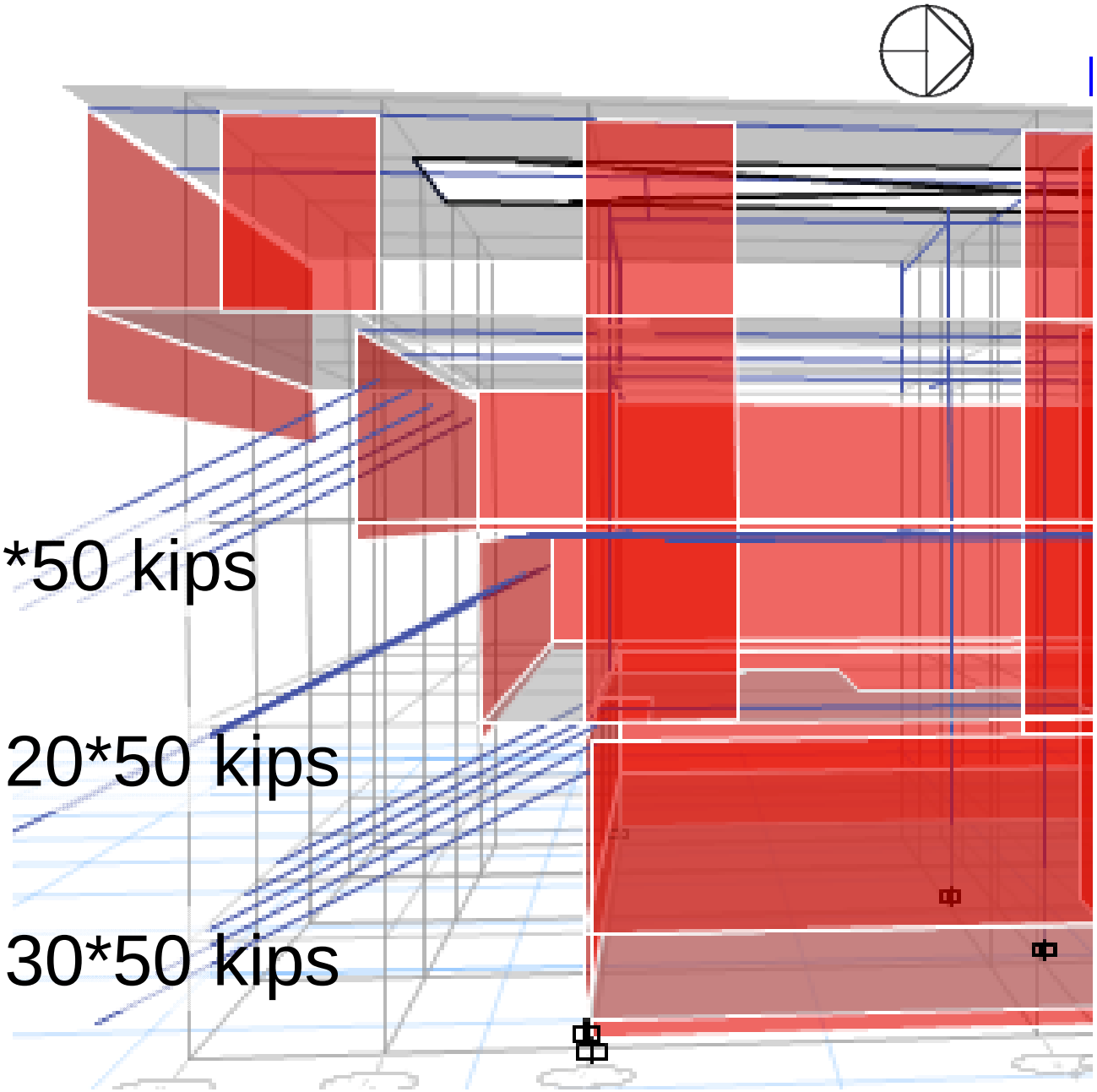
Nail Force

- 45 degree

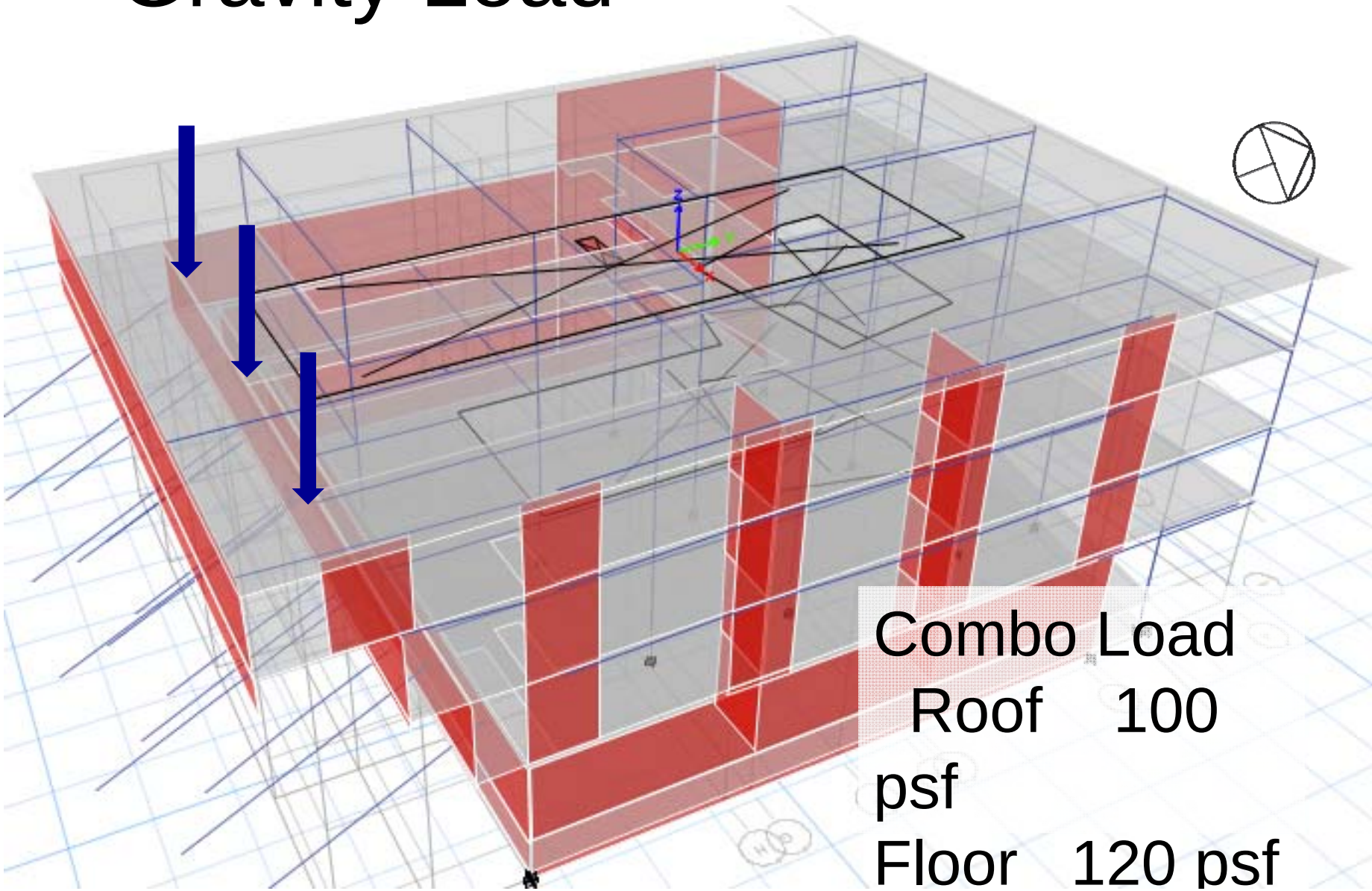
Level 3 10*50 kips

Level 2 20*50 kips

Level 1 30*50 kips

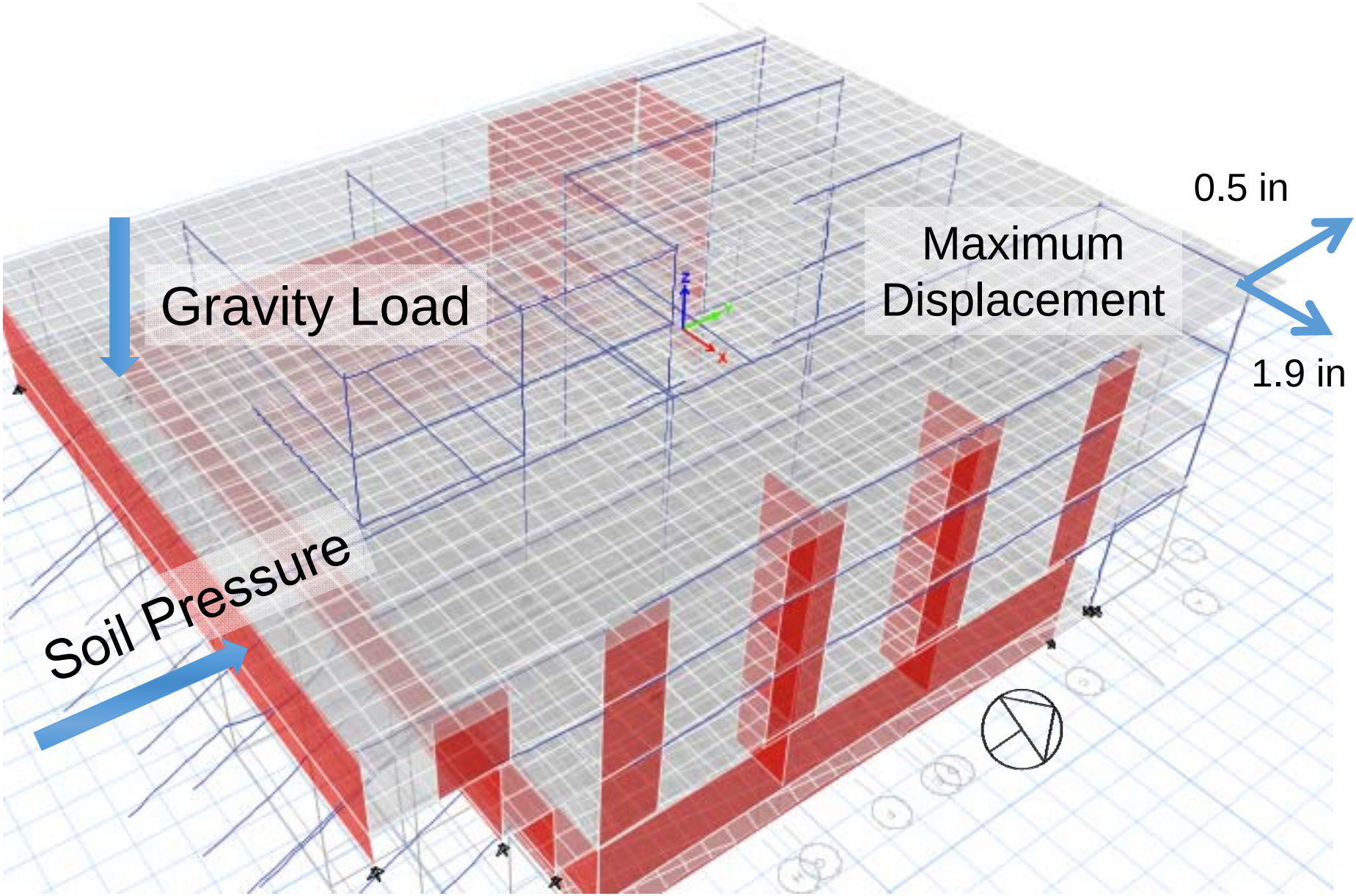


Gravity Load

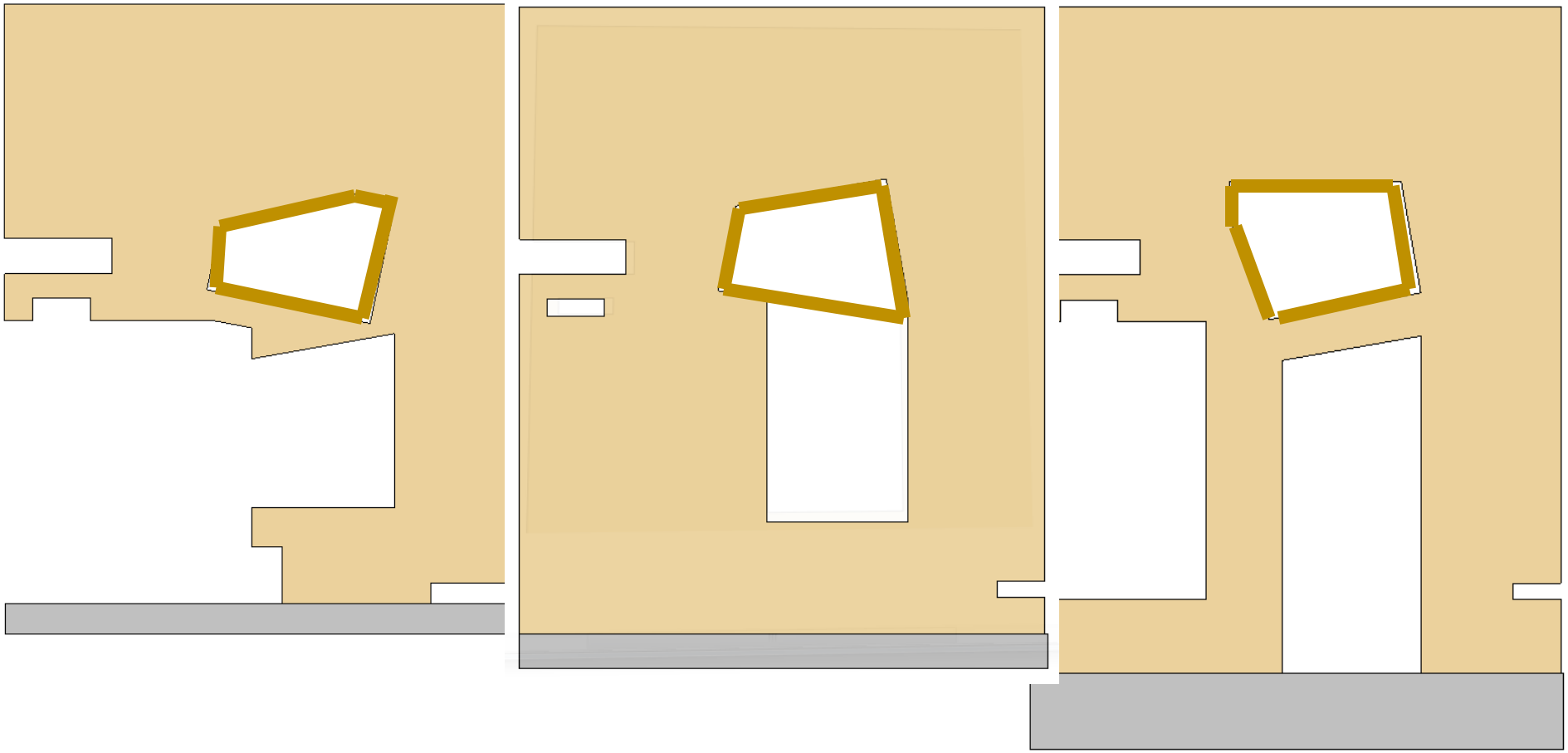


Combo Load
Roof 100 psf
Floor 120 psf

Deflection Result



CLT Floor Panel – Staircase

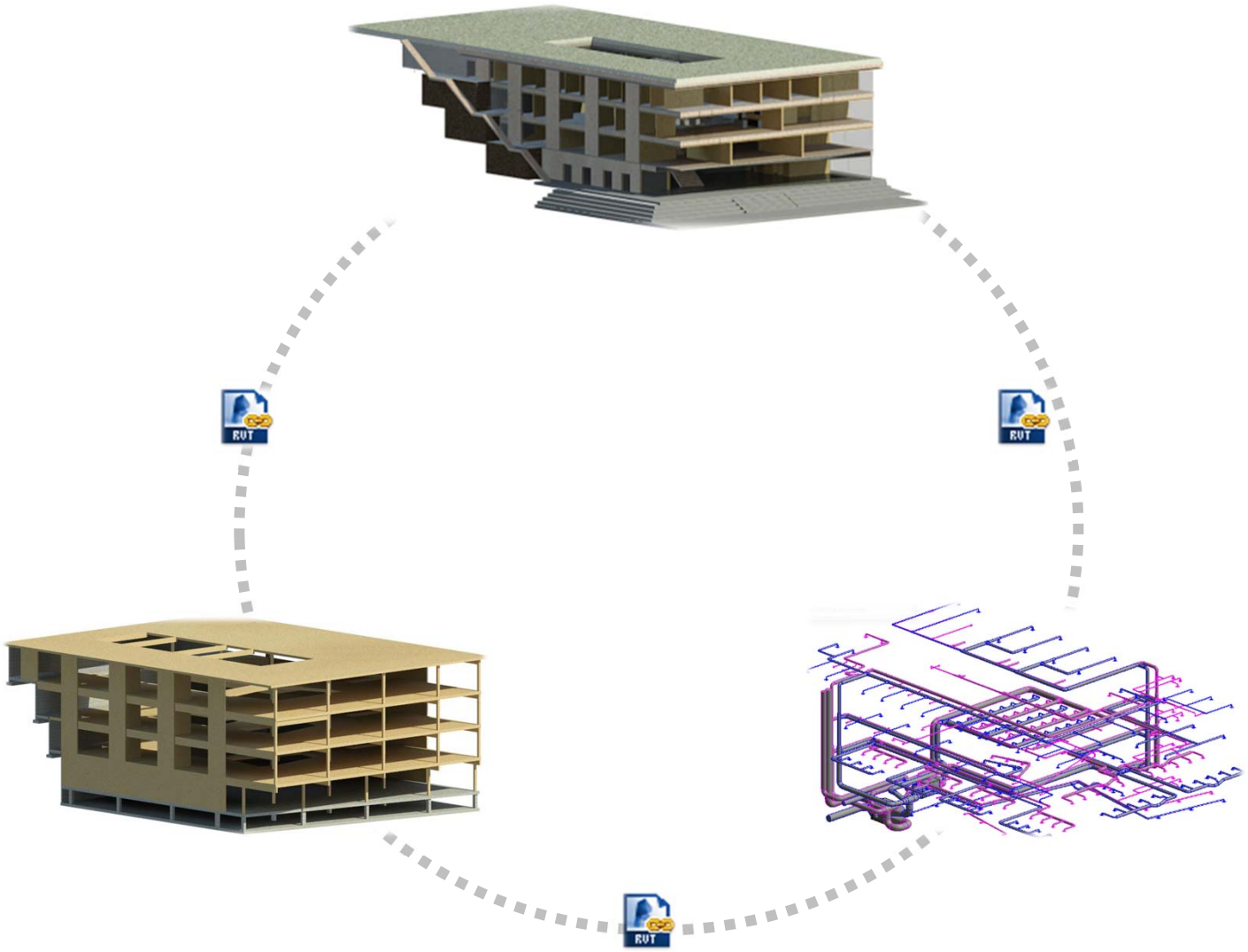


Level 1

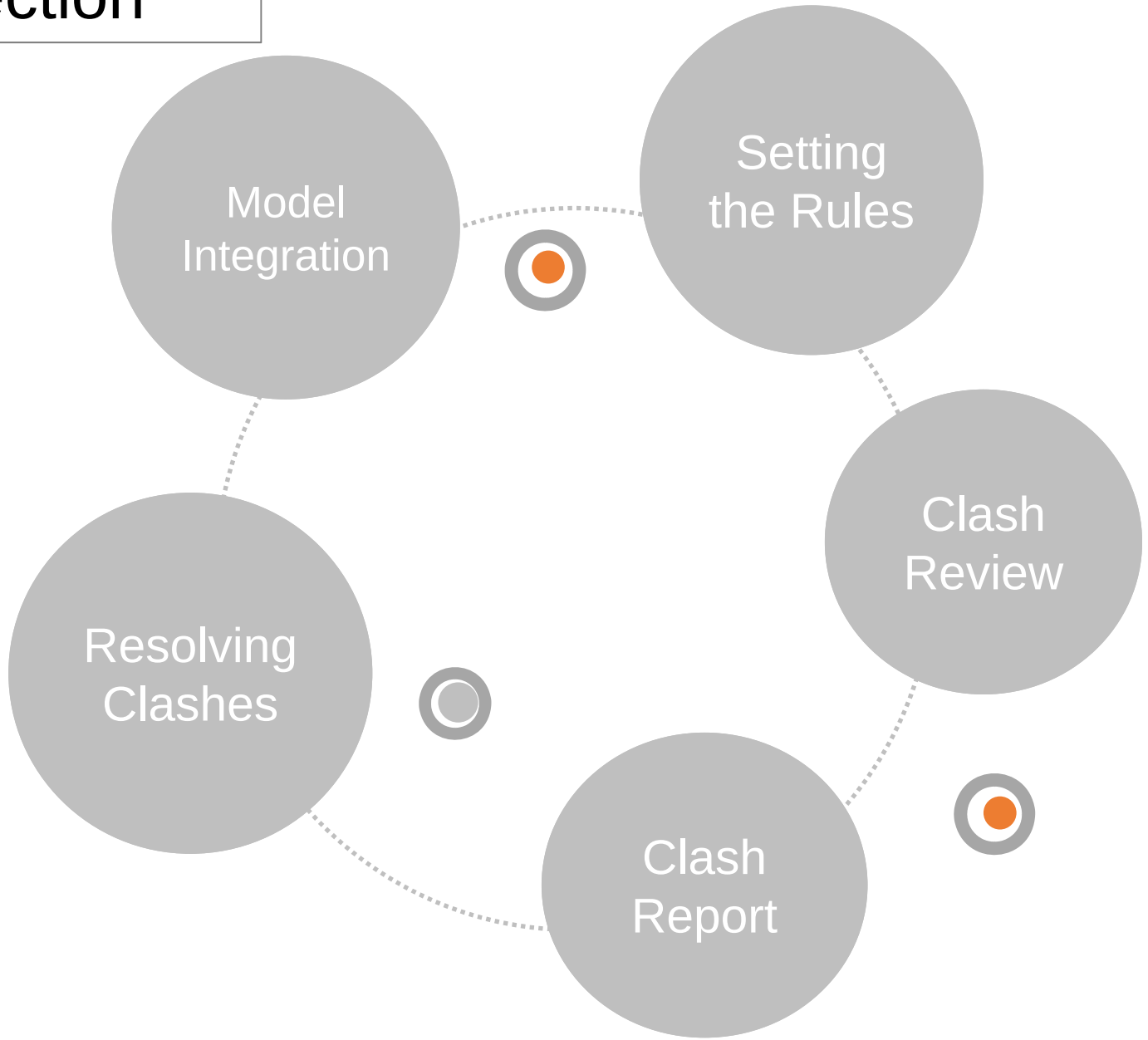
Level 2

Level 3

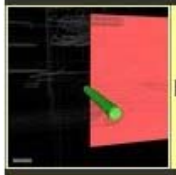
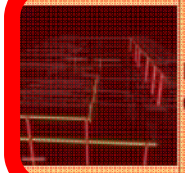
BIM Coordination



