



**FEASIBILITY STUDIES  
EXPANSION FOR A GREENHOUSE**

SC PAVILION  
CONCORDIA UNIVERSITY

PRESENTATION  
FEBRUARY 04th, 2015





1.



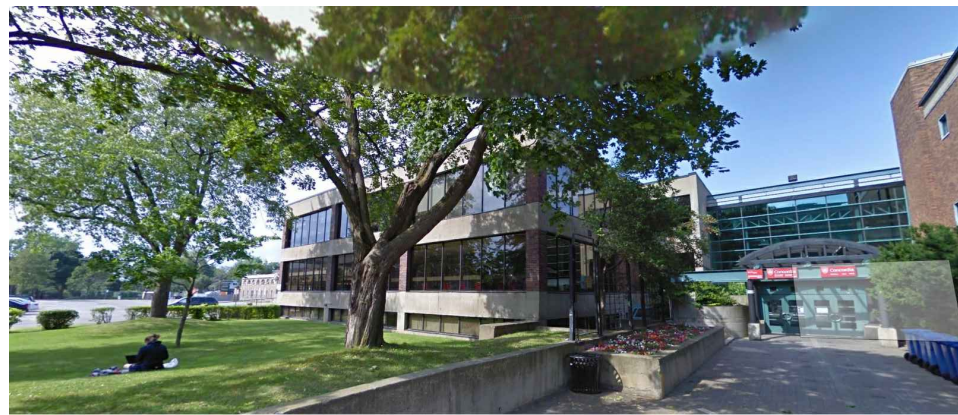