Clash Detection

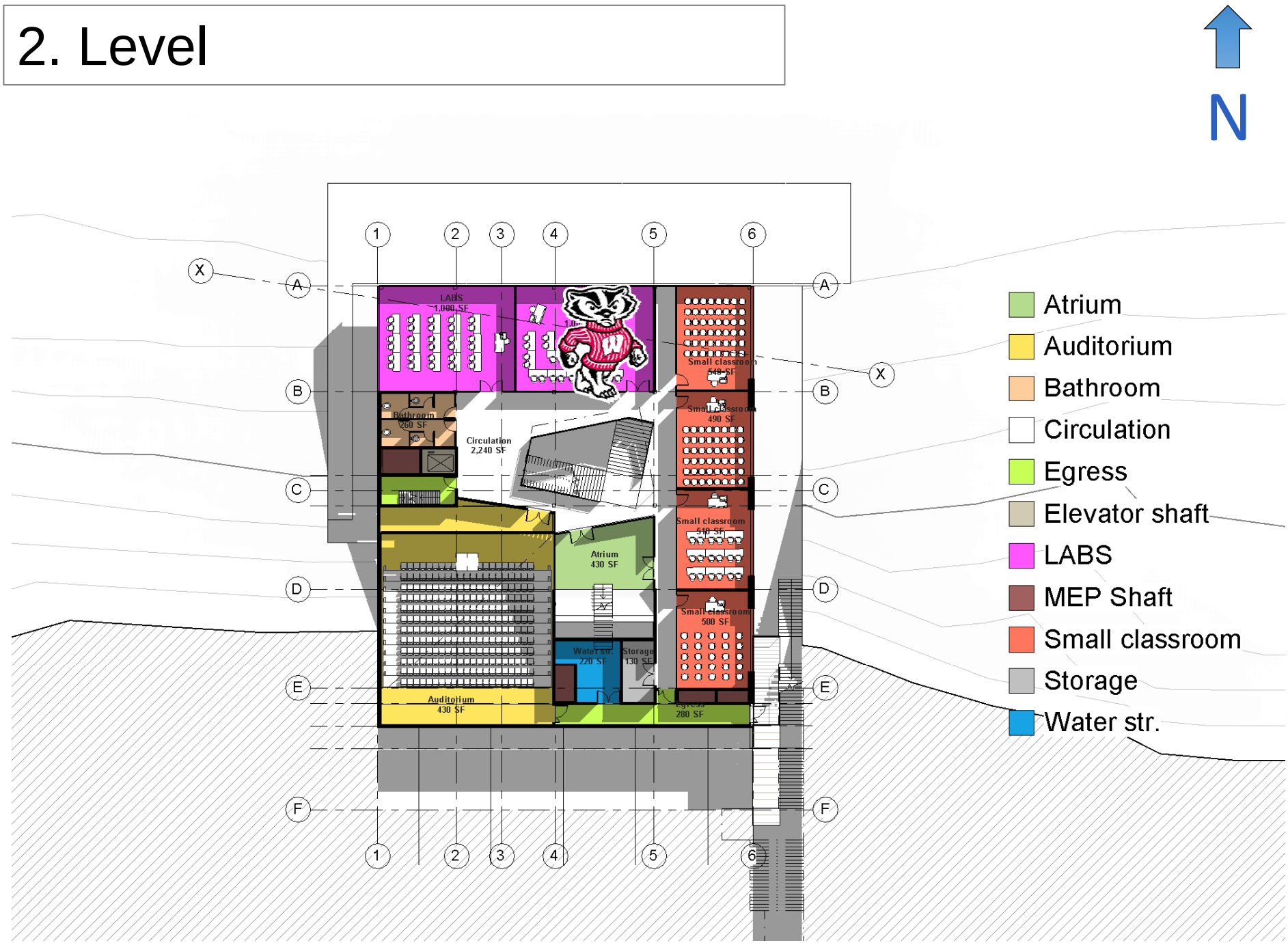


Clash Detection

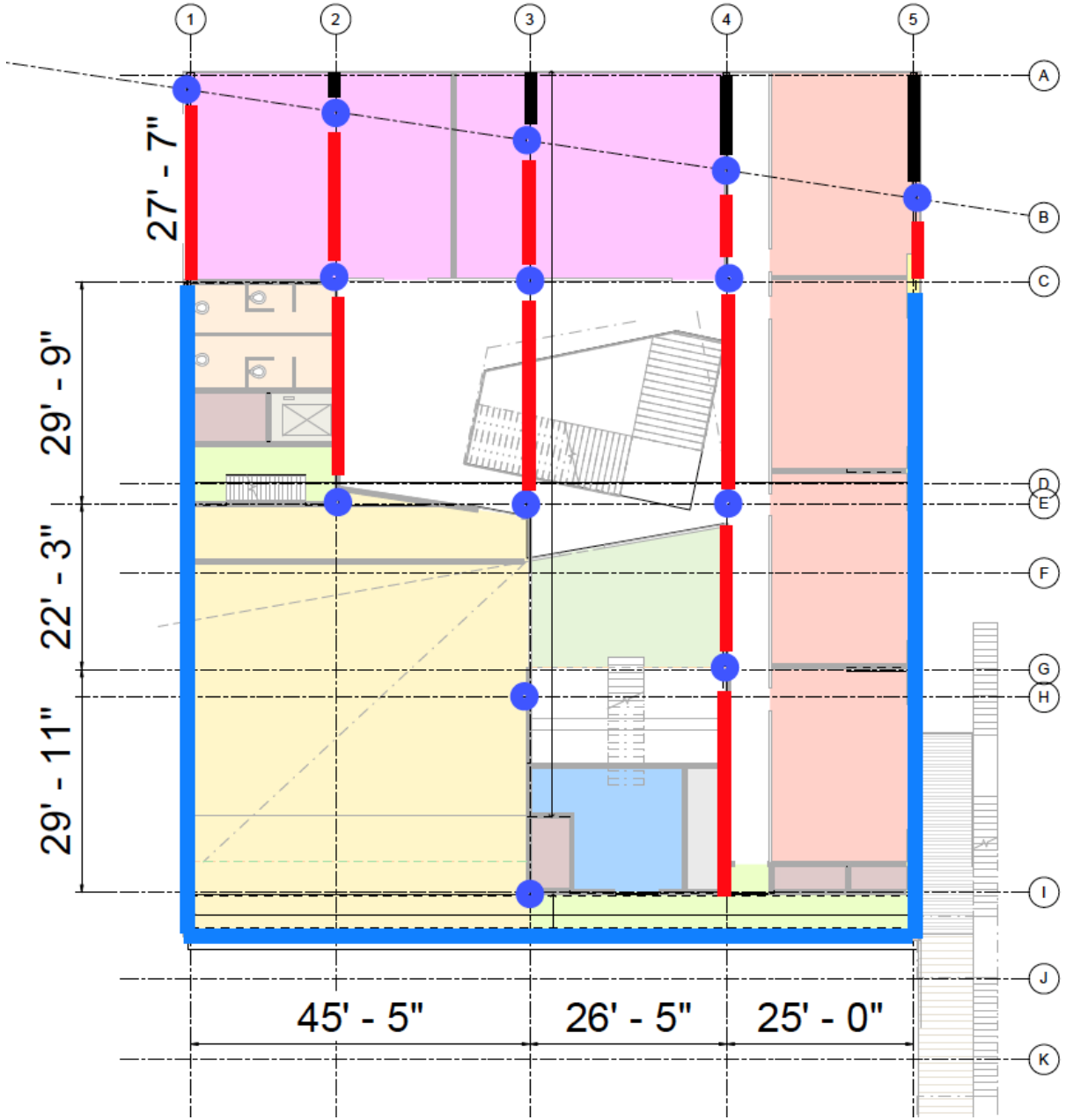
Image	Clash Name	Status	Grid Location	Description	Date Found	Assigned To	Comments
	MEP - Walls	Reviewed	H-4 : Level 1	Hard	2015/4/23 12:23.15	Ali, Cici, Lisa	*#0 - NEJC - 2015/4/23 12:44.36* Assigned to Ali, Cici, Lisa _____ Piping clashes with CLT Wall - this is the only clash between CLT Wall - MEP
	MEP - Floors	Reviewed	I-1 : Level 3	Hard	2015/4/23 12:23.15	Ali, Cici, Lisa	*#0 - NEJC - 2015/4/23 12:29.26* Assigned to Ali, Cici, Lisa _____ Do we need pre-modeled openings for things like this? *#0 - NEJC - 2015/4/23 12:46.05* Assigned to Ali, Cici, Lisa _____ Do we need a pre-modeled opening for this two clashes?
	MEP - Columns	Reviewed	A-3 : Level 2	Hard	2015/4/23 12:23.15	Ali, Cici, Lisa	*#0 - NEJC - 2015/4/23 12:45.30* Assigned to Ali, Cici, Lisa _____ These pipings need to be moved, they directly hit the columns, multiple levels
	MEP in Floor	Reviewed	F-4 : Level 3	Hard	2015/4/23 12:23.15	Ali, Cici, Lisa	*#0 - NEJC - 2015/4/23 12:47.16* Assigned to Ali, Cici, Lisa _____ This seems to be the most severe clash, you need to coordinate this guys.
	Approved - minor clashes	Approved	I-1 : Level 1	Hard	2015/4/23 12:23.15	Ali, Cici, Lisa	*#0 - NEJC - 2015/4/23 12:47.41* Assigned to Ali, Cici, Lisa _____ This seem to be minor clashes and are ok!

TERF

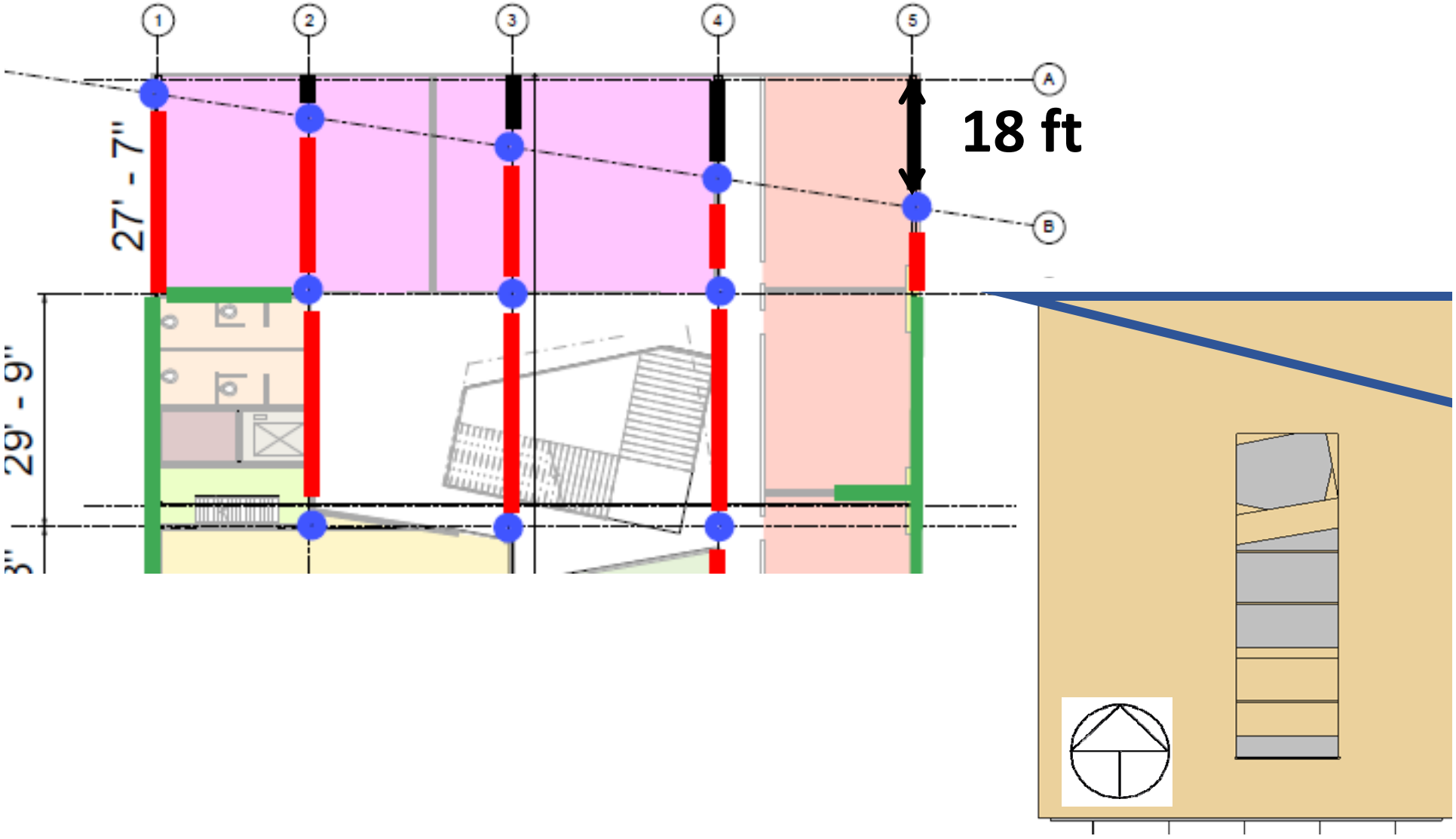
2. Level


N
1
2
3
4
5
6
X
A
B
C
D
E
F
LABS
1,000 SF
Bathroom
260 SF
Circulation
2,240 SF
Atrium
430 SF
Auditorium
430 SF
Water str.
220 SF
Storage
130 SF
Small classroom
490 SF
Small classroom
510 SF
Small classroom
500 SF
Atrium
Auditorium
Bathroom
Circulation
Egress
Elevator shaft
LABS
MEP Shaft
Small classroom
Storage
Water str.

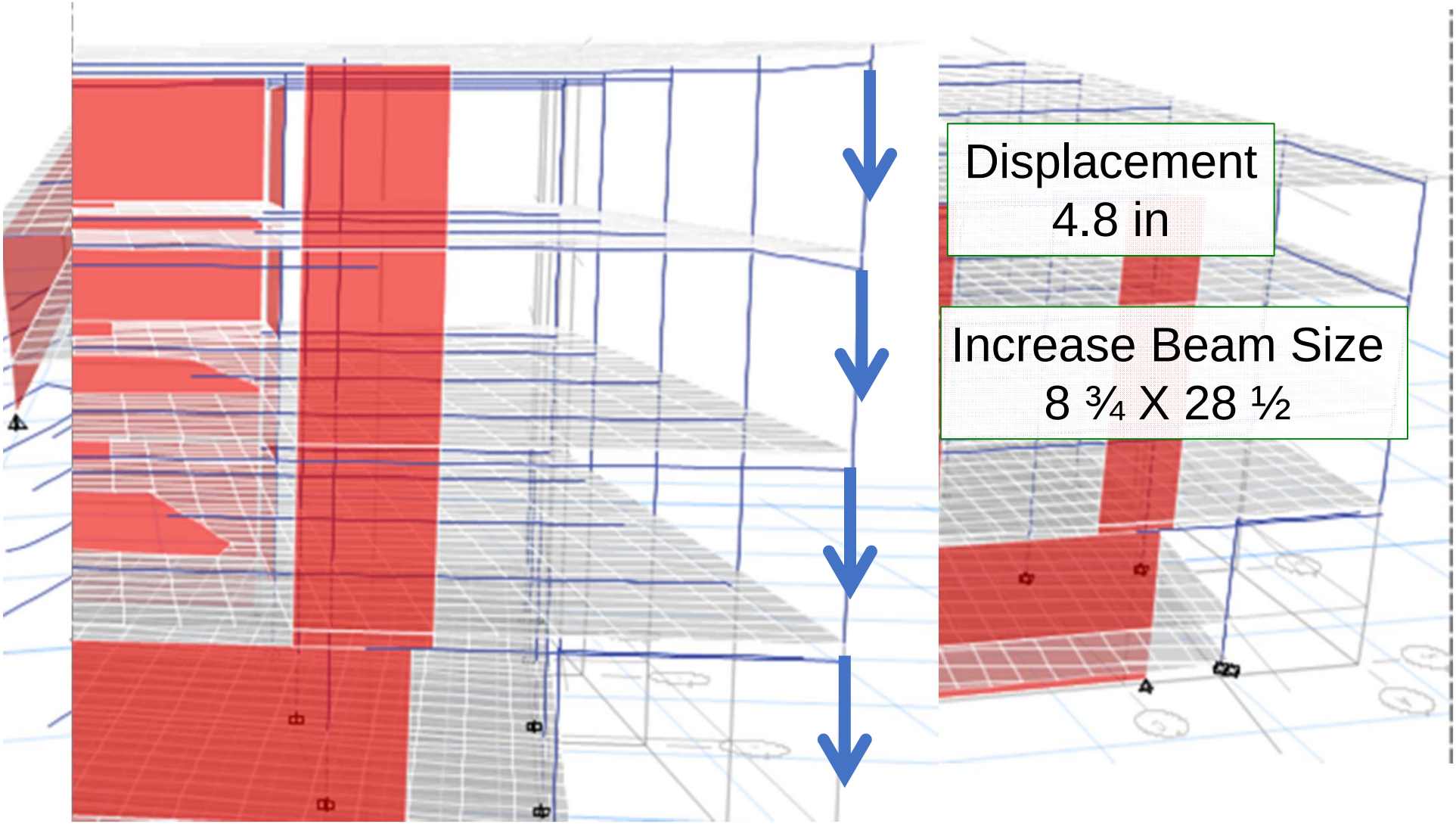
Structural Plan- First Level



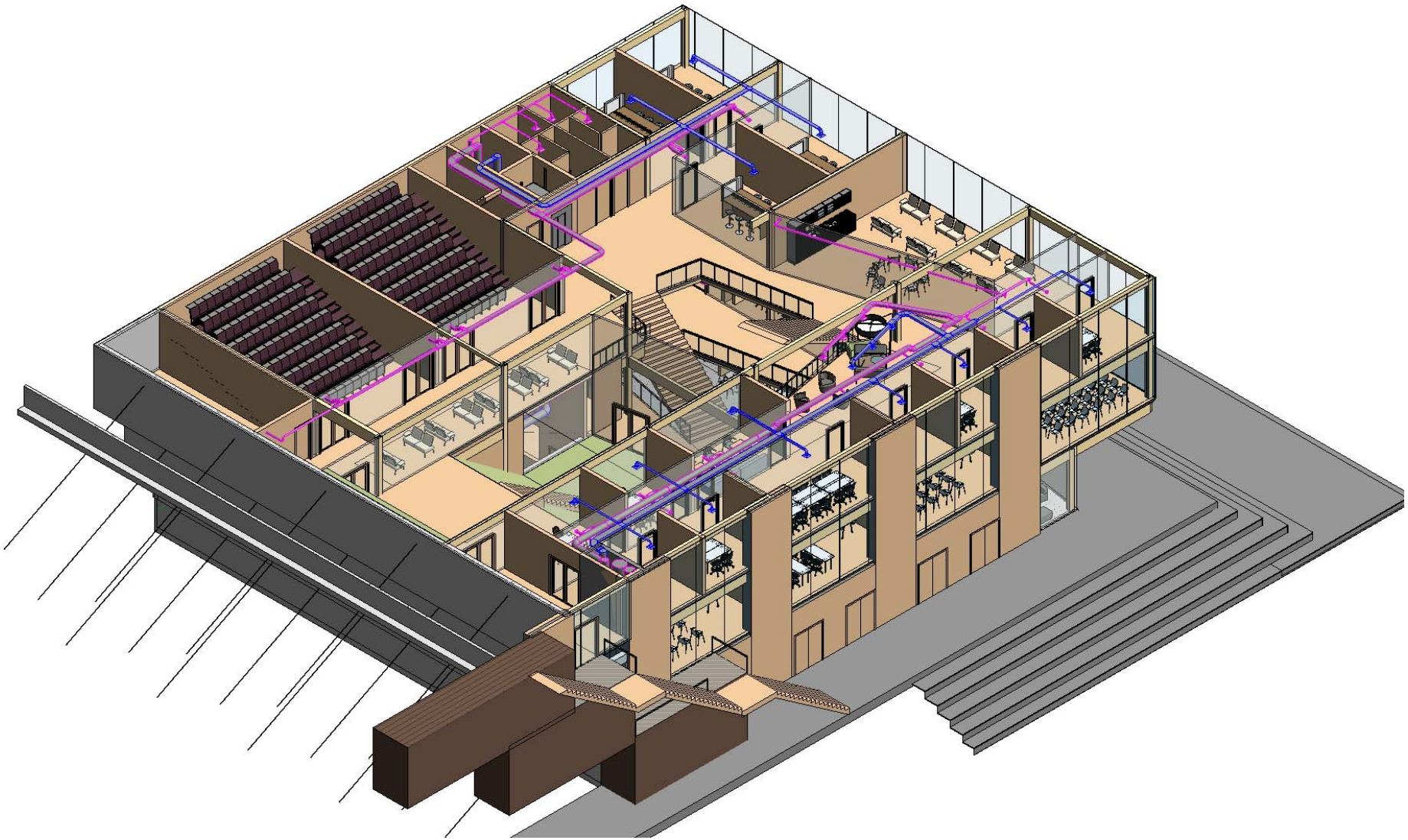
Cantilever



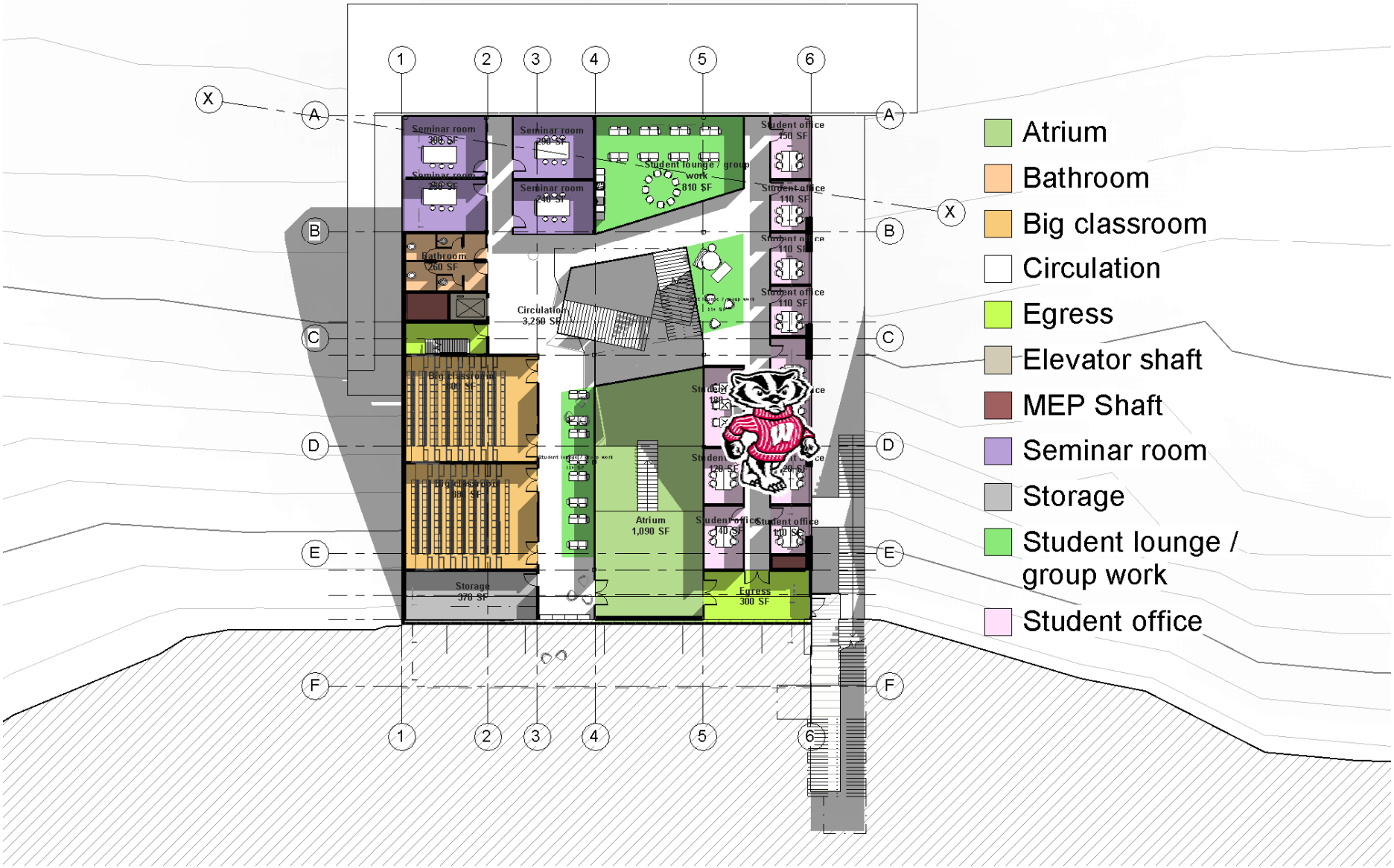
Cantilever Check



3. Level

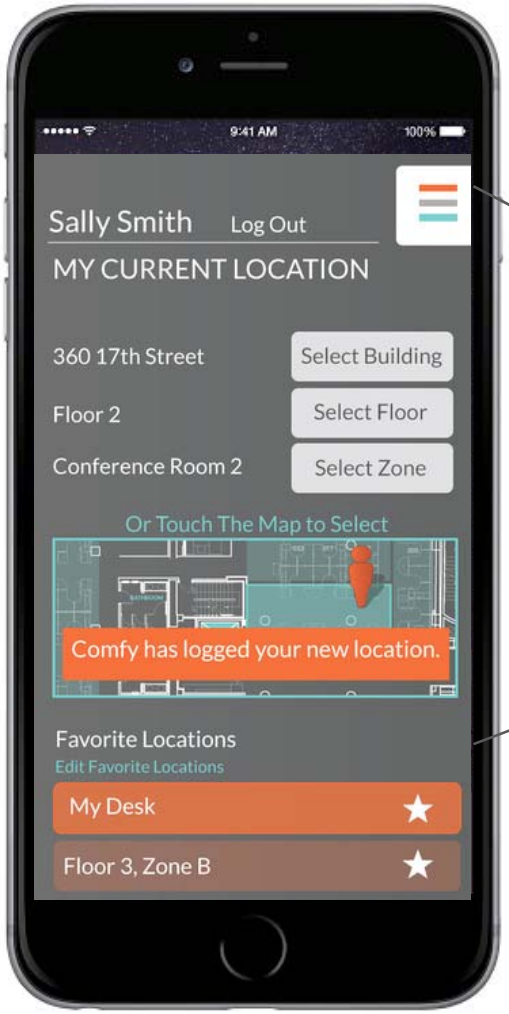


3. Level


N
Atrium
Bathroom
Big classroom
Circulation
Egress
Elevator shaft
MEP Shaft
Seminar room
Storage
Student lounge / group work
Student office
Seminar room 300 SF
Seminar room 290 SF
Seminar room 240 SF
Student lounge / group work 810 SF
Student office 150 SF
Student office 110 SF
Bathroom 260 SF
Circulation 3,250 SF
Atrium 1,090 SF
Egress 300 SF
Storage 370 SF
1
2
3
4
5
6
A
B
C
D
E
F
X

Atrium

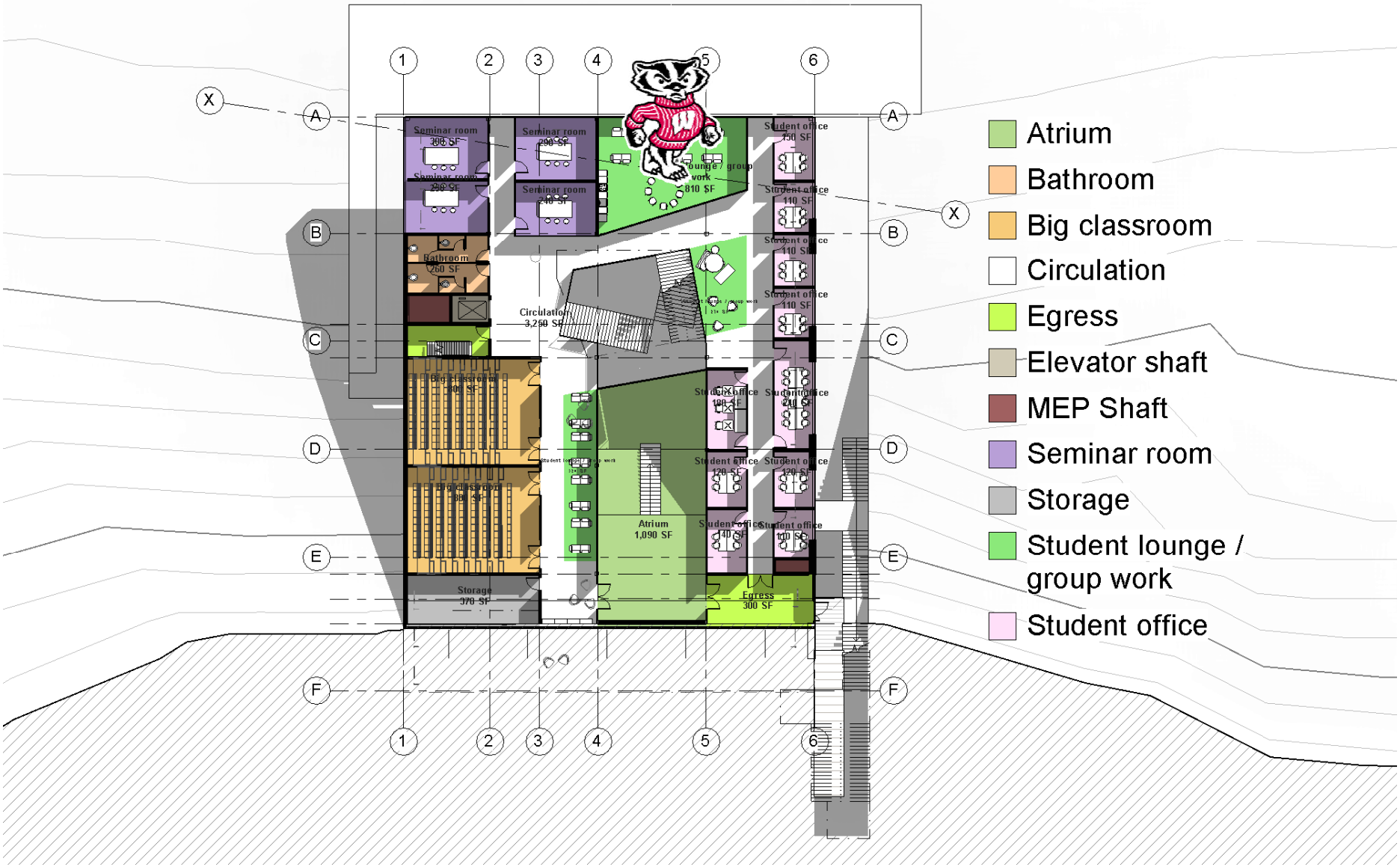
User Control



„I'm much happier with the temperature with Comfy, especially in the seminar rooms."
-Nick

Comfy

3. Level


Atrium
Bathroom
Big classroom
Circulation
Egress
Elevator shaft
MEP Shaft
Seminar room
Storage
Student lounge / group work
Student office
Seminar room 300 SF
Seminar room 290 SF
Seminar room 240 SF
Lounge / group work 810 SF
Student office 150 SF
Student office 110 SF
Bathroom 260 SF
Circulation 3,250 SF
Big classroom 700 SF
Big classroom 700 SF
Atrium 1,090 SF
Storage 370 SF
Egress 300 SF
1
2
3
4
5
6
A
B
C
D
E
F
X

Student Lounge

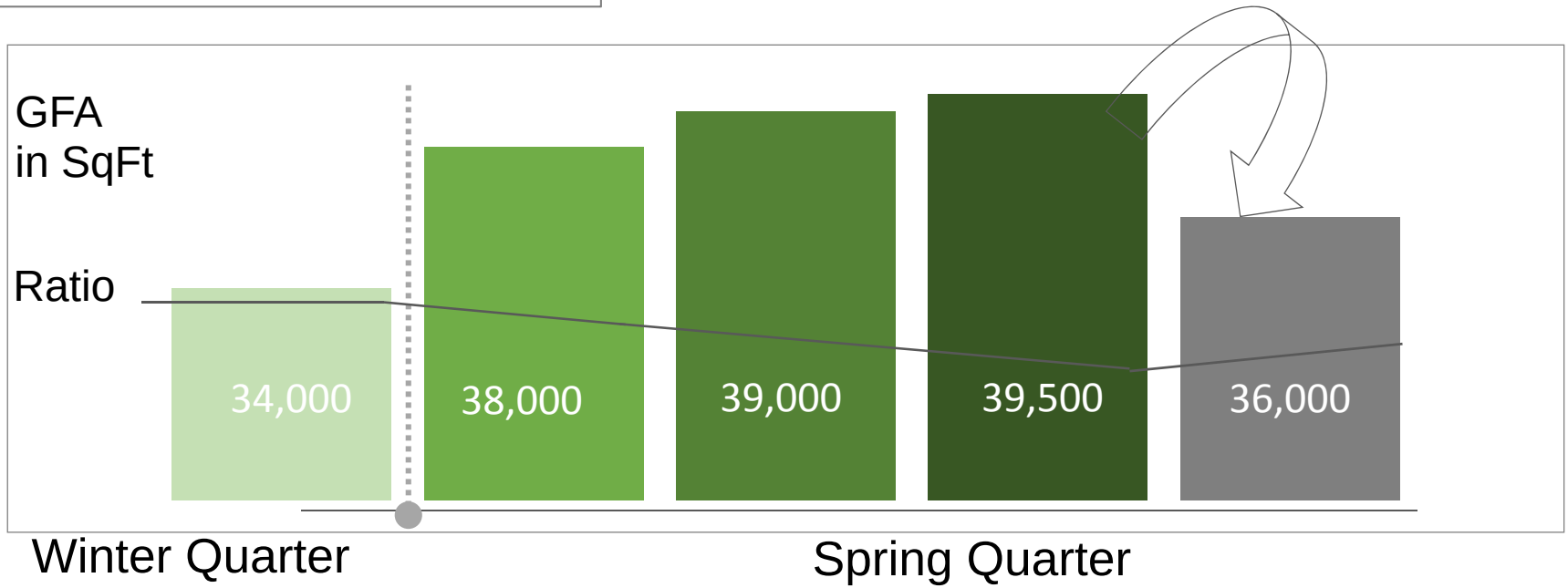
Provide additional spaces/ Value for money

Student Lounge

Collaboration Area

Cafe

Space efficiency



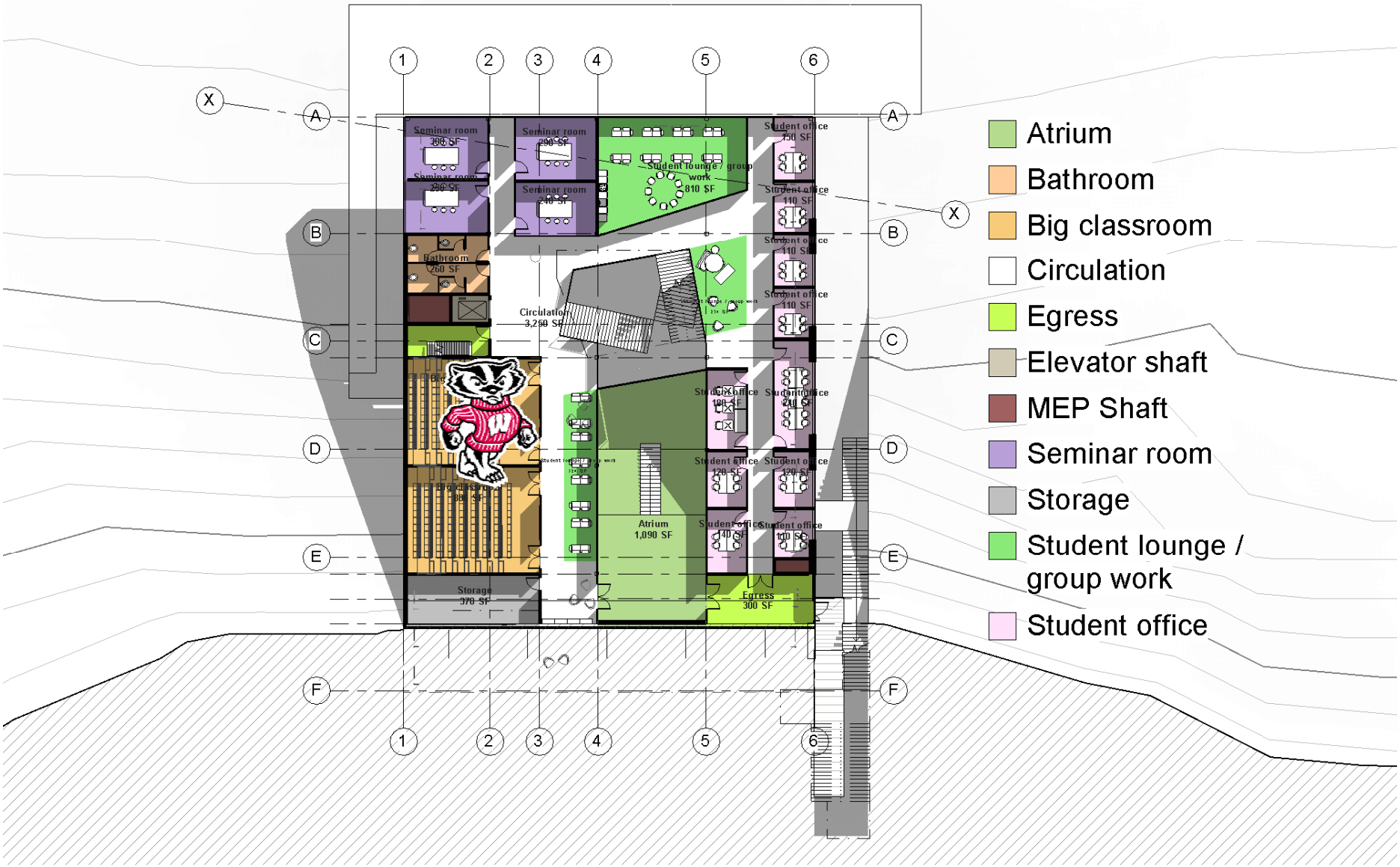
O+M Cost

Space efficiency

Construction Cost

Maximum Rent **340$/SqFT**
Maximum Rent **$1 Mio./Years**

3. Level

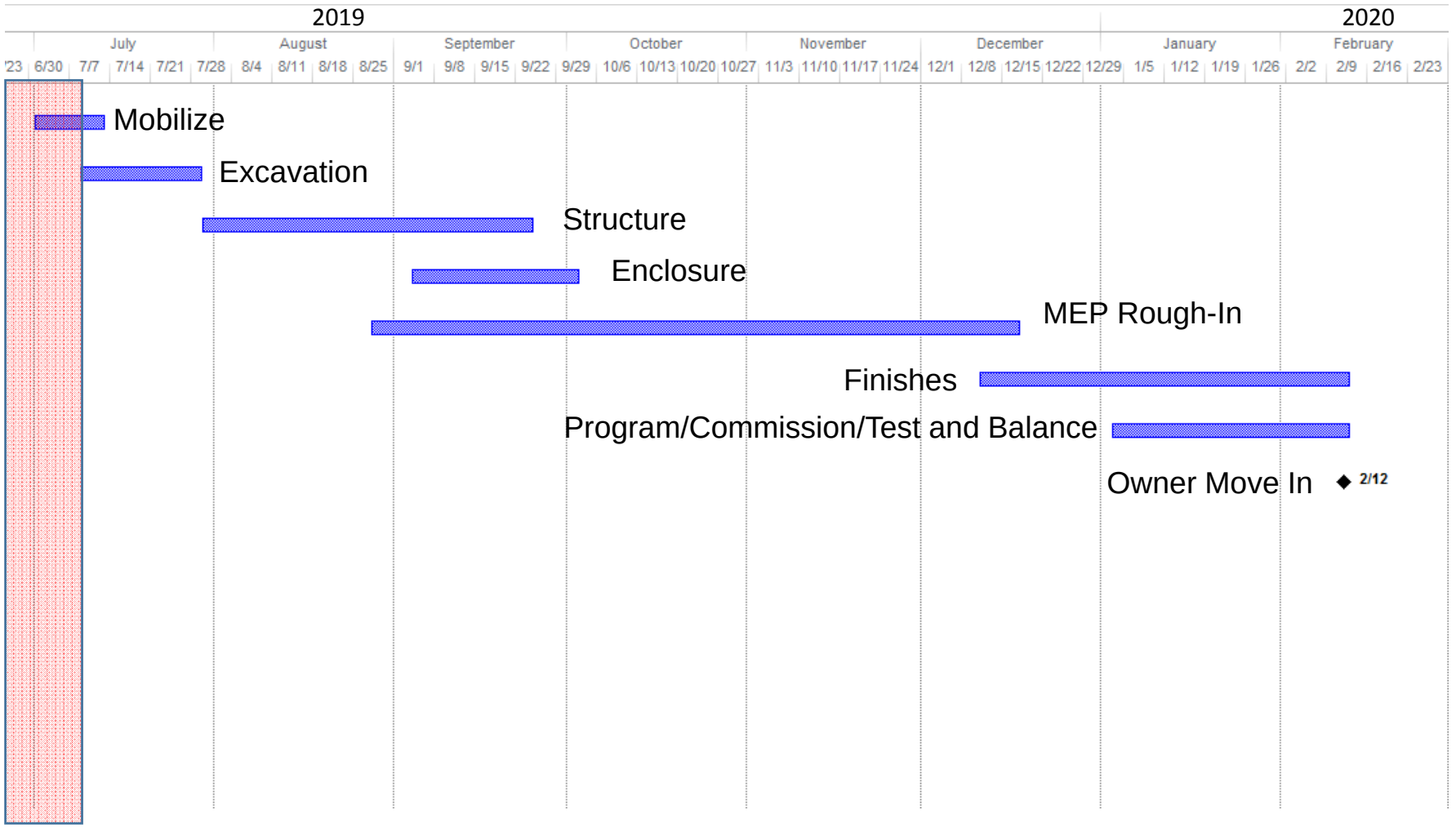

N
Atrium
Bathroom
Big classroom
Circulation
Egress
Elevator shaft
MEP Shaft
Seminar room
Storage
Student lounge / group work
Student office
Seminar room 300 SF
Seminar room 290 SF
Seminar room 240 SF
Student lounge / group work 810 SF
Student office 150 SF
Student office 110 SF
Bathroom 260 SF
Circulation 3,250 SF
Atrium 1,090 SF
Egress 300 SF
Storage 370 SF
1
2
3
4
5
6
A
B
C
D
E
F
X

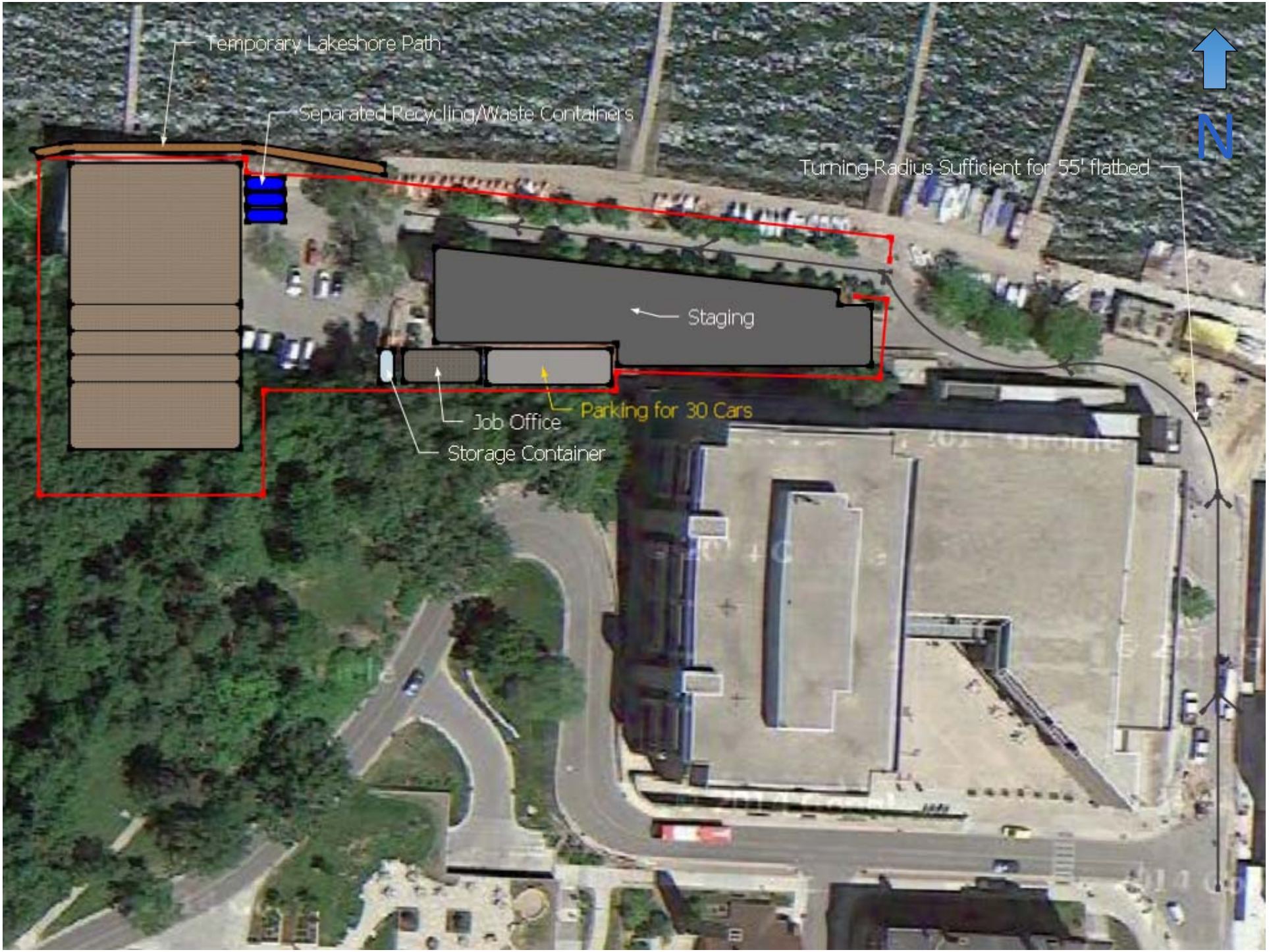
Big Classroom


Ab
U
6+8

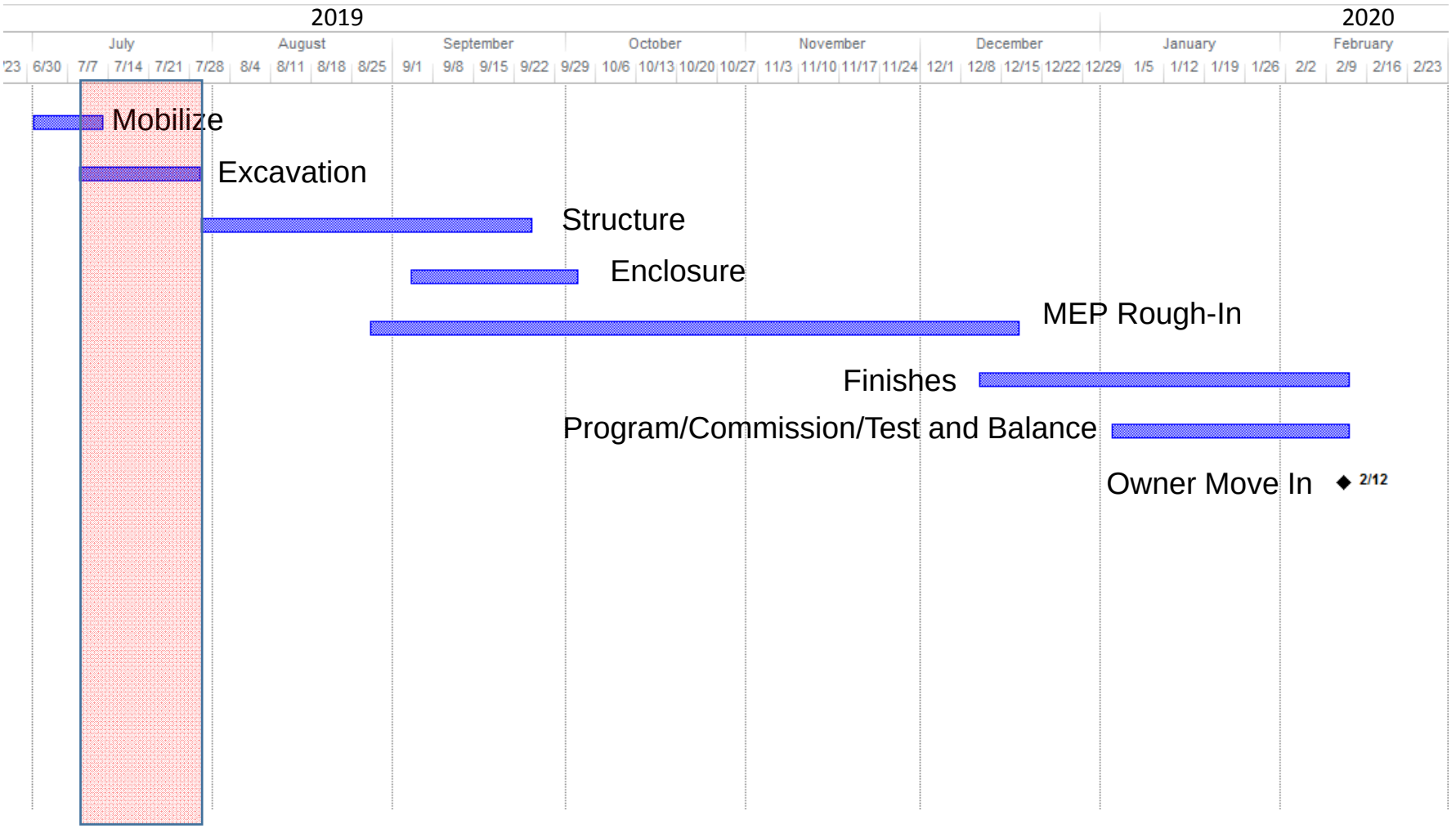

N

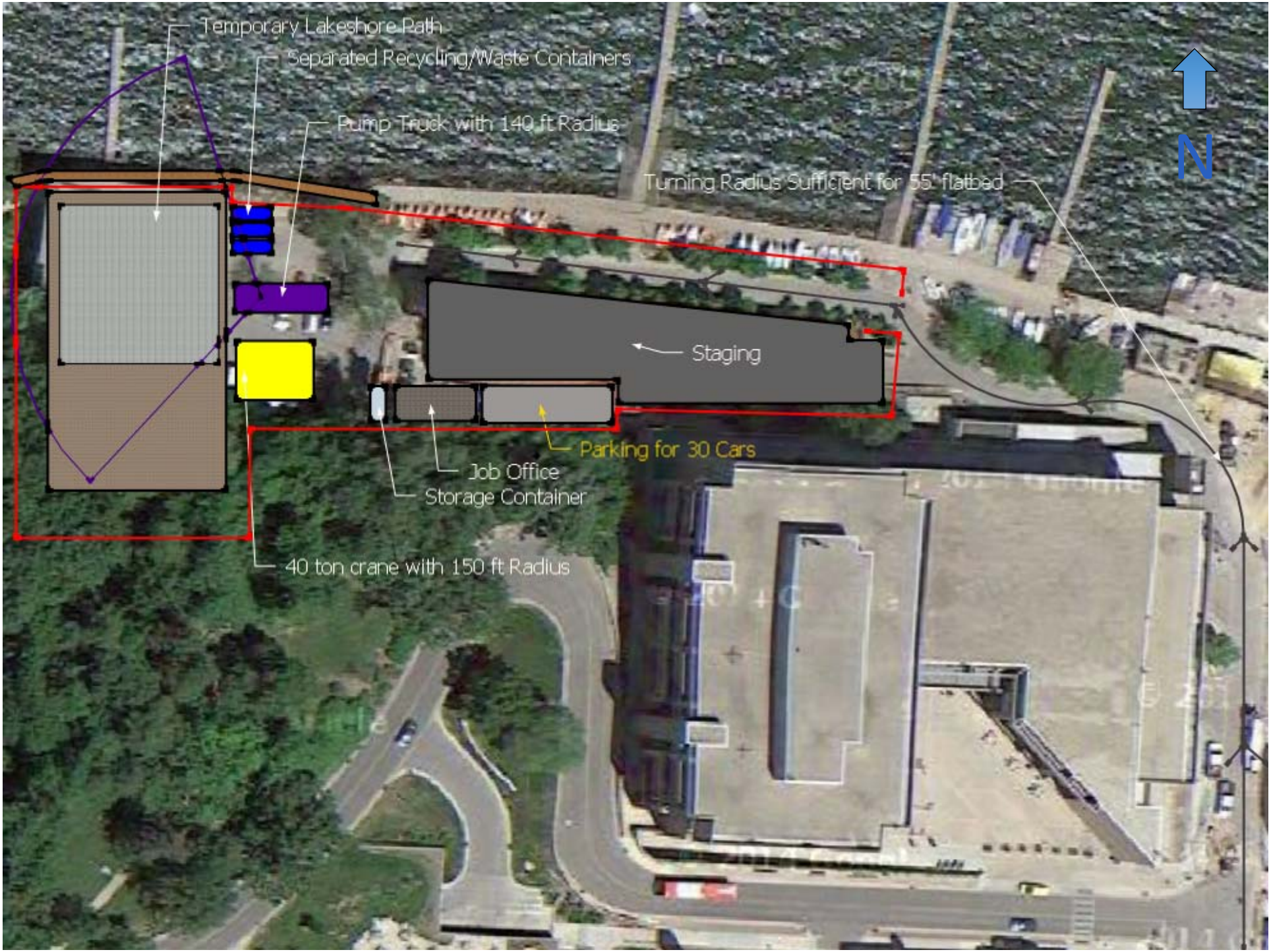
Schedule Overview



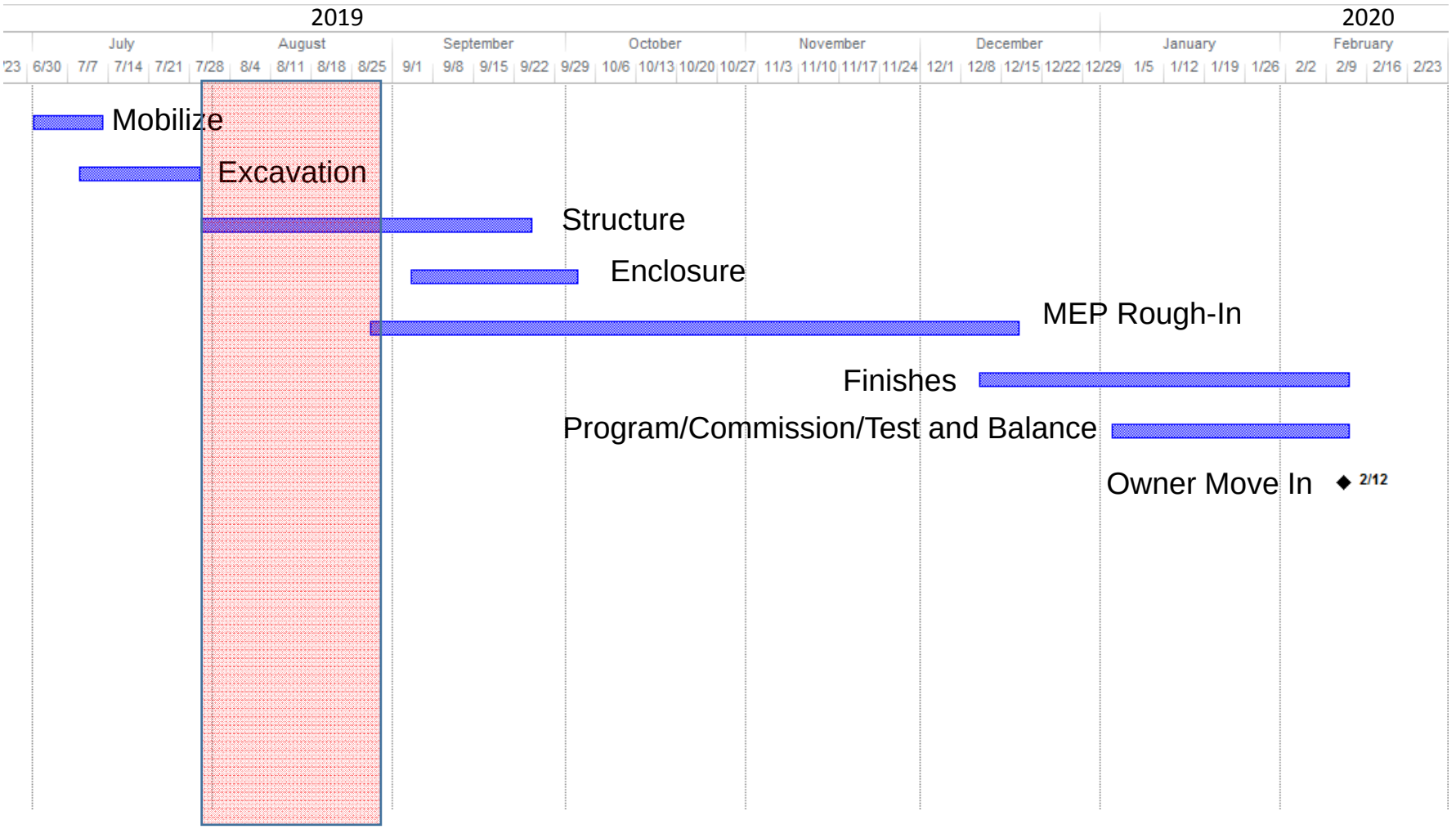

Temporary Lakeshore Path
Separated Recycling/Waste Containers
Turning Radius Sufficient for 55' flatbed
N
Staging
Job Office
Parking for 30 Cars
Storage Container

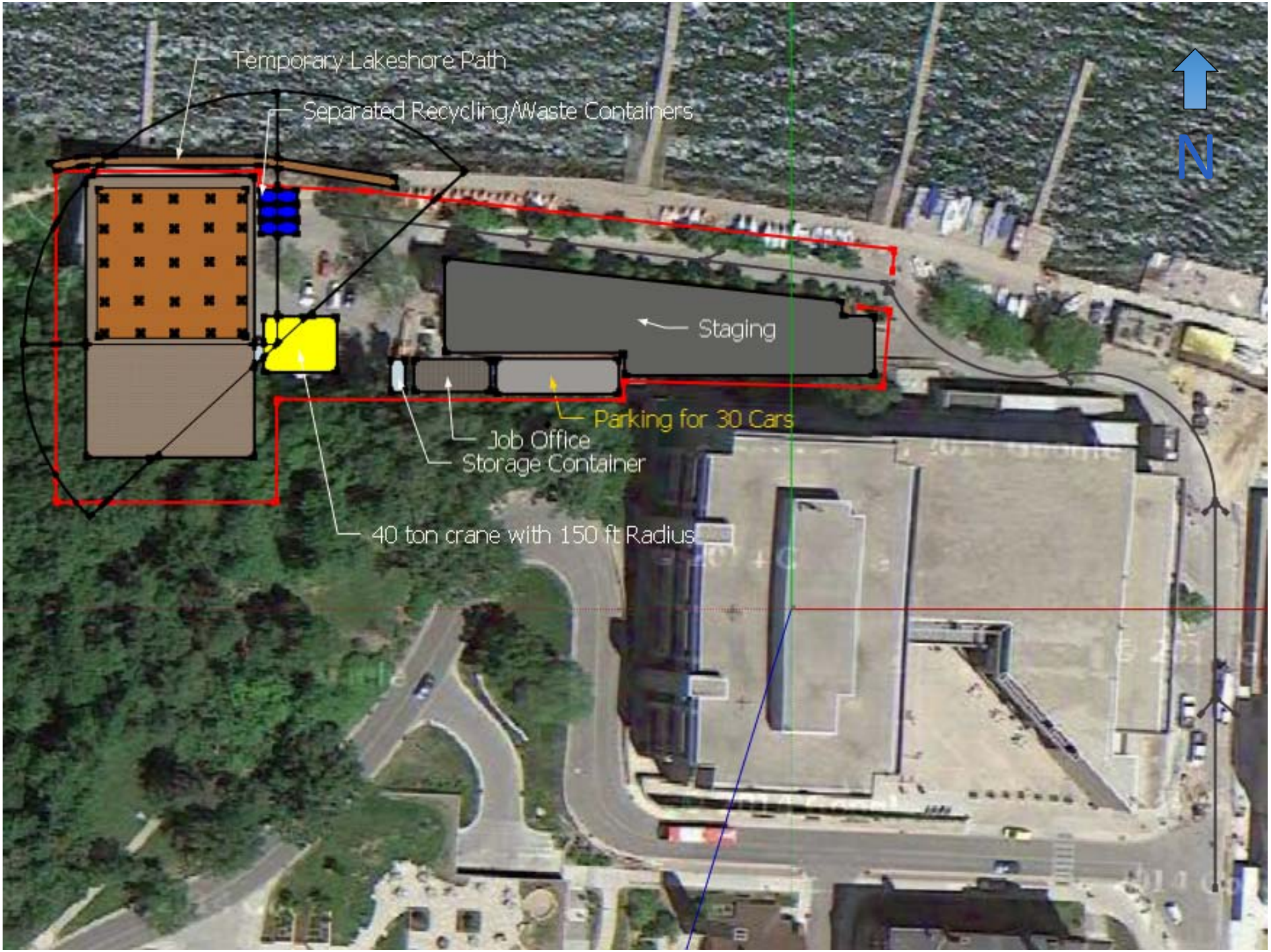
Schedule Overview



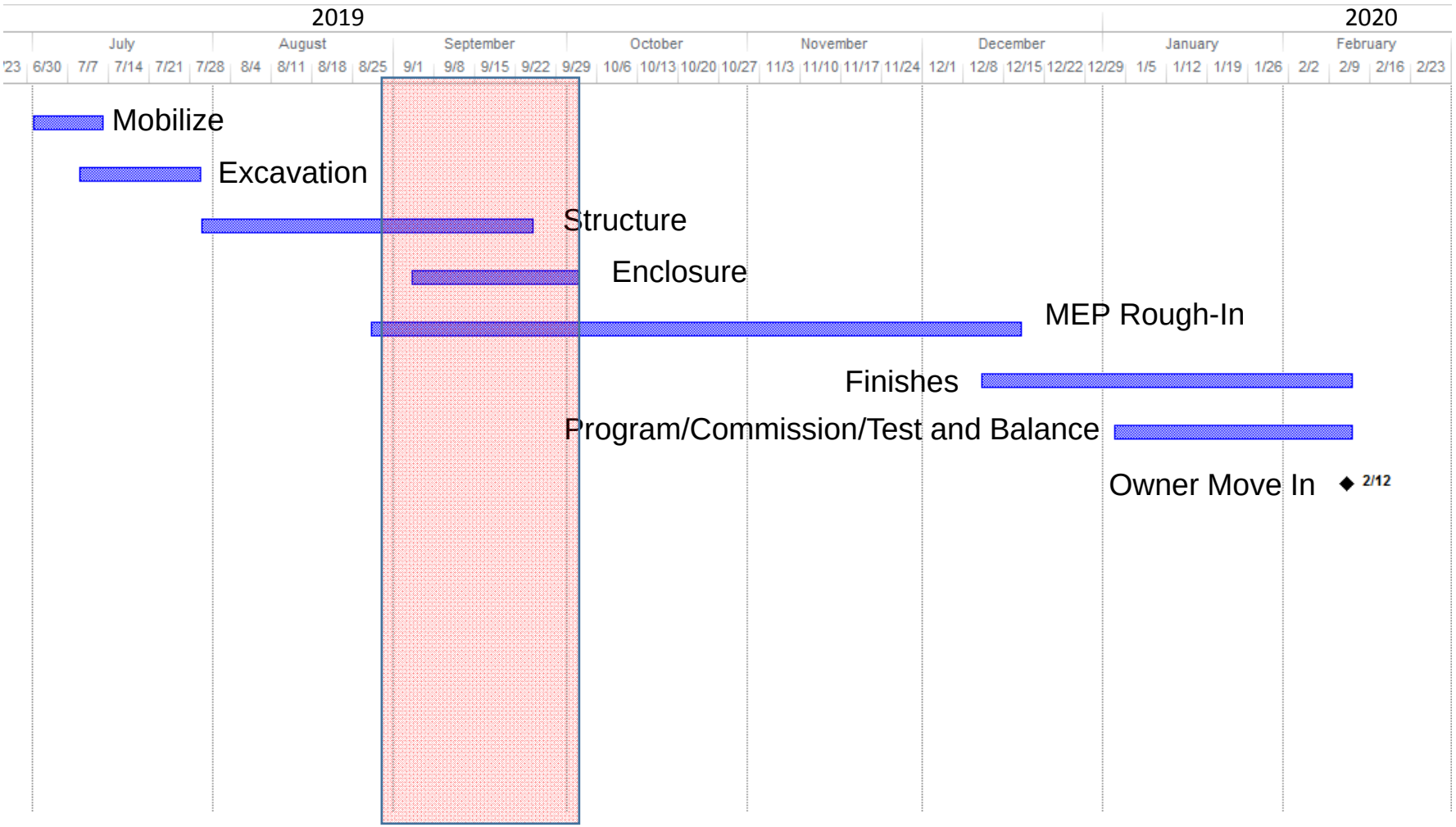

Temporary Lakeshore Path
Separated Recycling/Waste Containers
Pump Truck with 140 ft Radius
Turning Radius Sufficient for 55' flatbed
N
Staging
Parking for 30 Cars
Job Office
Storage Container
40 ton crane with 150 ft Radius

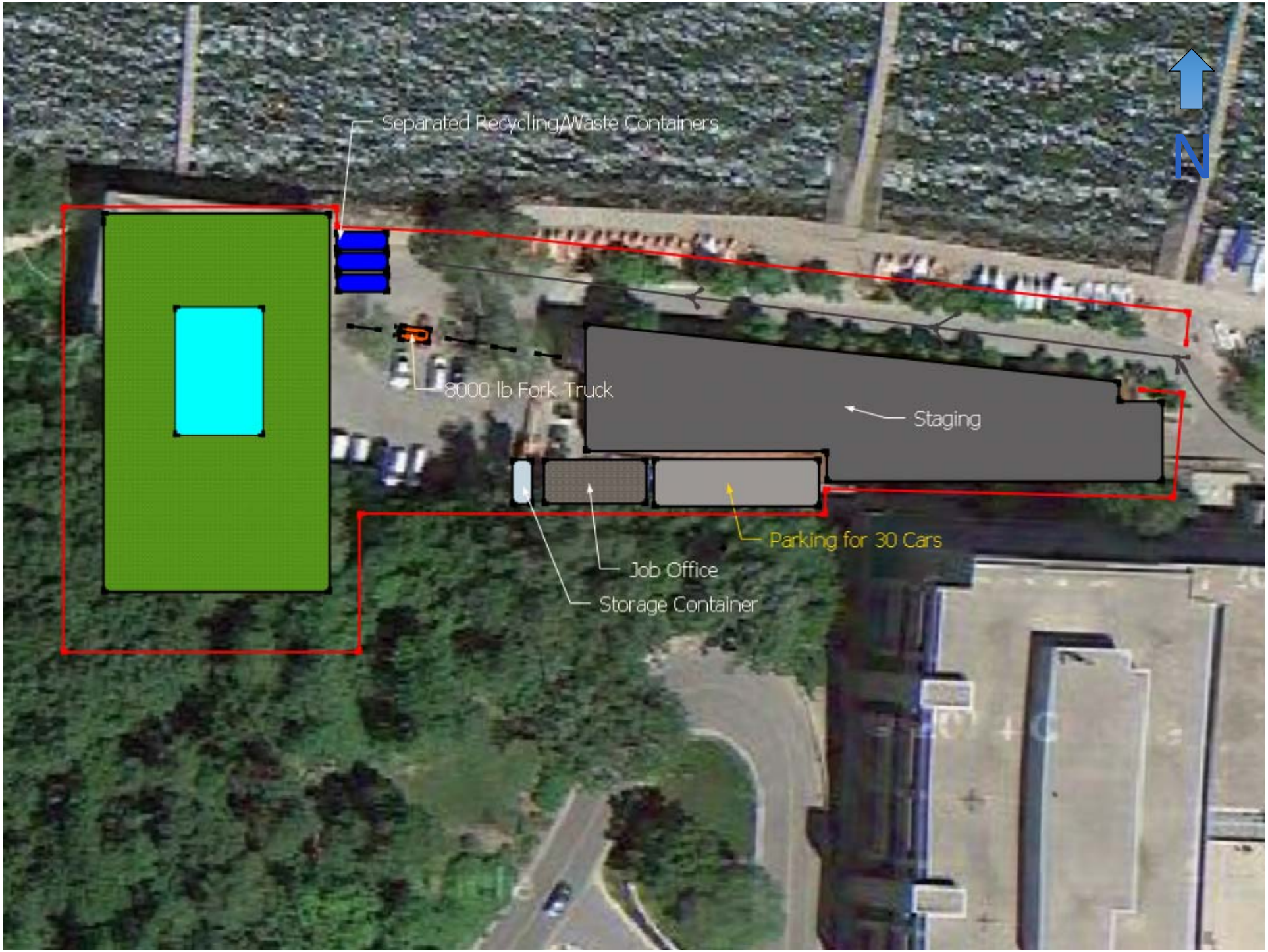
Schedule Overview



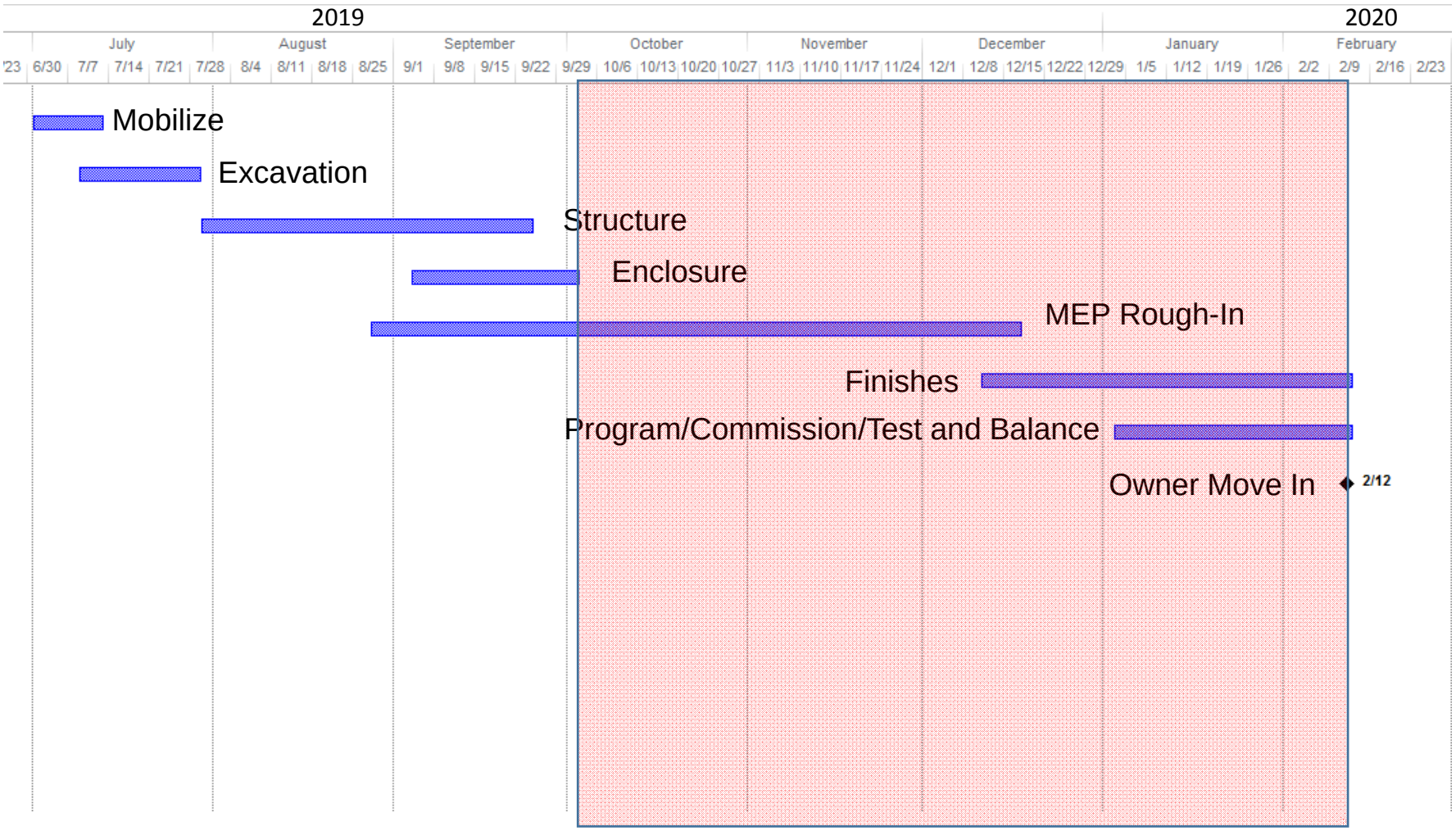

Temporary Lakeshore Path
Separated Recycling/Waste Containers
Staging
Parking for 30 Cars
Job Office
Storage Container
40 ton crane with 150 ft Radius
N

Schedule Overview




Separated Recycling/Waste Containers
N
8000 lb Fork Truck
Staging
Parking for 30 Cars
Job Office
Storage Container

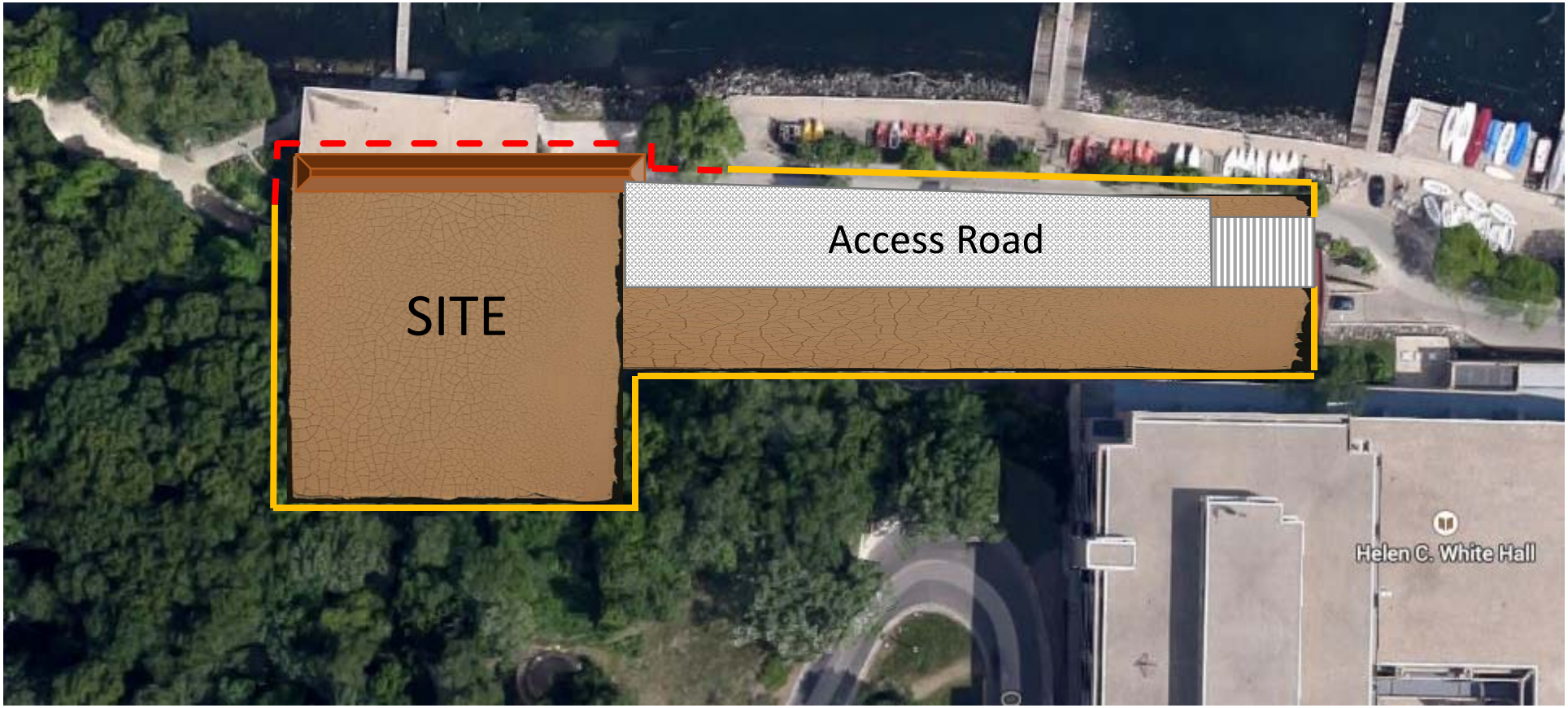
Schedule Overview



Construction activity pollution prevention

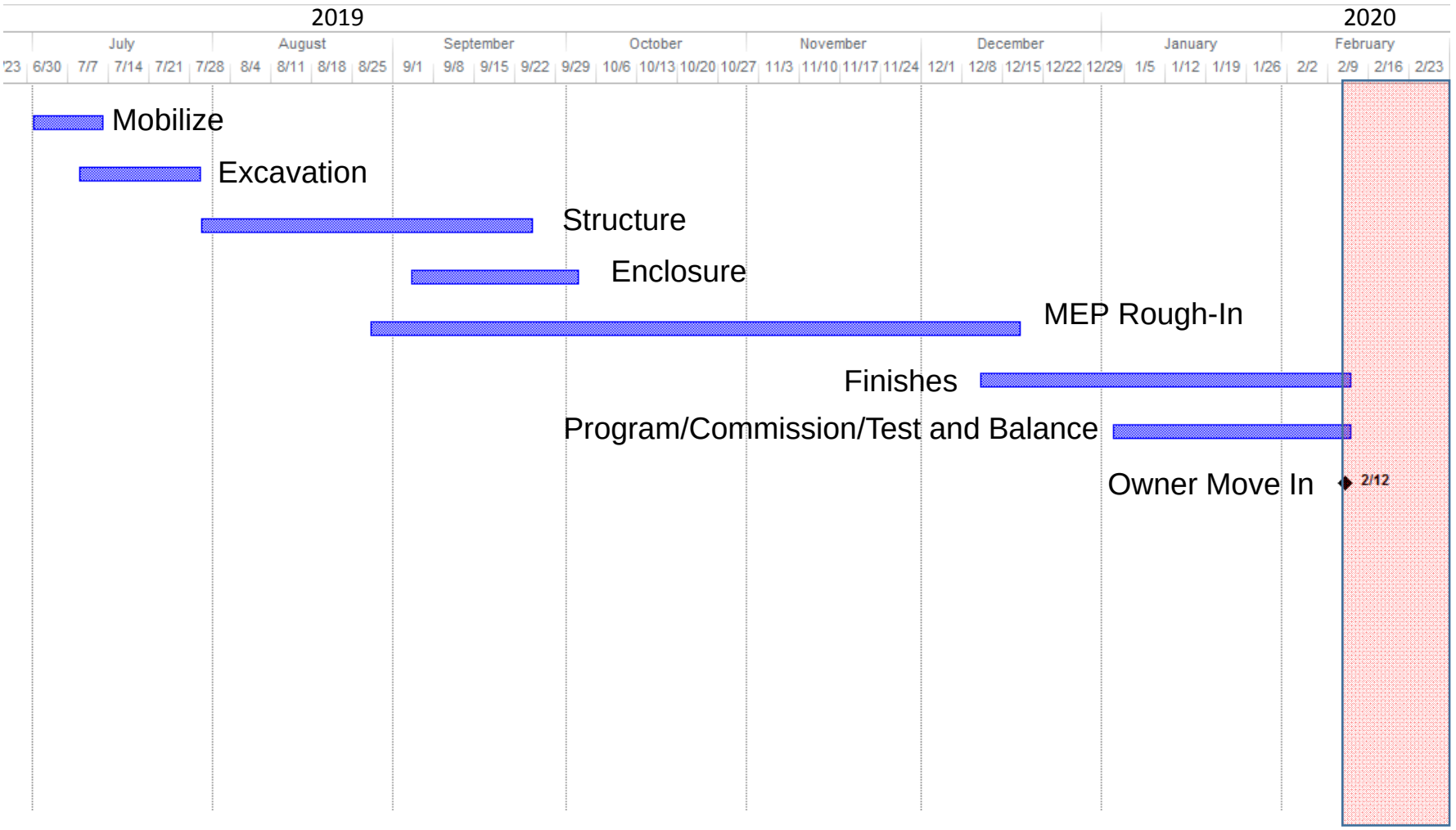
- Stabilized construction/access road (stone)
- Construction entrance with „shaker plates“
- Super silt fence + fiber rolls
- Job site boundaries/fence
- Sediment trap

Budgeted: $100,000
Schedule: During mobilization phase

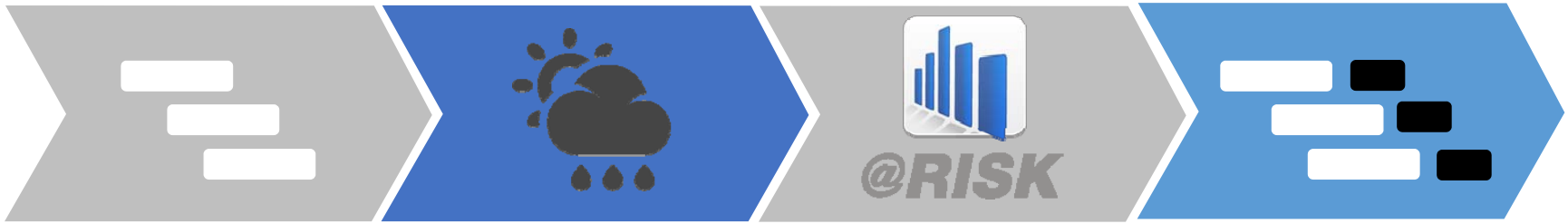



N

Schedule Overview



Riskmanagement



Milestones Schedule

- Shortest Schedule, showing best Conditions

Identify Risky Tasks

- Excavation
- Structure/Out door work
- Material Delay

Risk Simulation

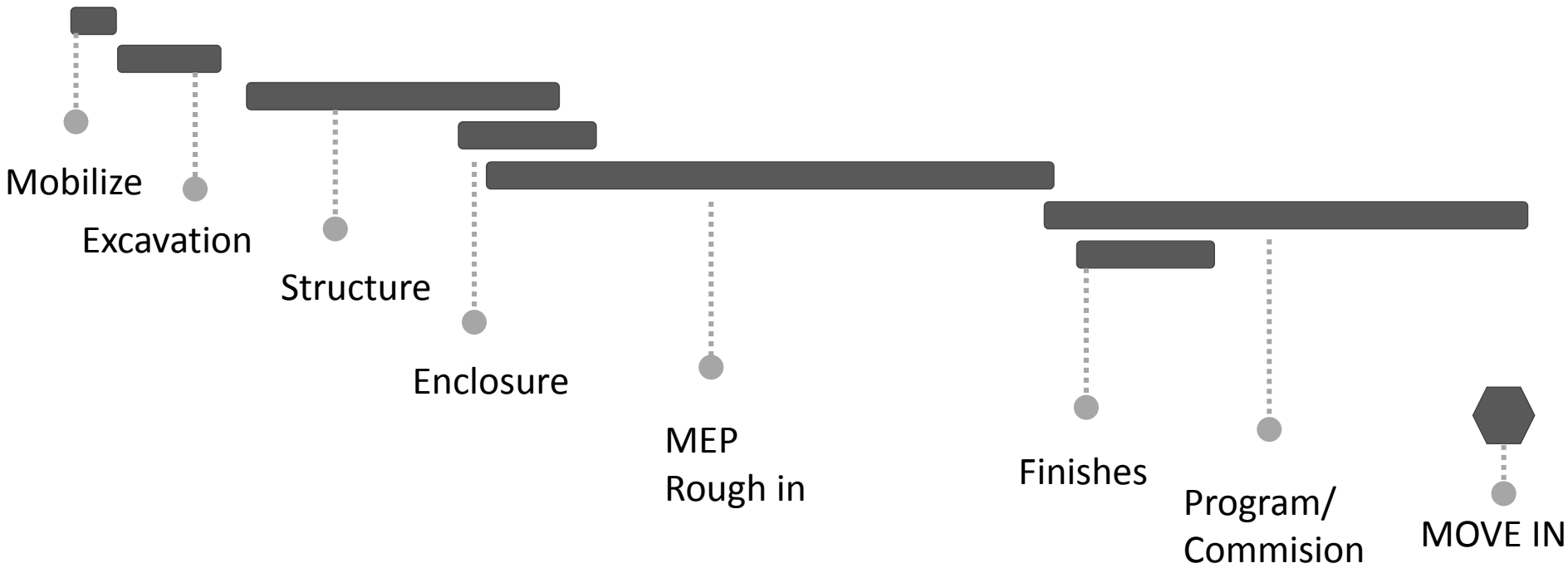
- Minimum
- Mean Value
- Maximum

Time Buffers

- Risk-management approach

Riskmangement

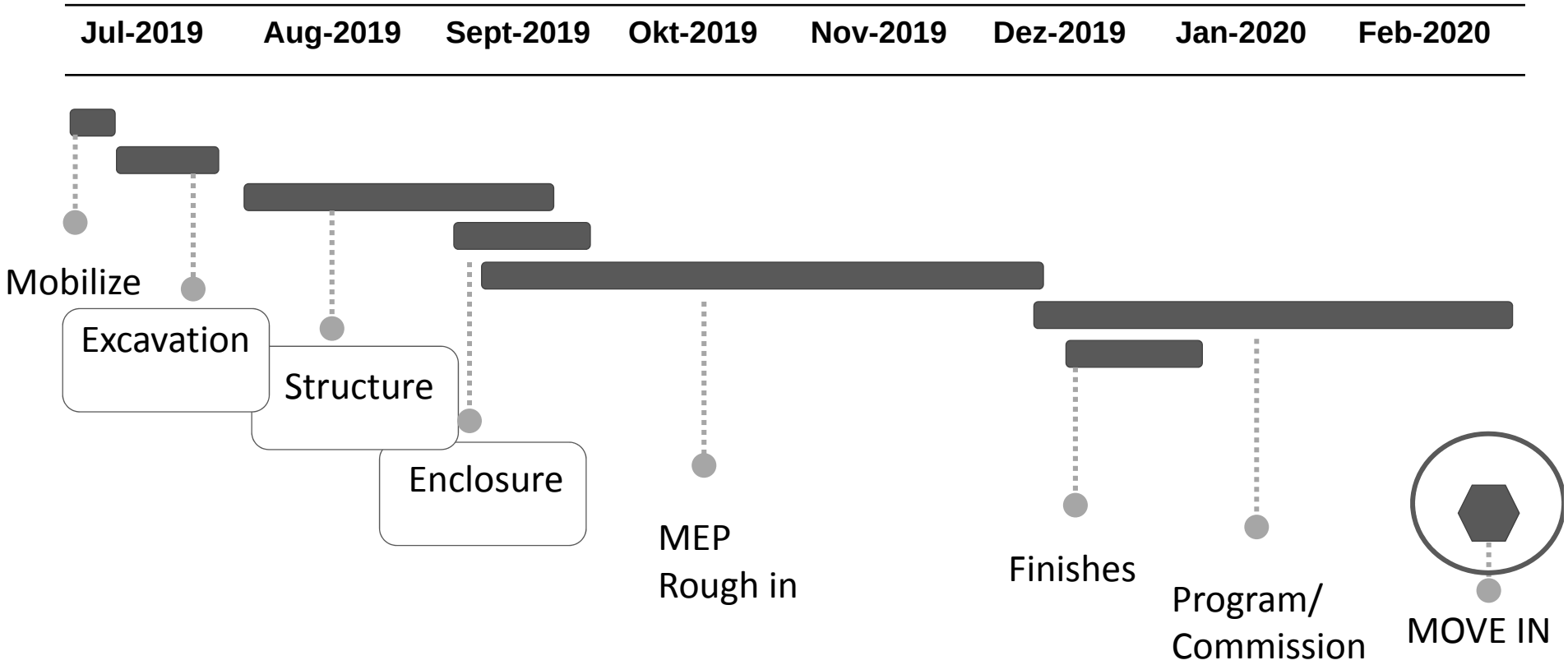
Milestones Schedule



Riskmangement

Milestones Schedule

Identify Risky Tasks

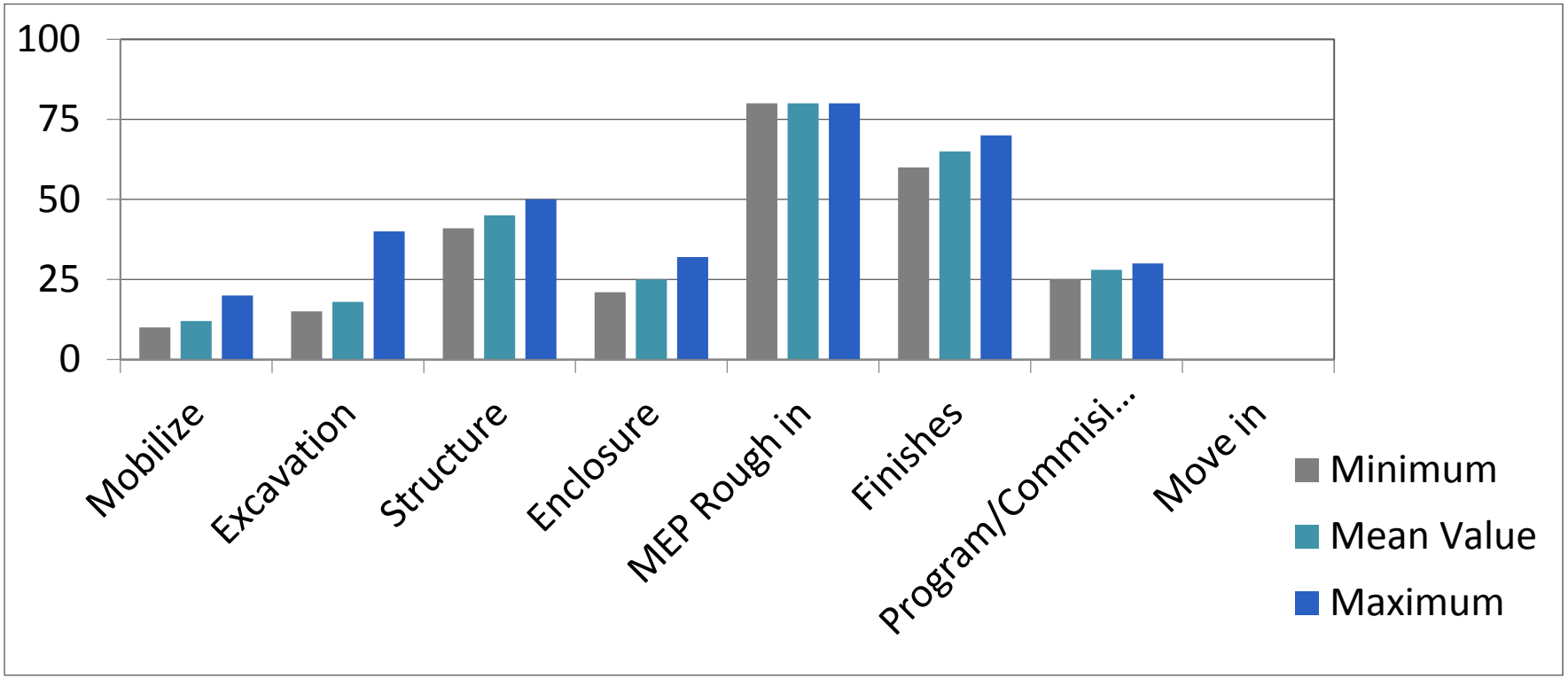


Riskmangement

Milestones Schedule

Identify Risky Tasks

Risk Simulation



Riskmangement

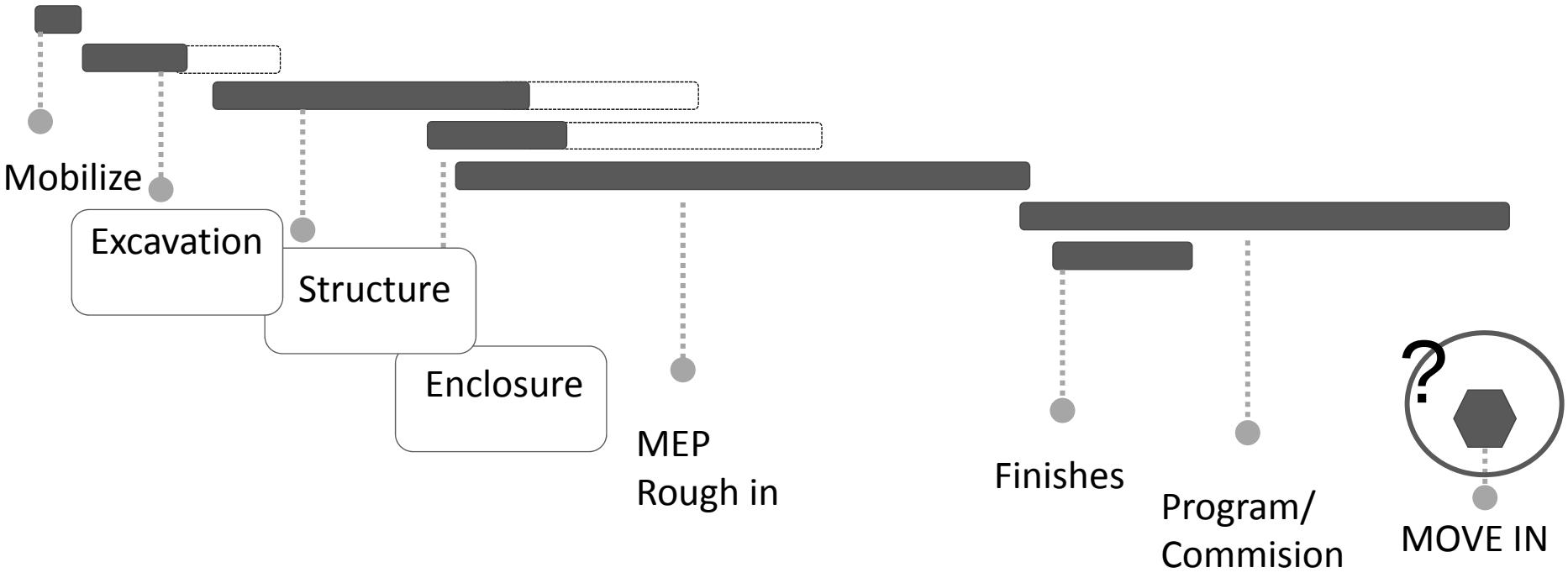
Milestones Schedule

Identify Risky Tasks

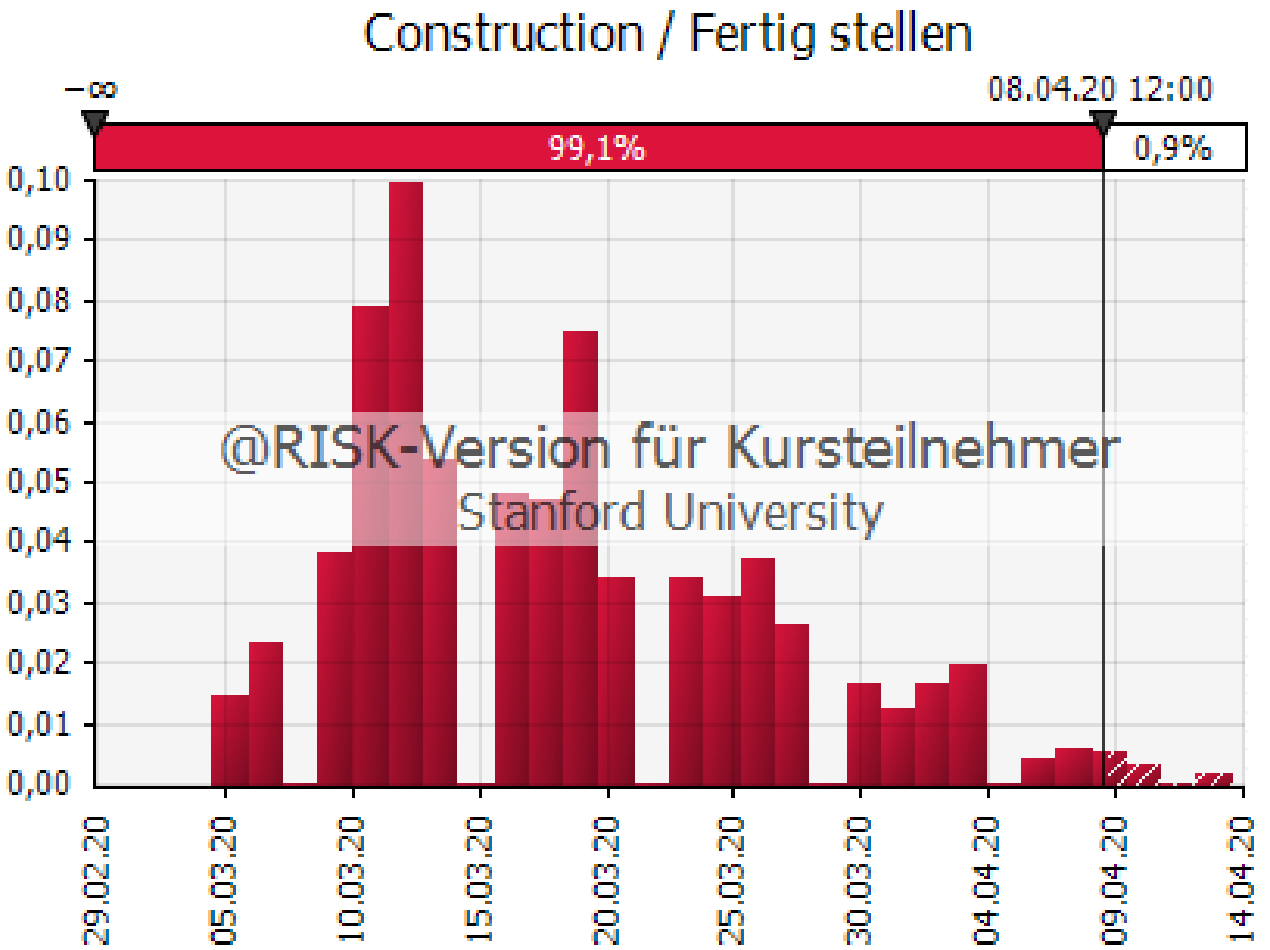
Risk Simulation

Time Buffers

Jul-2019	Aug-2019	Sept-2019	Okt-2019	Nov-2019	Dez-2019	Jan-2020	Feb-2020



Riskmangement



Statistik	
	Construction / Fe..
Zelle	Aufgaben!E2
Minimum	04.03.20 13:28
Maximum	13.04.20 14:16
Mittelwert	18.03.20 07:19
Modus	13.03.20 10:19
Medianwert	17.03.20 09:31
Std.Abw.	8,063 Tage
Schiefe	0,7293
Wölbung	2,8991
Werte	1000
Fehler	0
Gefiltert	0
Linker X	−∞

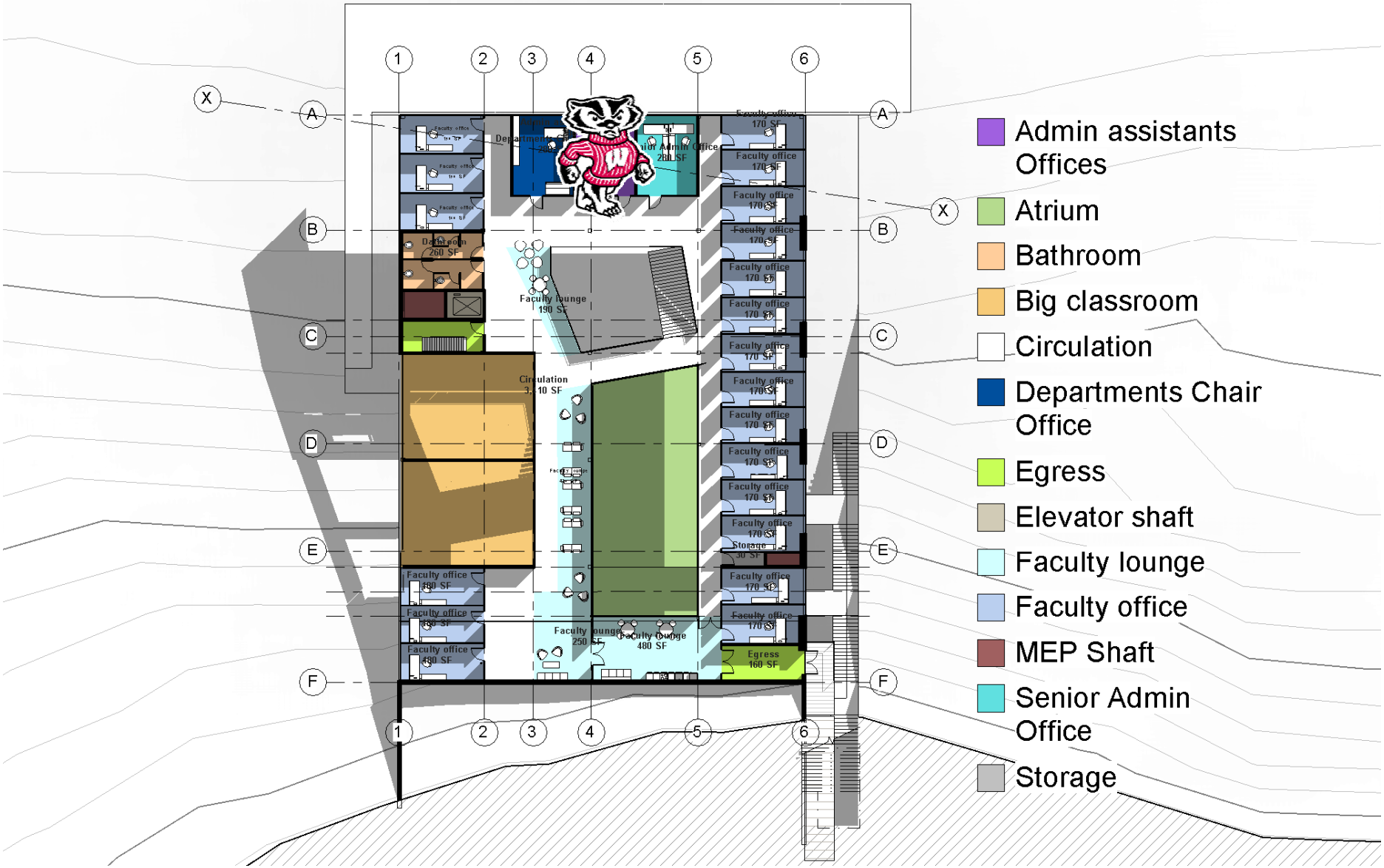
Buffers

Buffers

Buffers

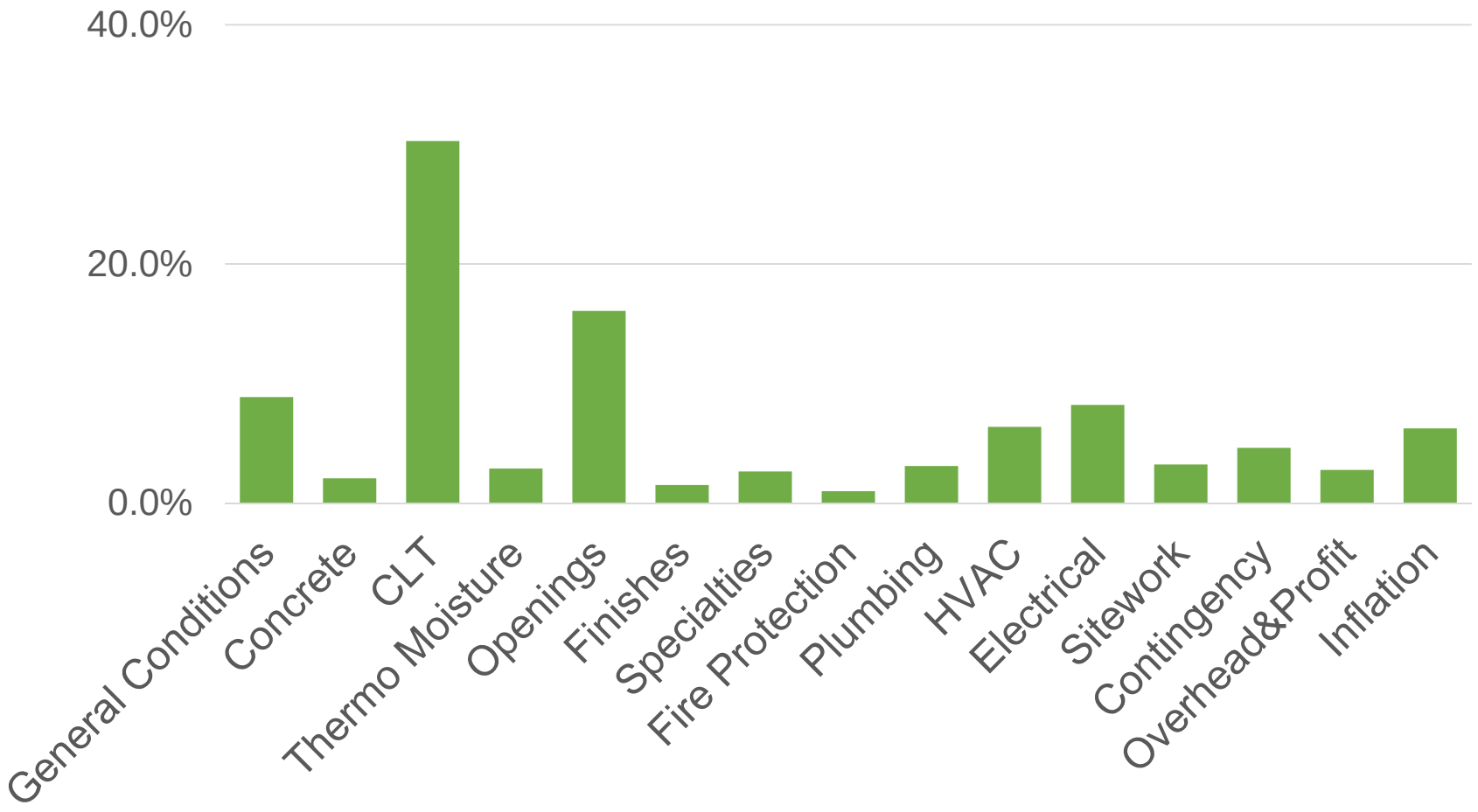
99% Probability
Finish before
08.04.2020

4. Level


N
Admin assistants Offices
Atrium
Bathroom
Big classroom
Circulation
Departments Chair Office
Egress
Elevator shaft
Faculty lounge
Faculty office
MEP Shaft
Senior Admin Office
Storage
Faculty office 170 SF
Faculty office 480 SF
Faculty lounge 190 SF
Faculty lounge 250 SF
Faculty lounge 480 SF
Circulation 3,110 SF
Egress 160 SF
Storage 30 SF
Dept room 260 SF
110' Admin Office 280 SF

Admin Office

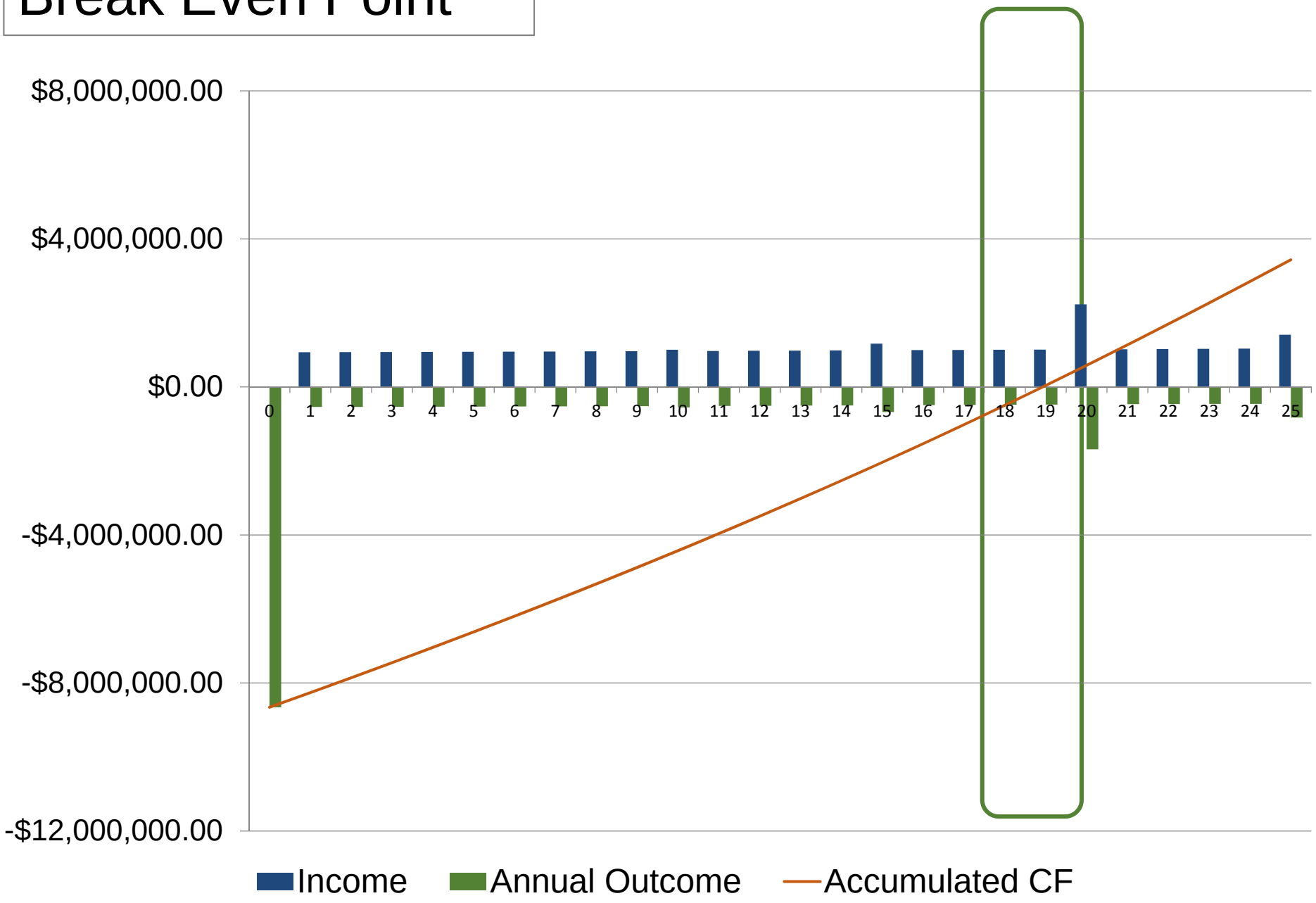
Cost Estimate



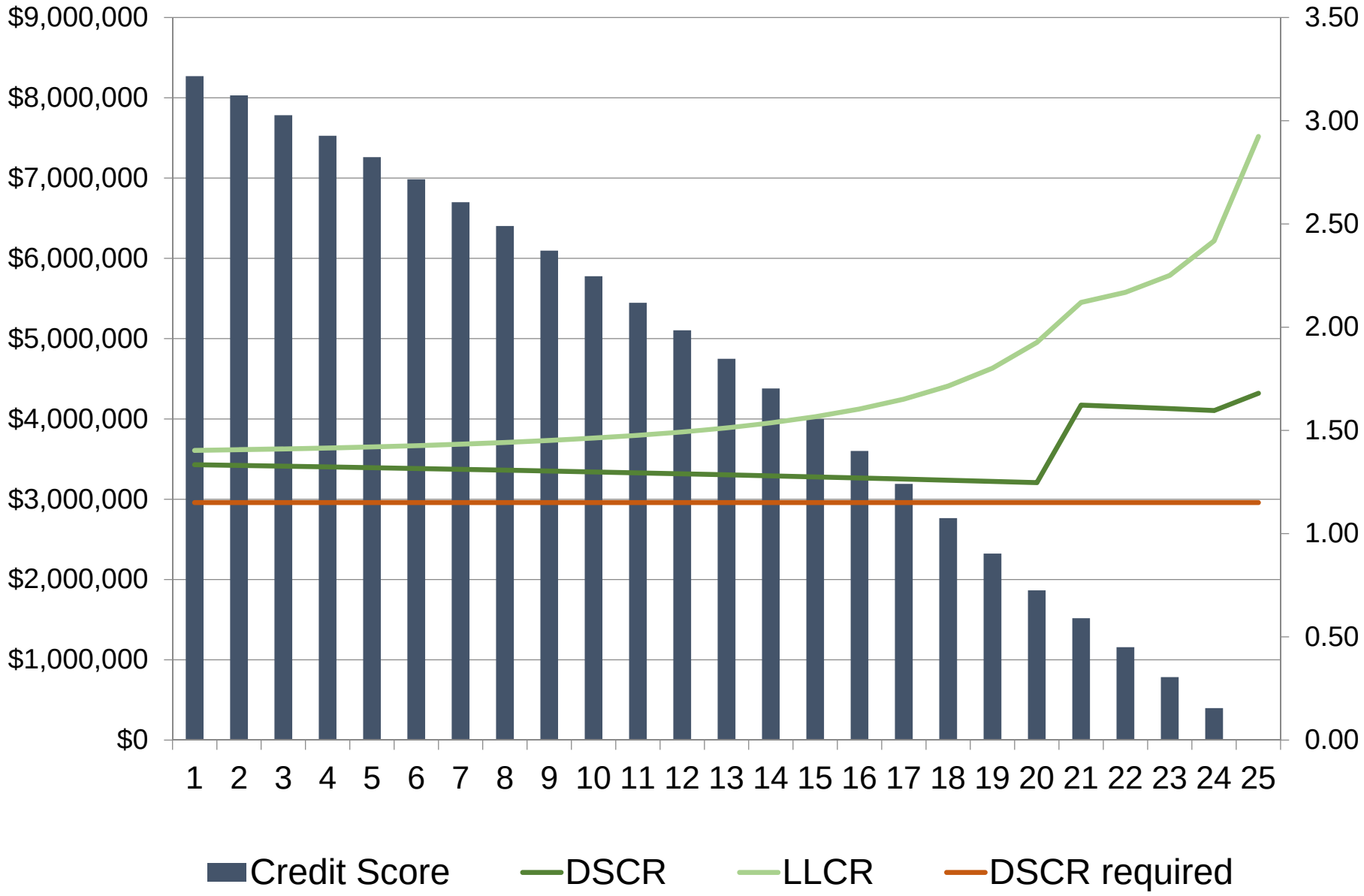
Total Building Cost: $8.270.000

Cost Per Square Foot: $219

Break Even Point



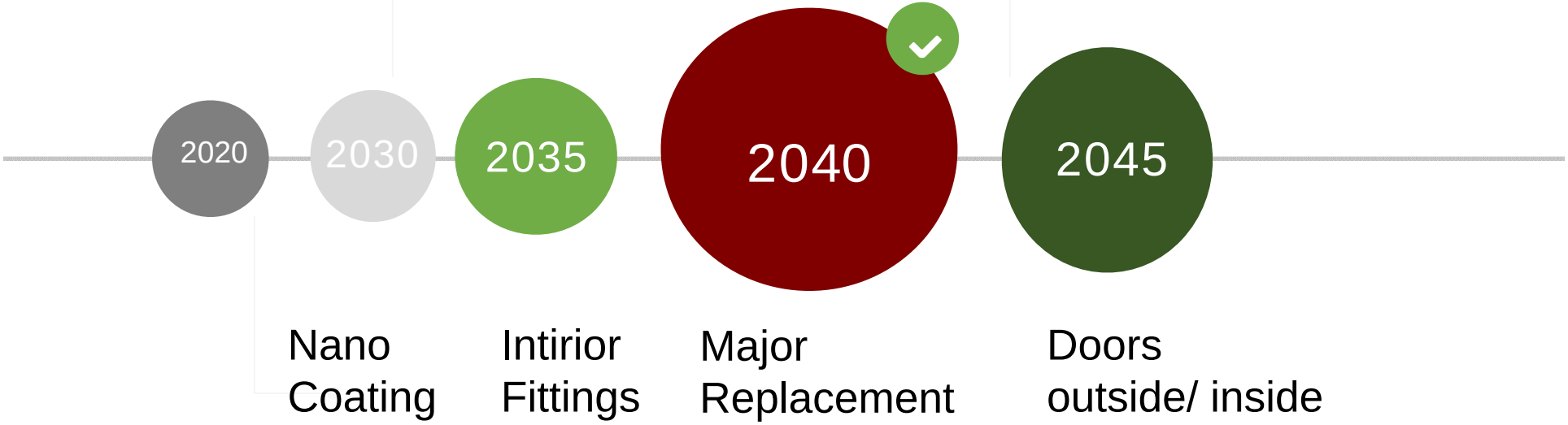
Loan Structure



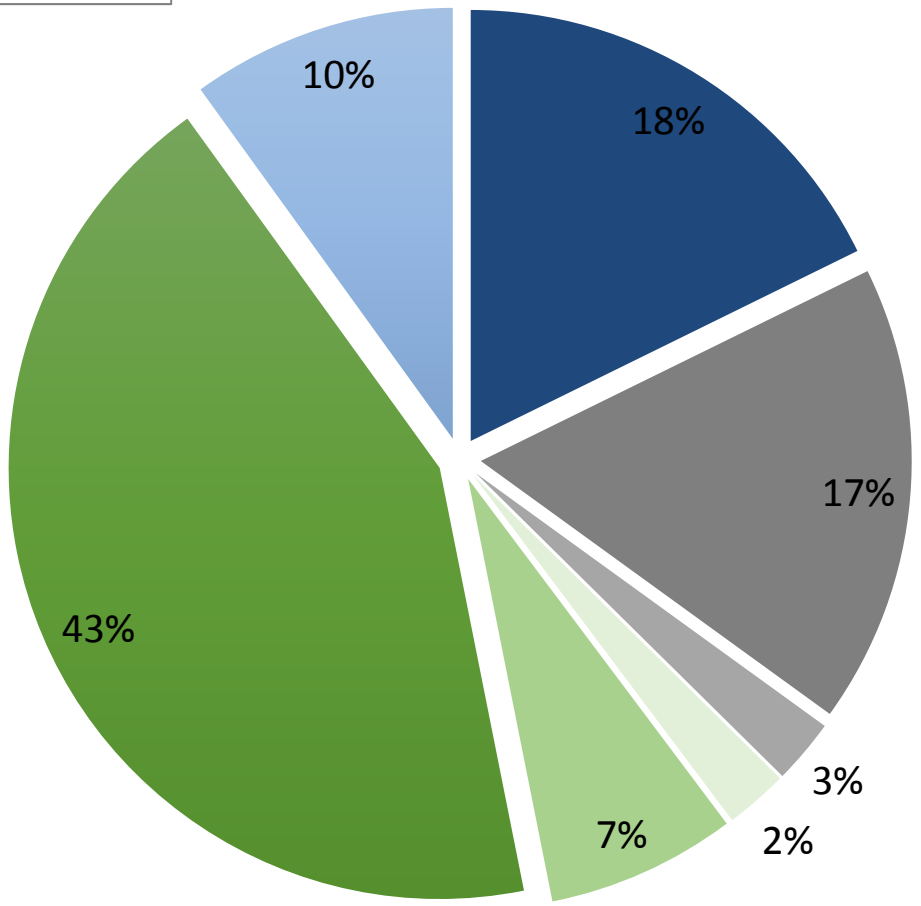
Replacement Strategy

10	$37.500
15	$180.000
20	$1.200.000
25	$370.000

Reserve Account generated through yearly Cash Flow



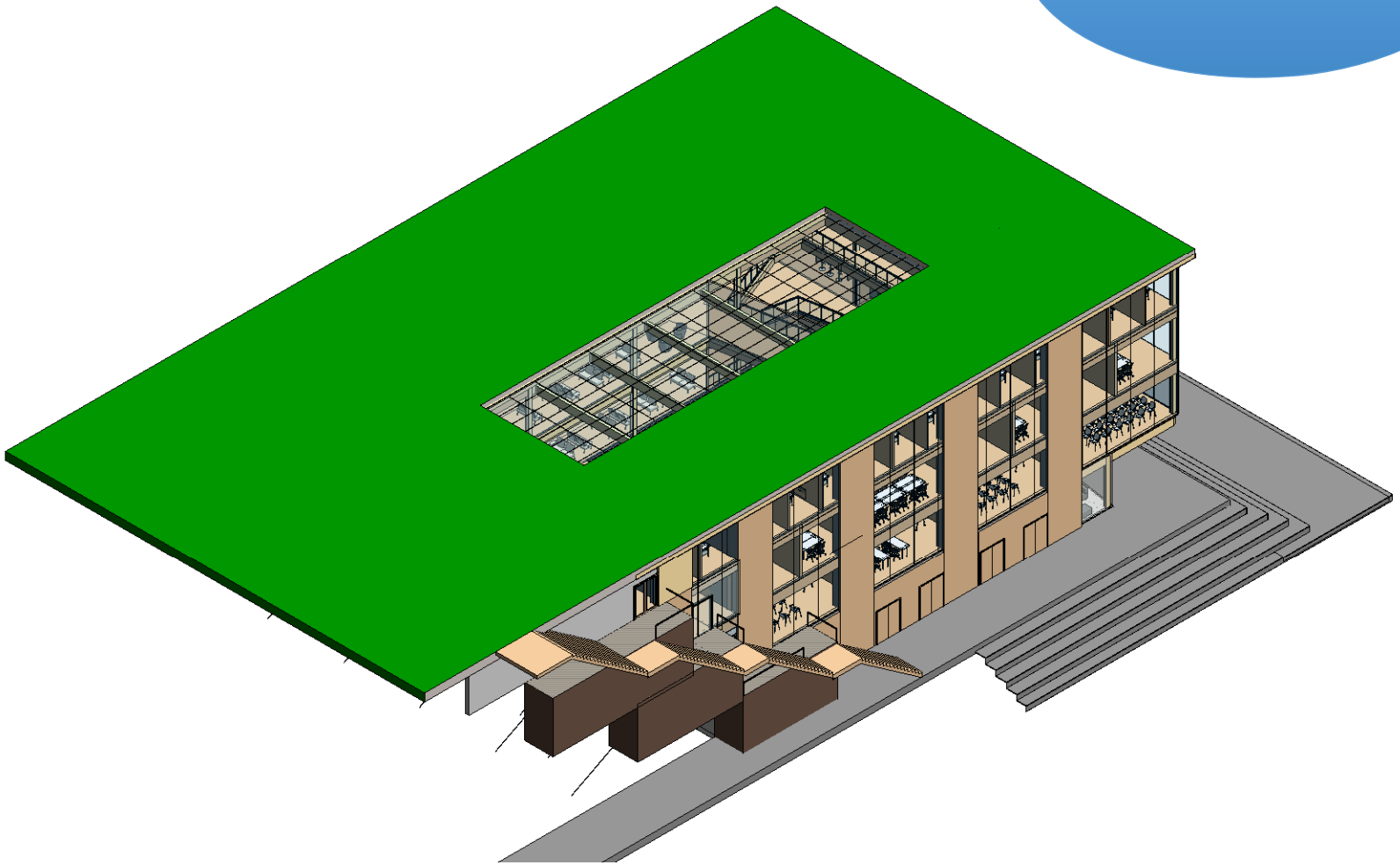
Life Cycle Cost



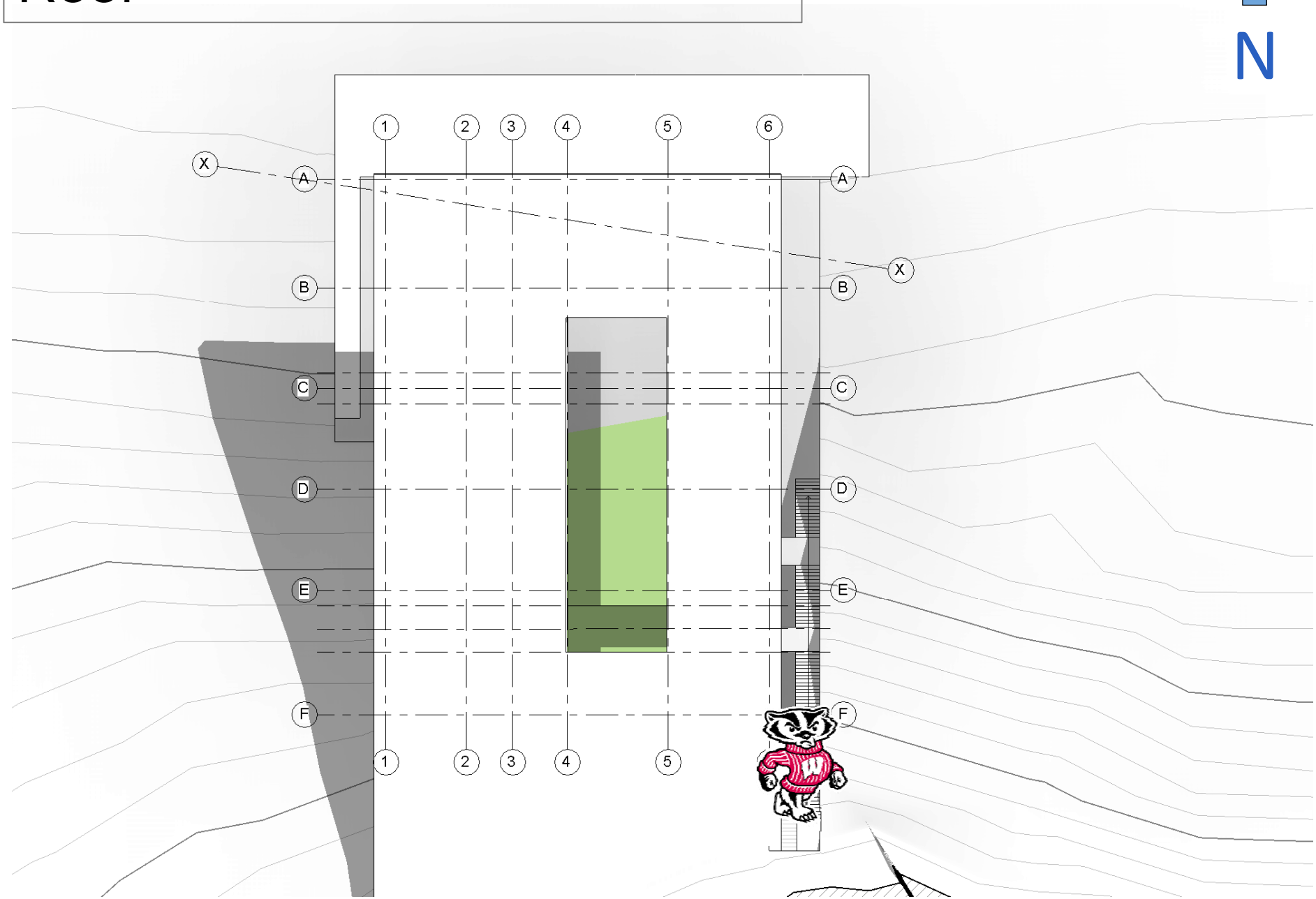
Construction Cost
Operation & Maintance Cost
Replacement Cost
Risk Surcharge
Interest Payment
Renatl Payments
Extra Income

Roof

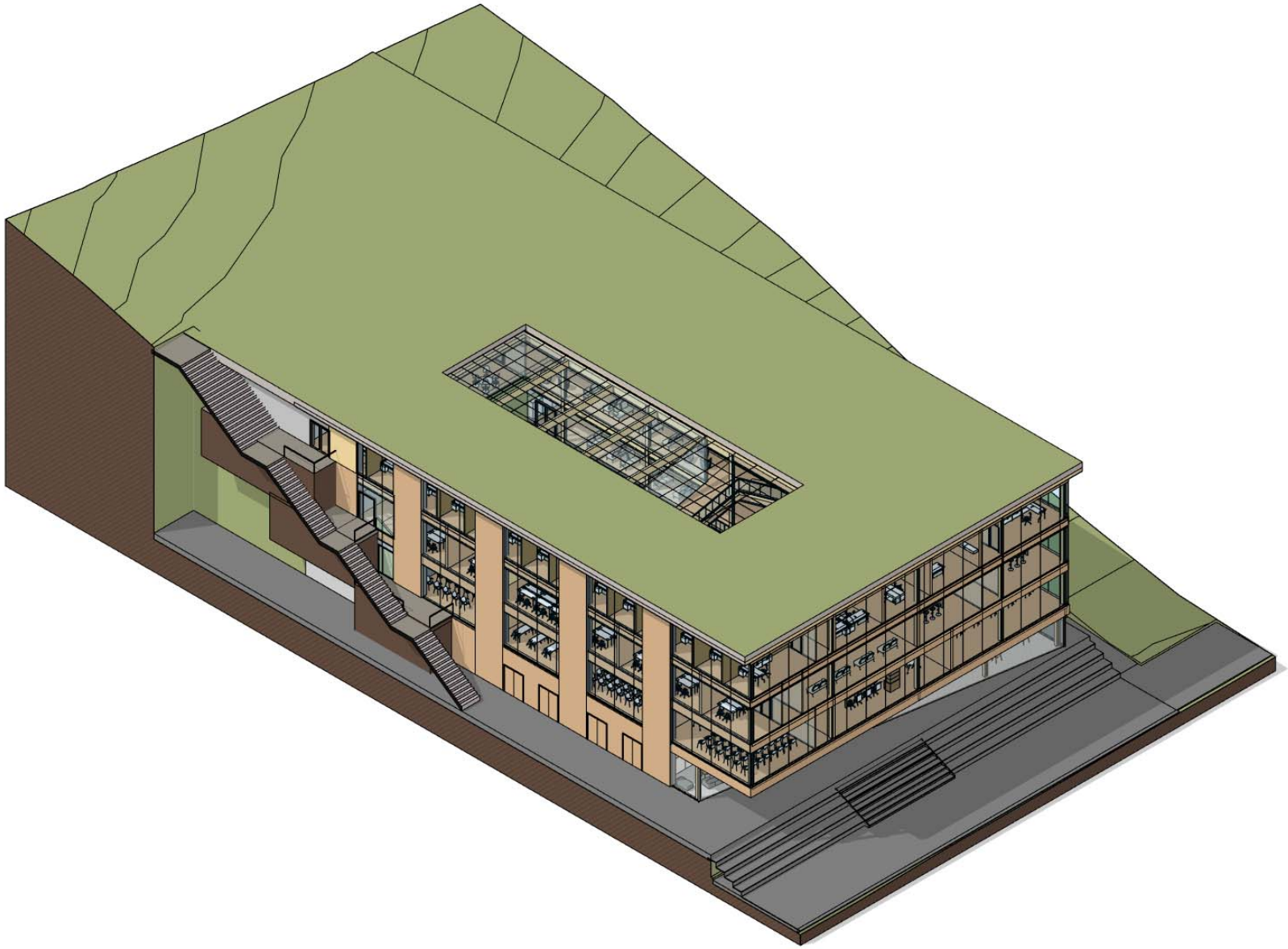
Lake Mendota



Roof



Roof View

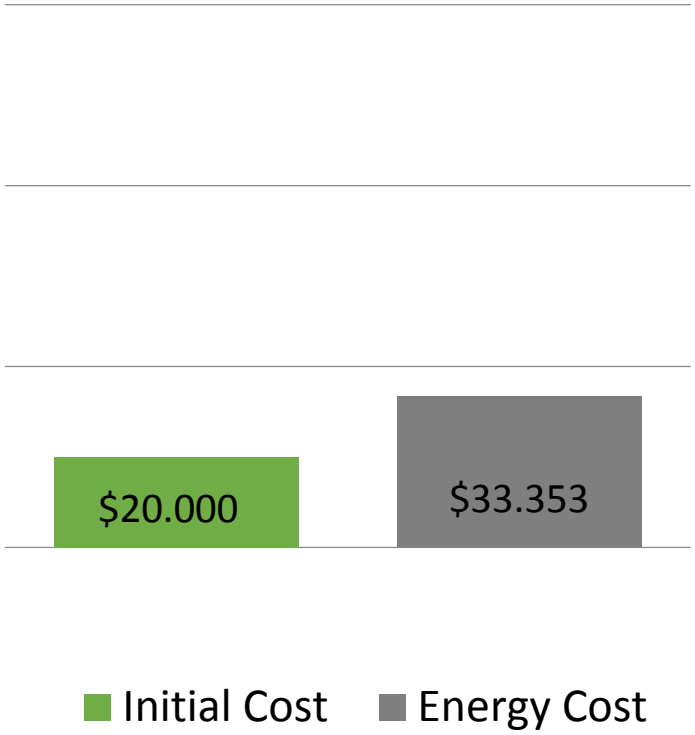


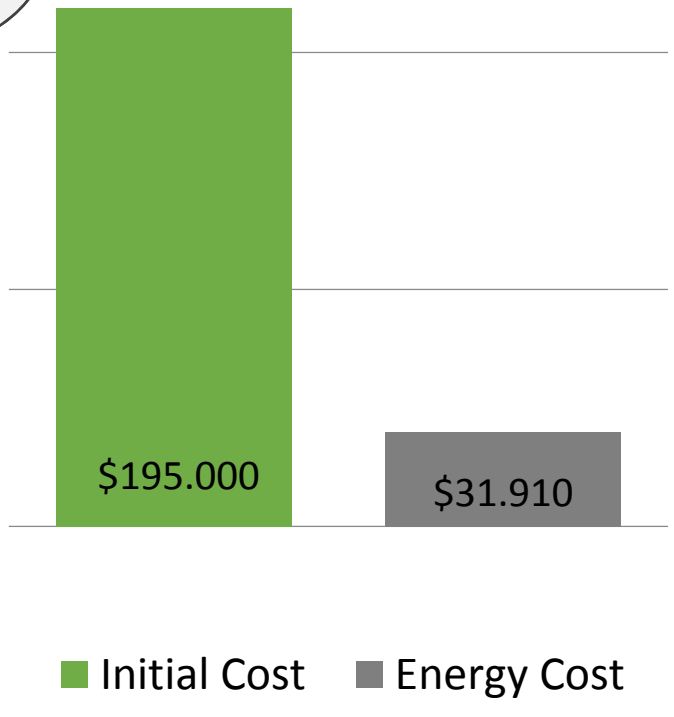
Cost

Benefit

Cogen

PV





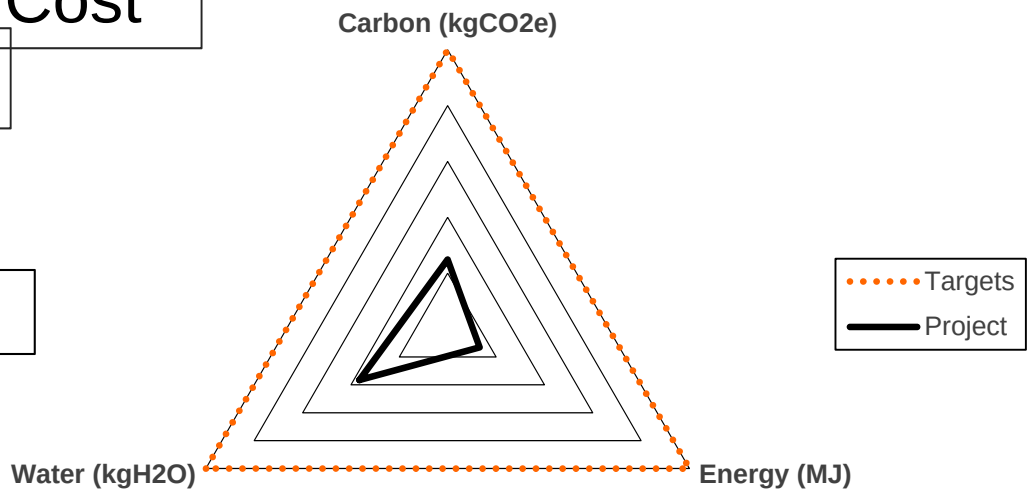
Loss over 25 year PPP Contract with PV

$138.000

Cost

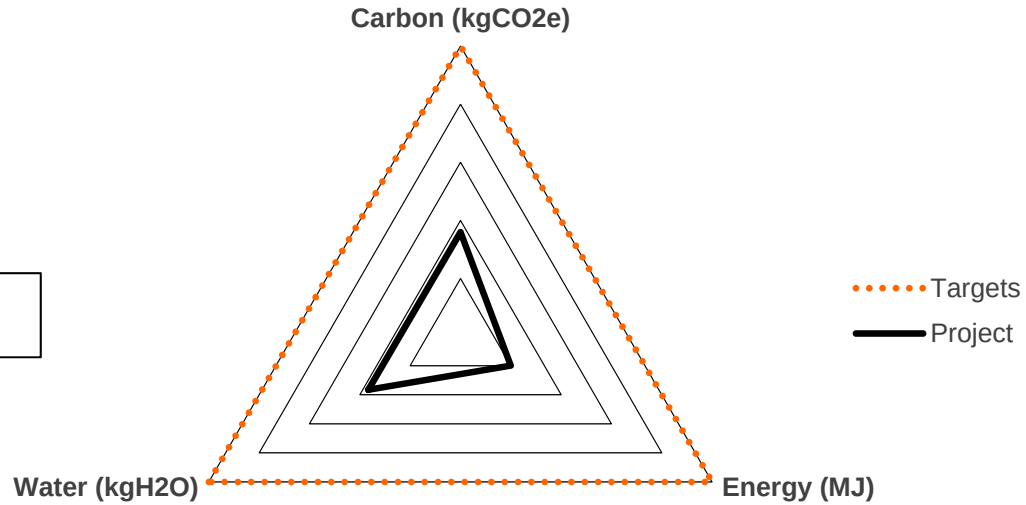
Benefit

PV



Electricity:
35.000 kWh
Heating:
19.000 Kwh

No Pv



Electricity:
124.000 kWh
Heating:
19.000 Kwh

Why?
Why not?

The Story of Water

WARKA
Water

Shading
Fins

KAUST
King Abdullah University of Science and Technology

King Abdullah
University

Transform Air
into Water

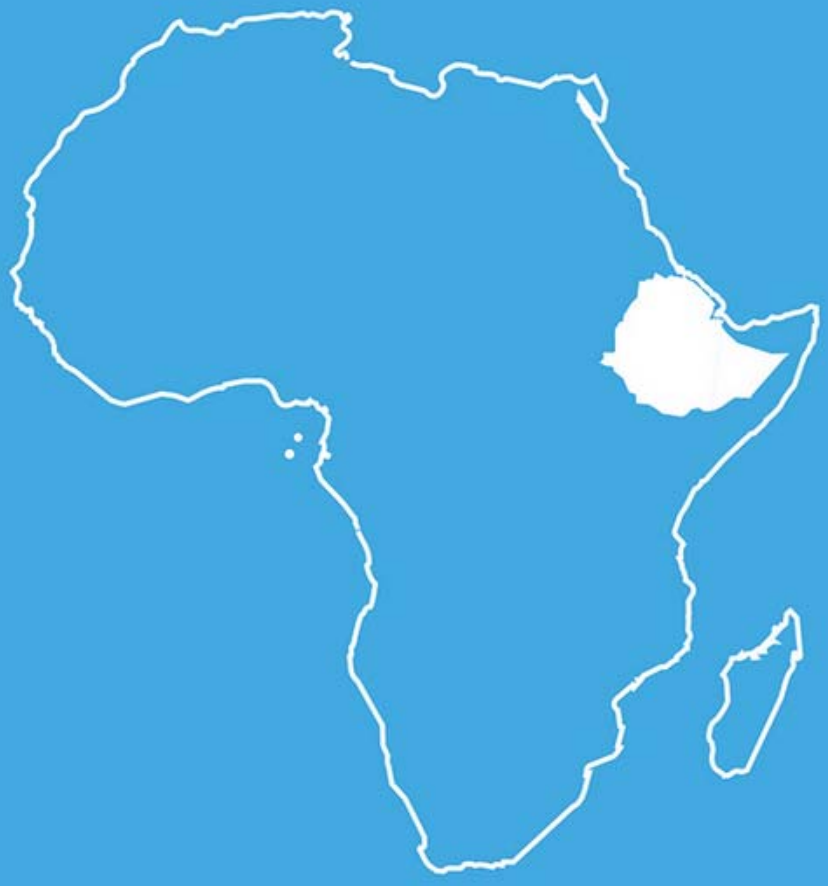
Solid, Liquid,
Vapour

The Beetle

DETAILS

HYDROPHILIC
Shell

WARKA WATER



Ethiopia

Capital city: Addis Abeba

Population: 94 million

Lack of Safe Water

60 %

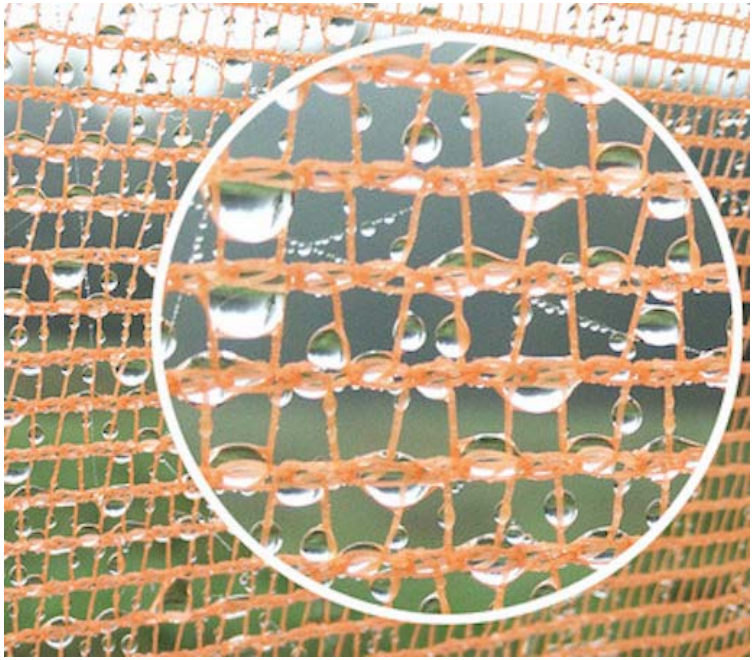
Infant Mortality Rate

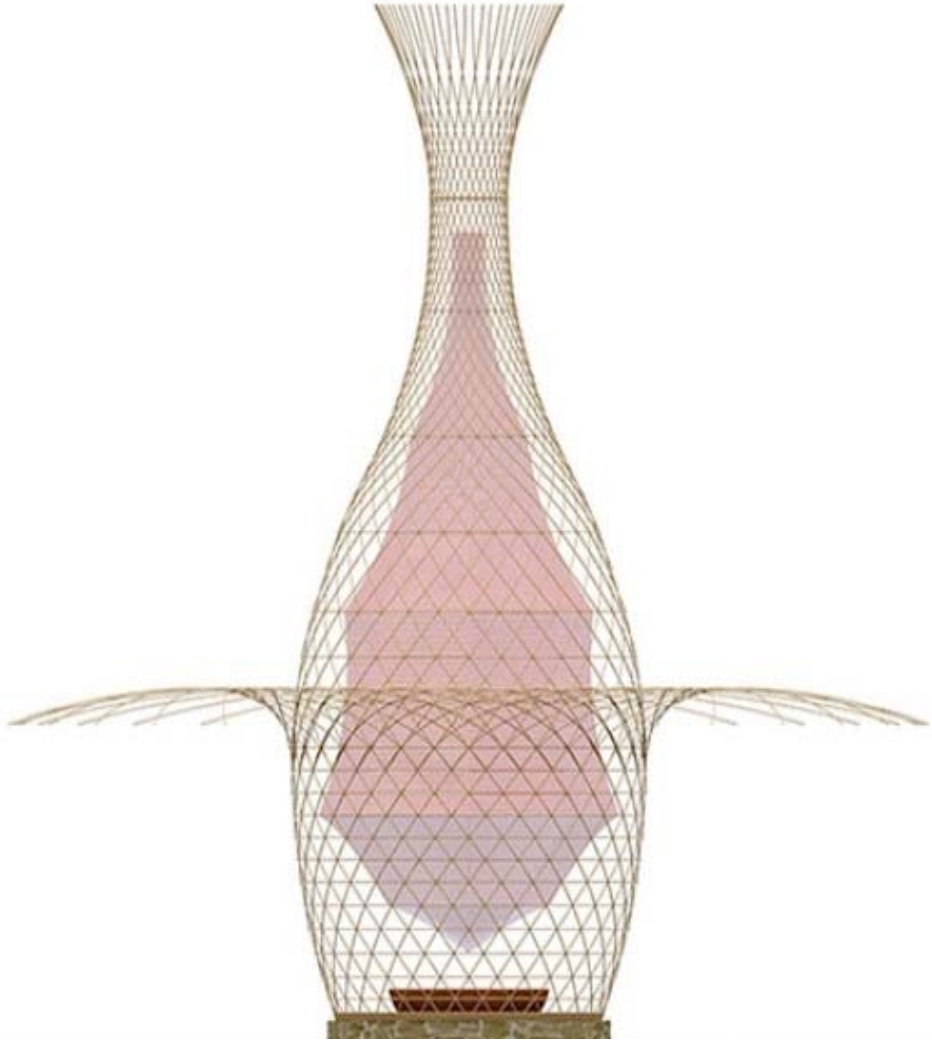
6 %

Living in Poverty

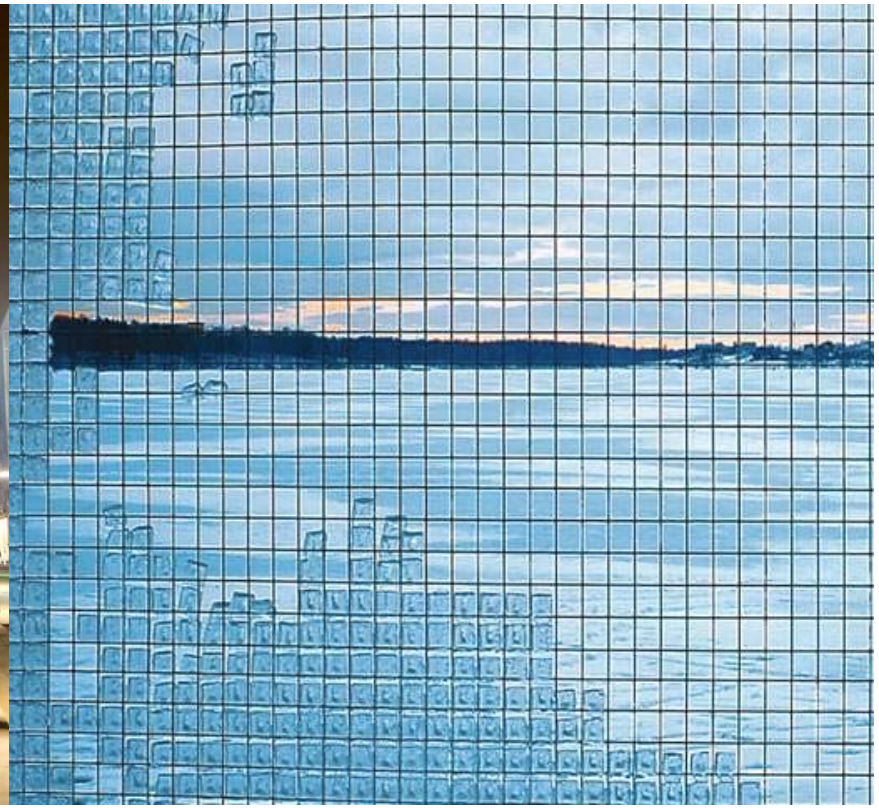
30 %

WARKA WATER

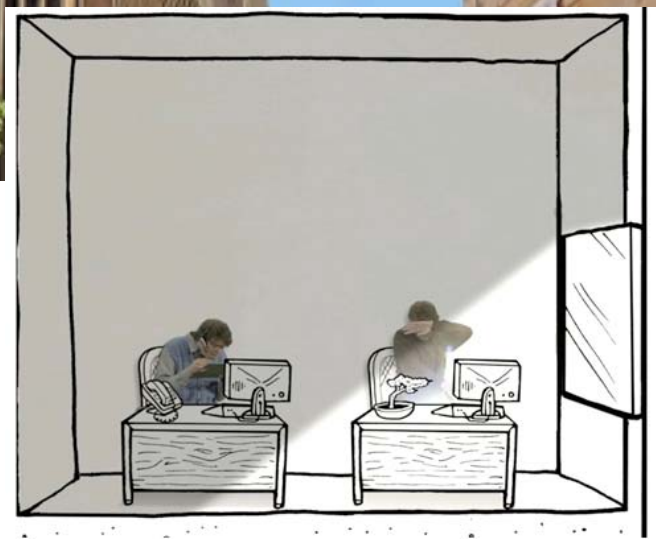




Solid, Liquid, Vapour



Shading



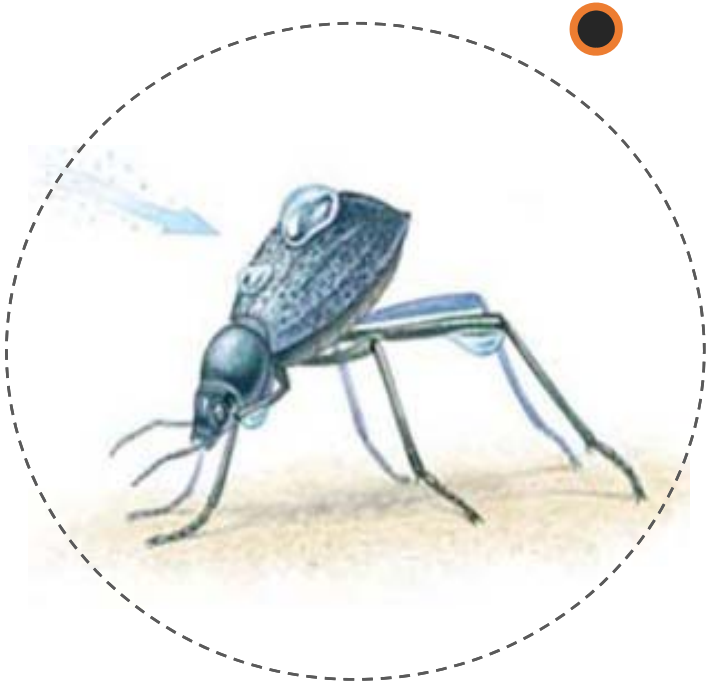
The Beetle

A

CM

MEP

LCFM

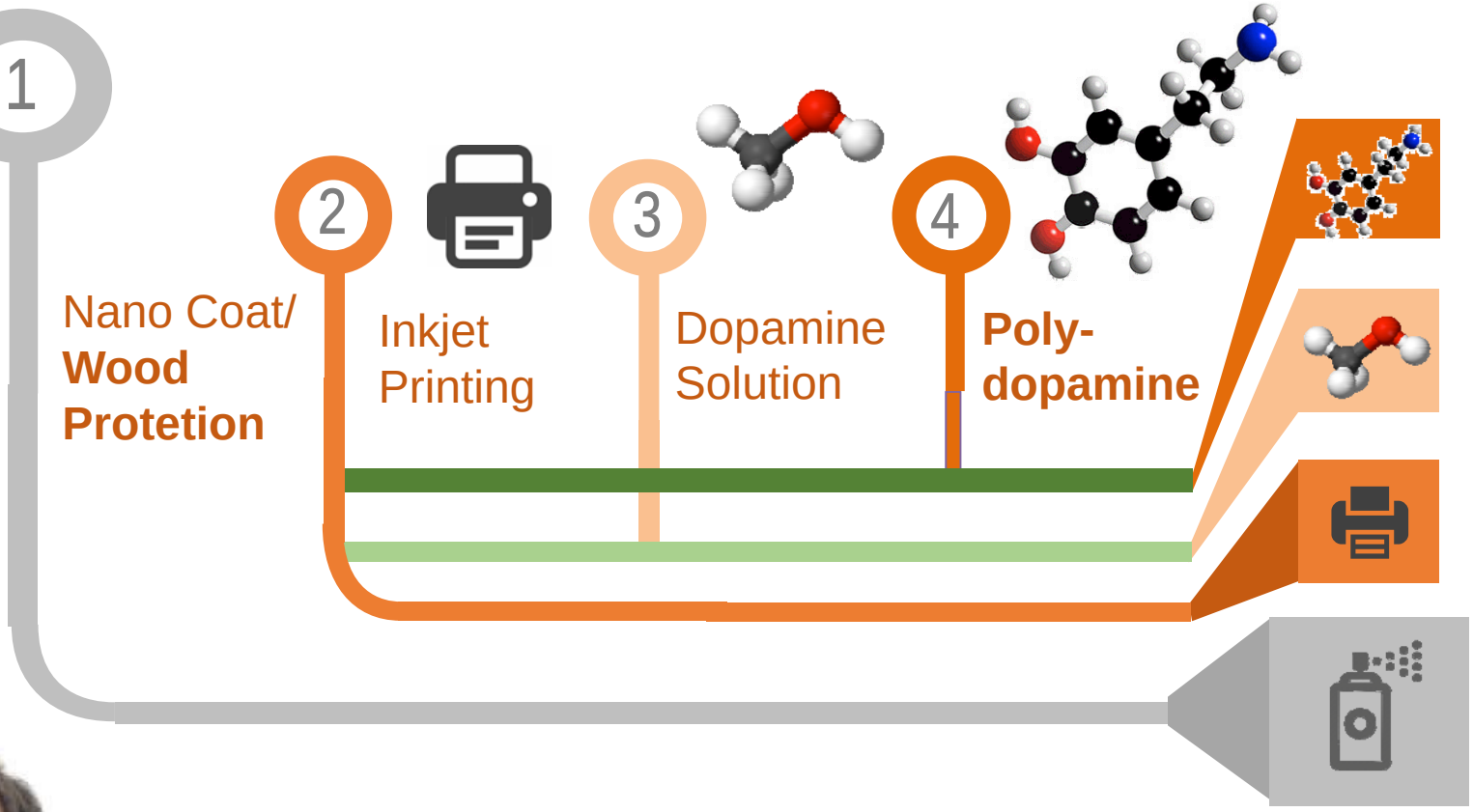


The Hydrophilic Shell of the Beetle

The Beetle

RENDERING FINS

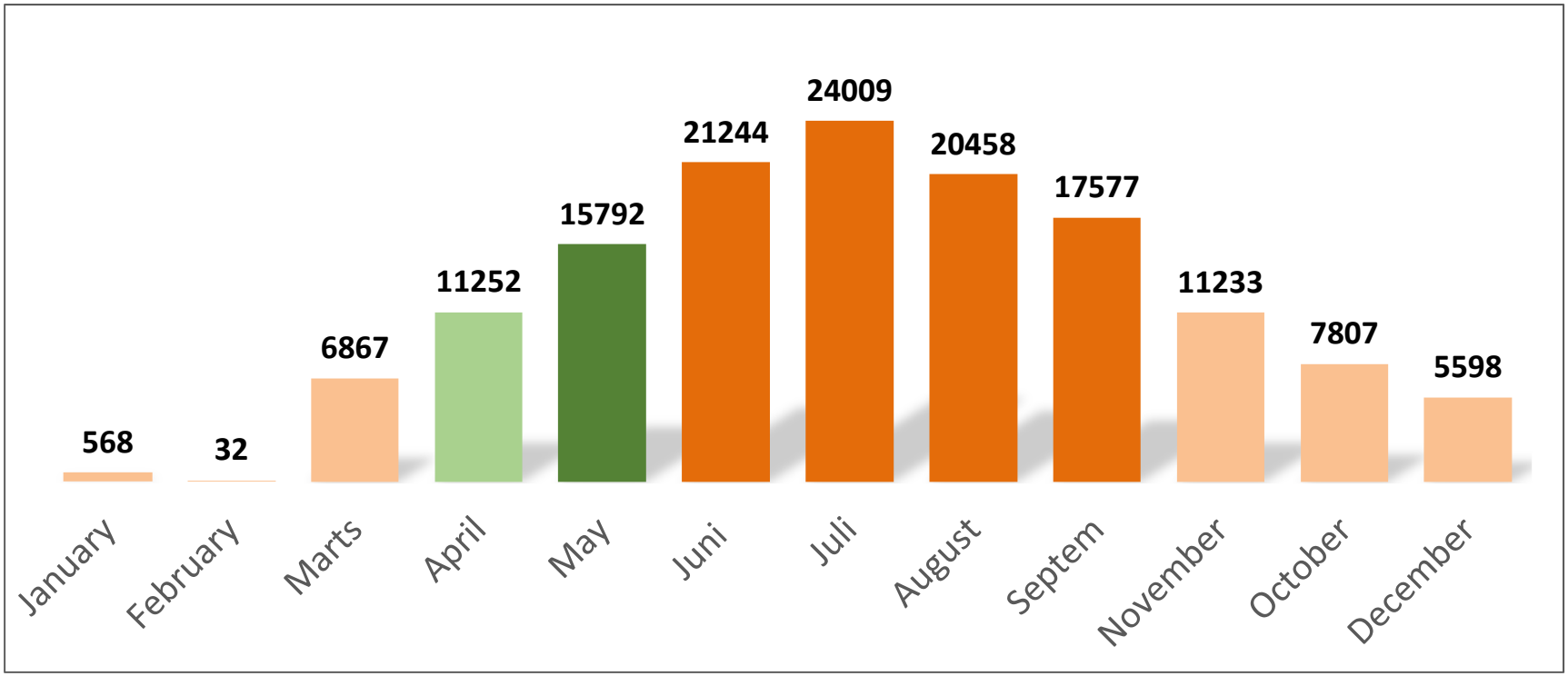
The Beetle



Professor Peng Wang
Biological and Environmental Science and Engineering

KAUST
King Abdullah University of Science and Technology

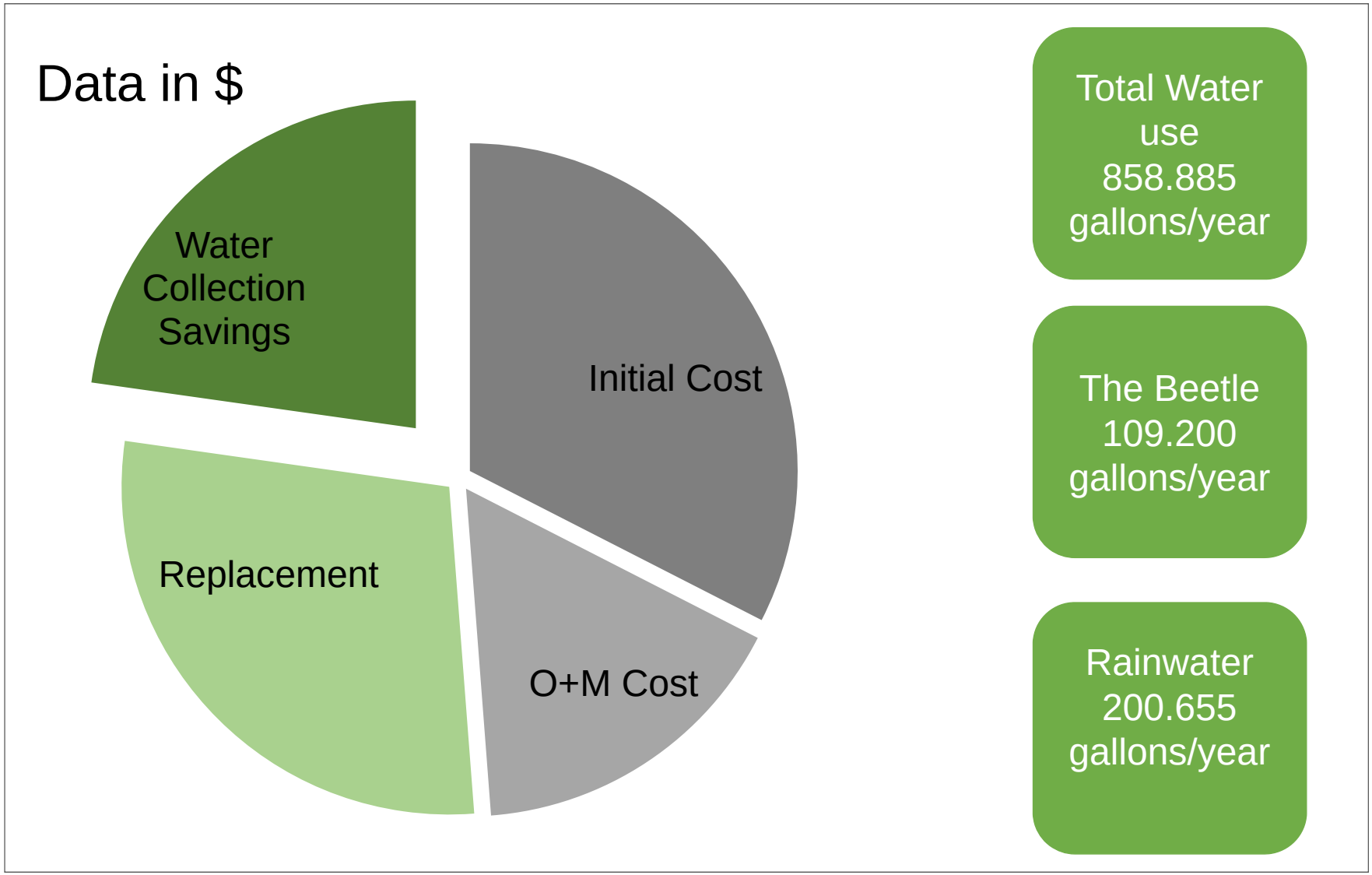
The Beetle



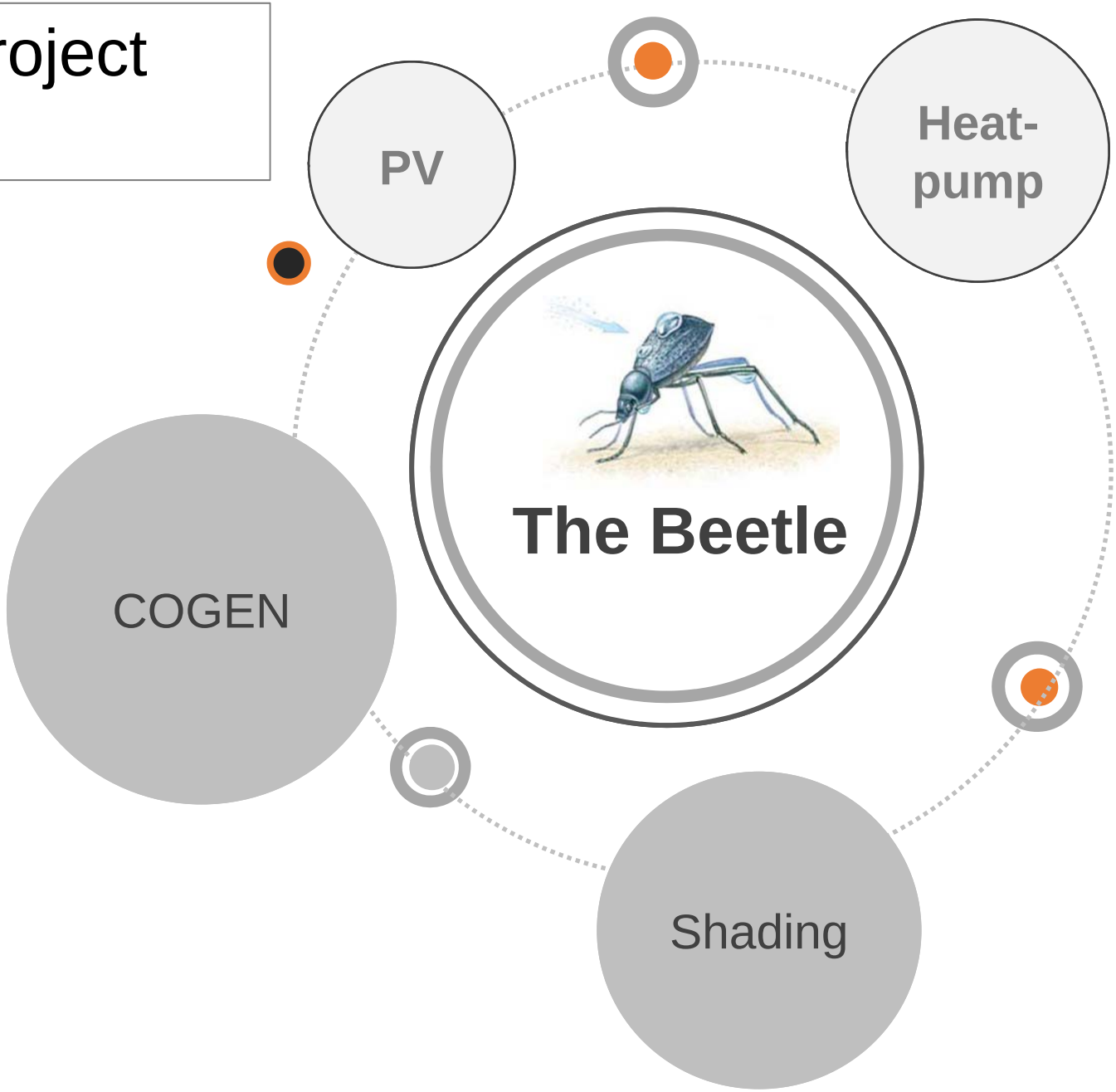
110.000 gal collected per year

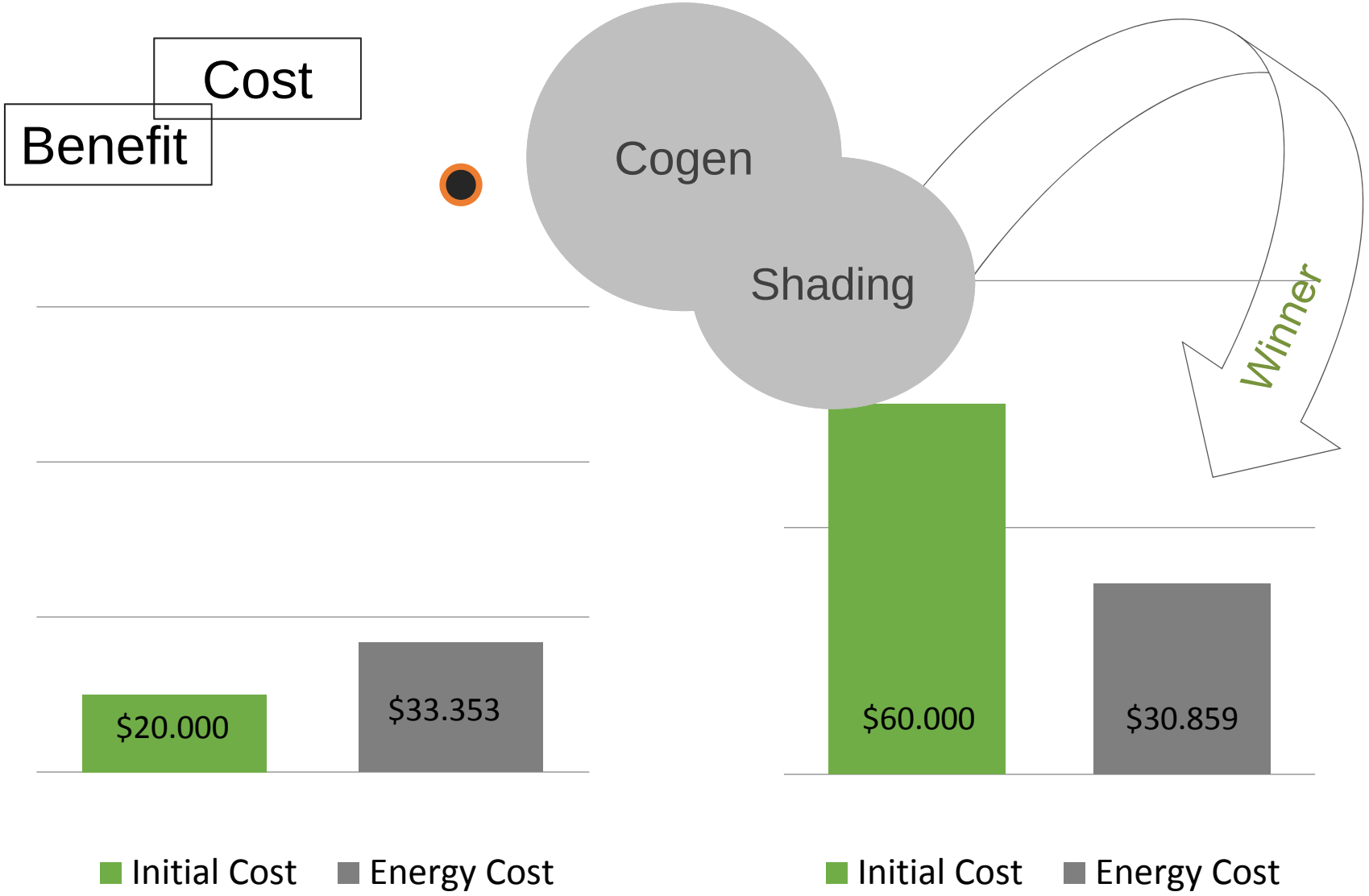
86.000 Toilet Flushes per year

The Beetle


Data in $
Water Collection Savings
Initial Cost
Replacement
O+M Cost
Total Water use 858.885 gallons/year
The Beetle 109.200 gallons/year
Rainwater 200.655 gallons/year

Integrated Project Analysis





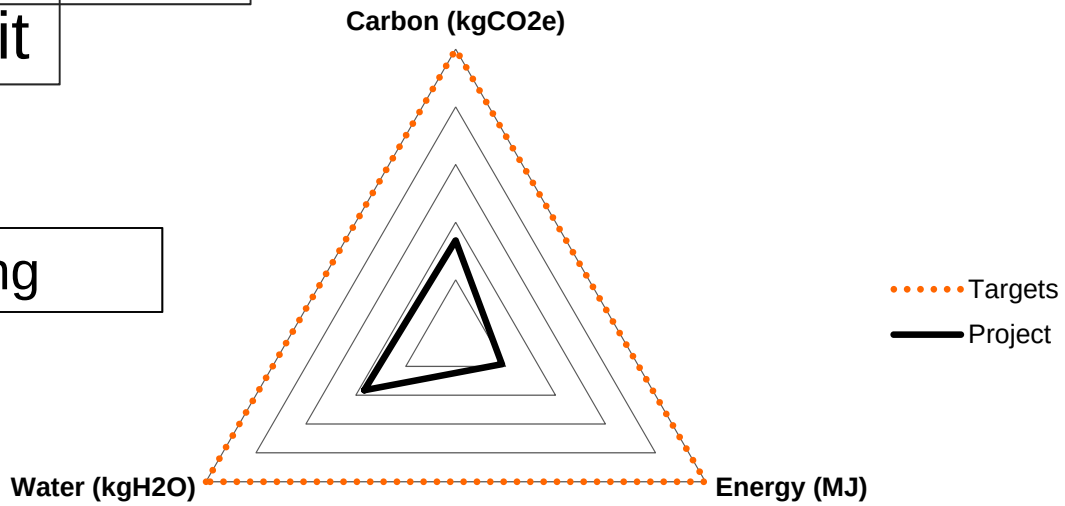
Savings over 25 year PPP Contract with Shading:

$2300 + 30% Duct Size Savings

Cost

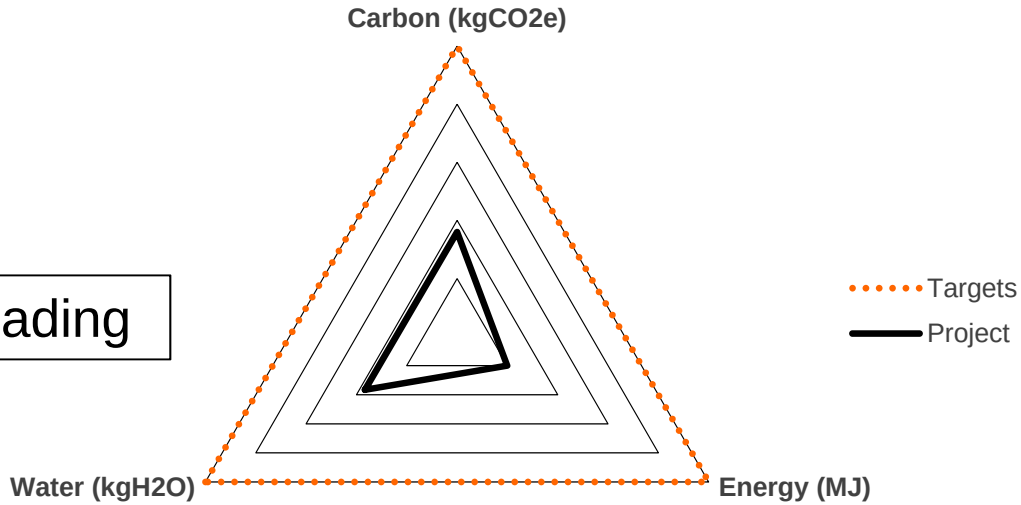
Benefit

Shading



Electricity:
103.000 kWh
Heating:
20.210 Kwh

No Shading

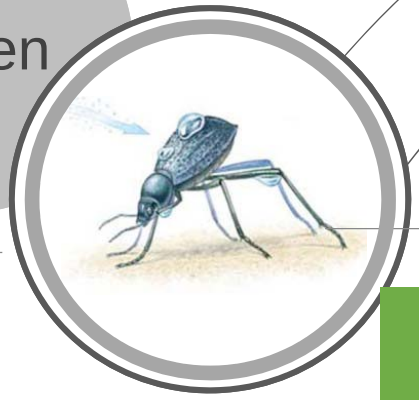


Electricity:
124.000 kWh
Heating:
19.000 Kwh

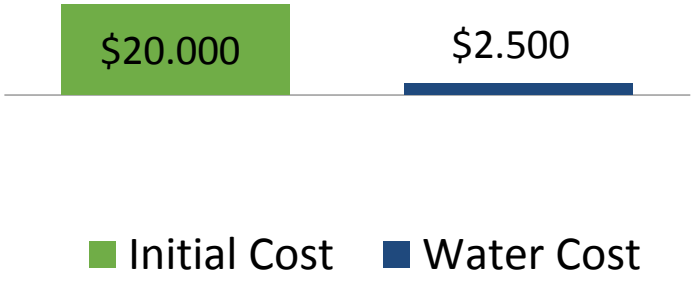
Cost

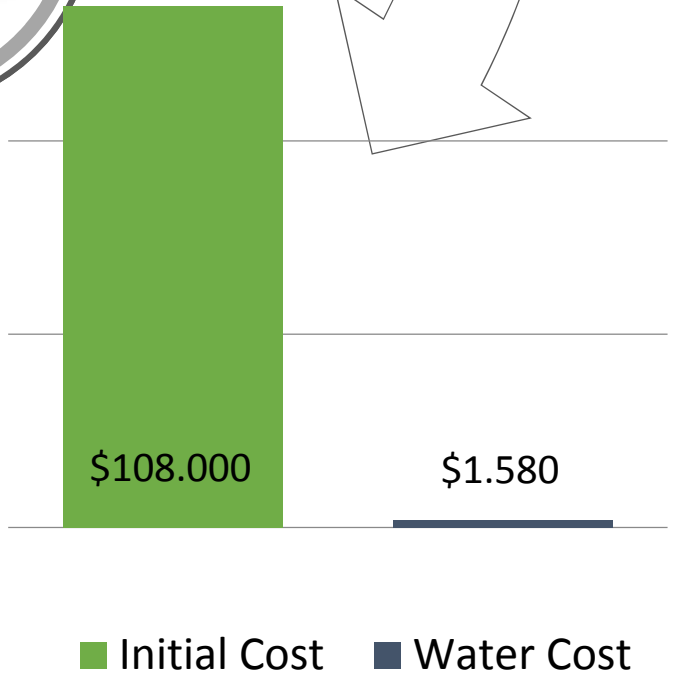
Benefit

Cogen



Winner





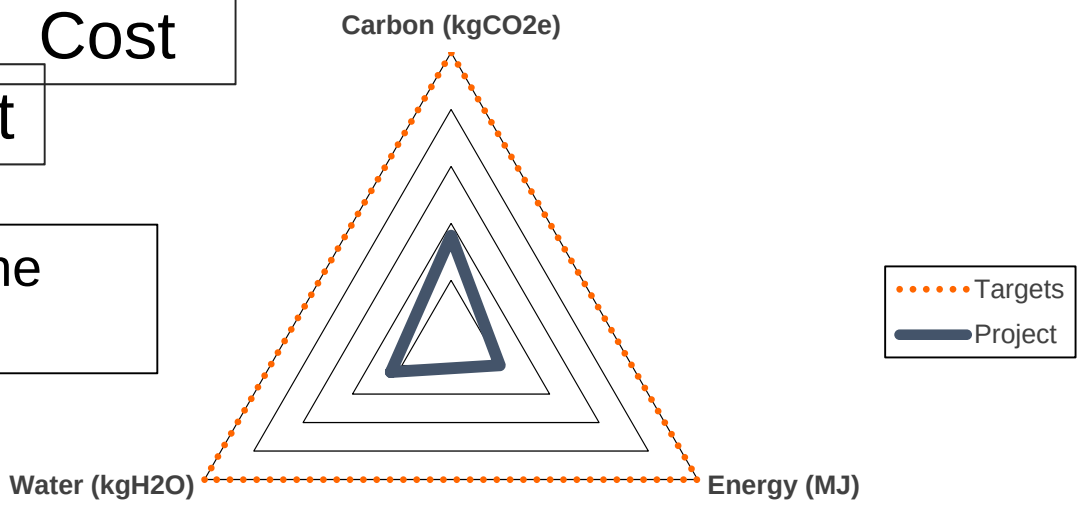
Value for Money over 1 year PPP Contract with the Beetle:

$3.400 for Academic Research

Cost

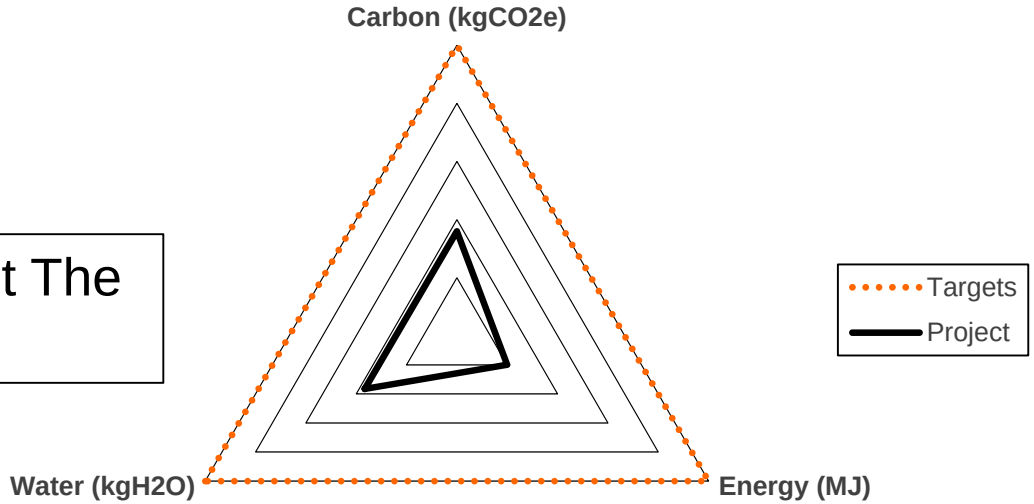
Benefit

With The Beetle



Electricity:
121.000 kWh
Heating:
18.000 Kwh
Watercollection:
109.000 gallons

Without The Beetle



Electricity:
124.000 kWh
Heating:
19.000 Kwh