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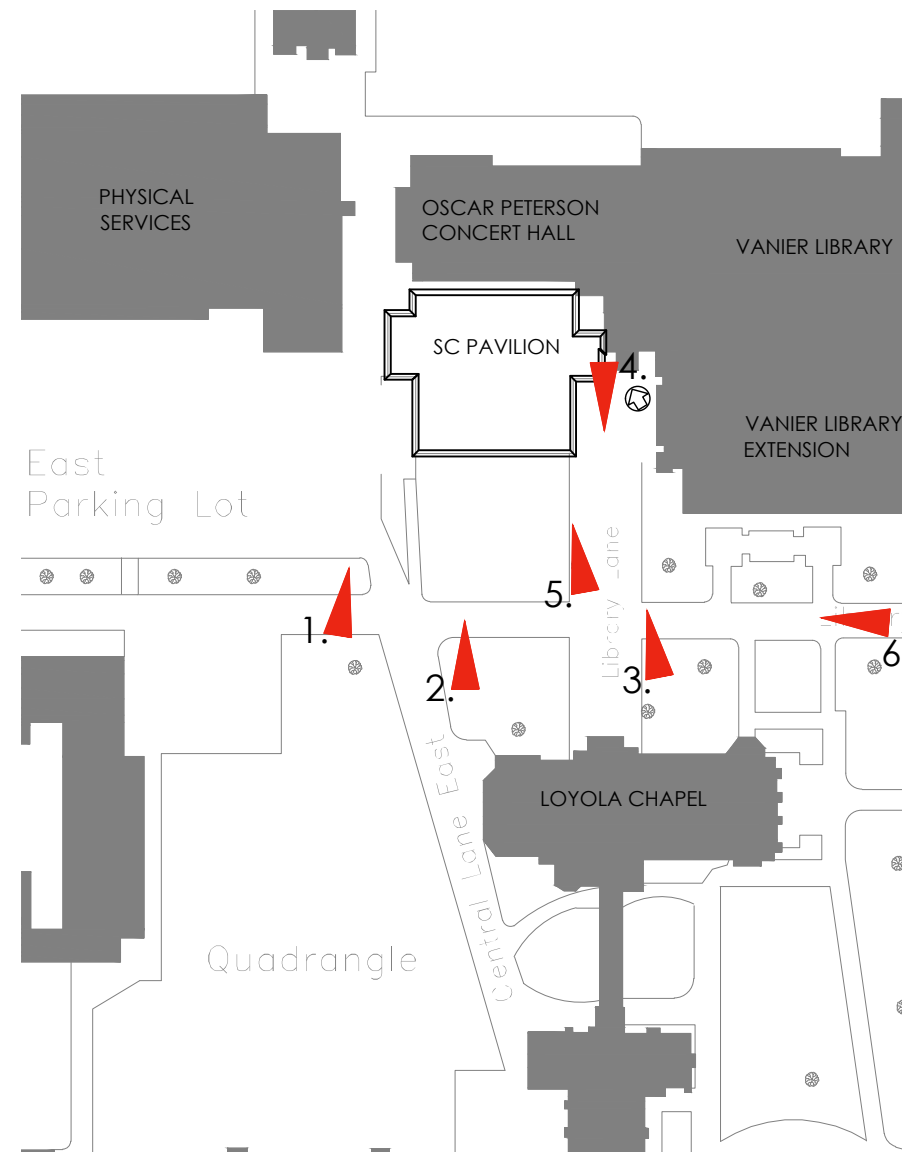
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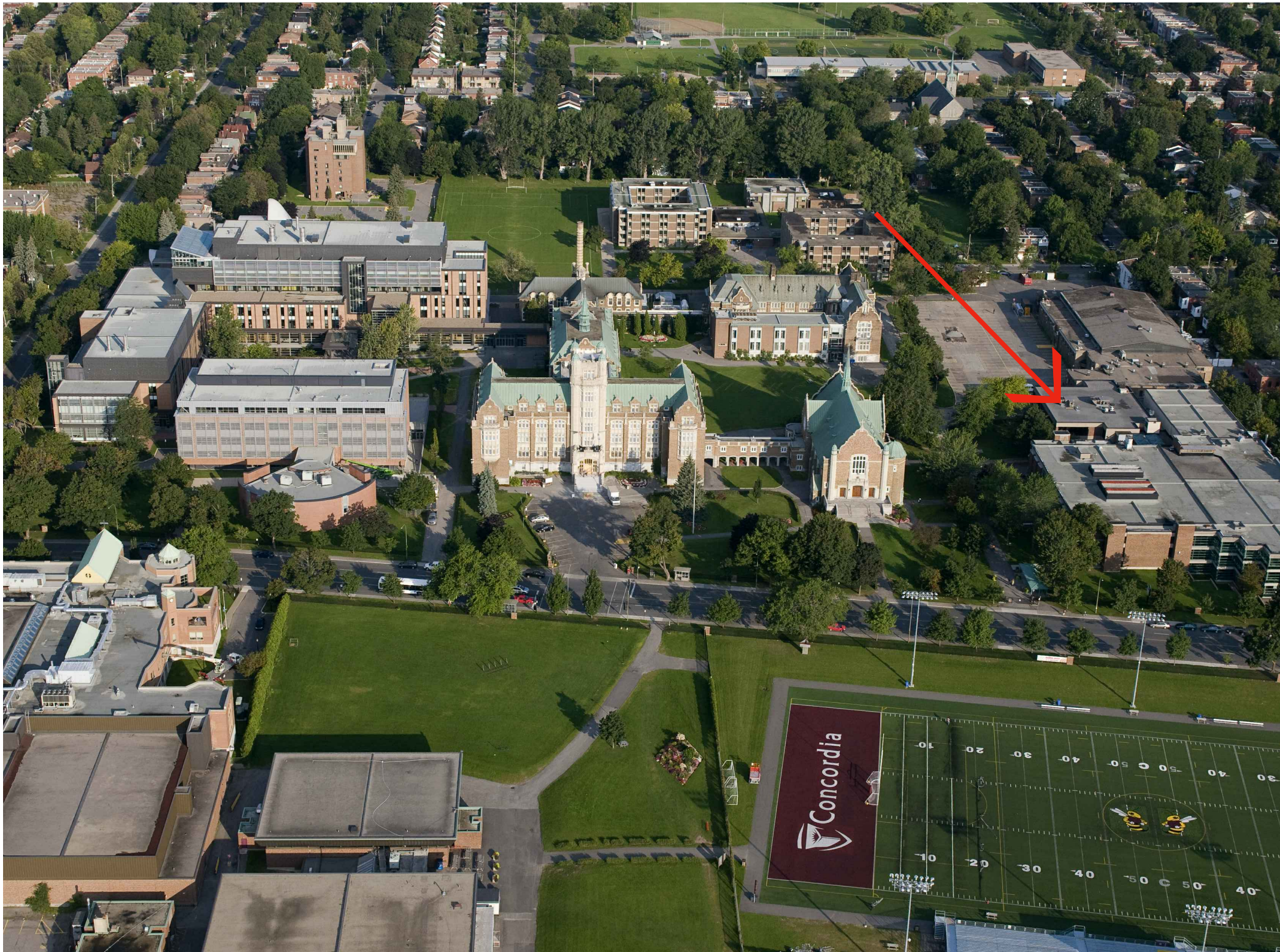


SITE PLAN



6.



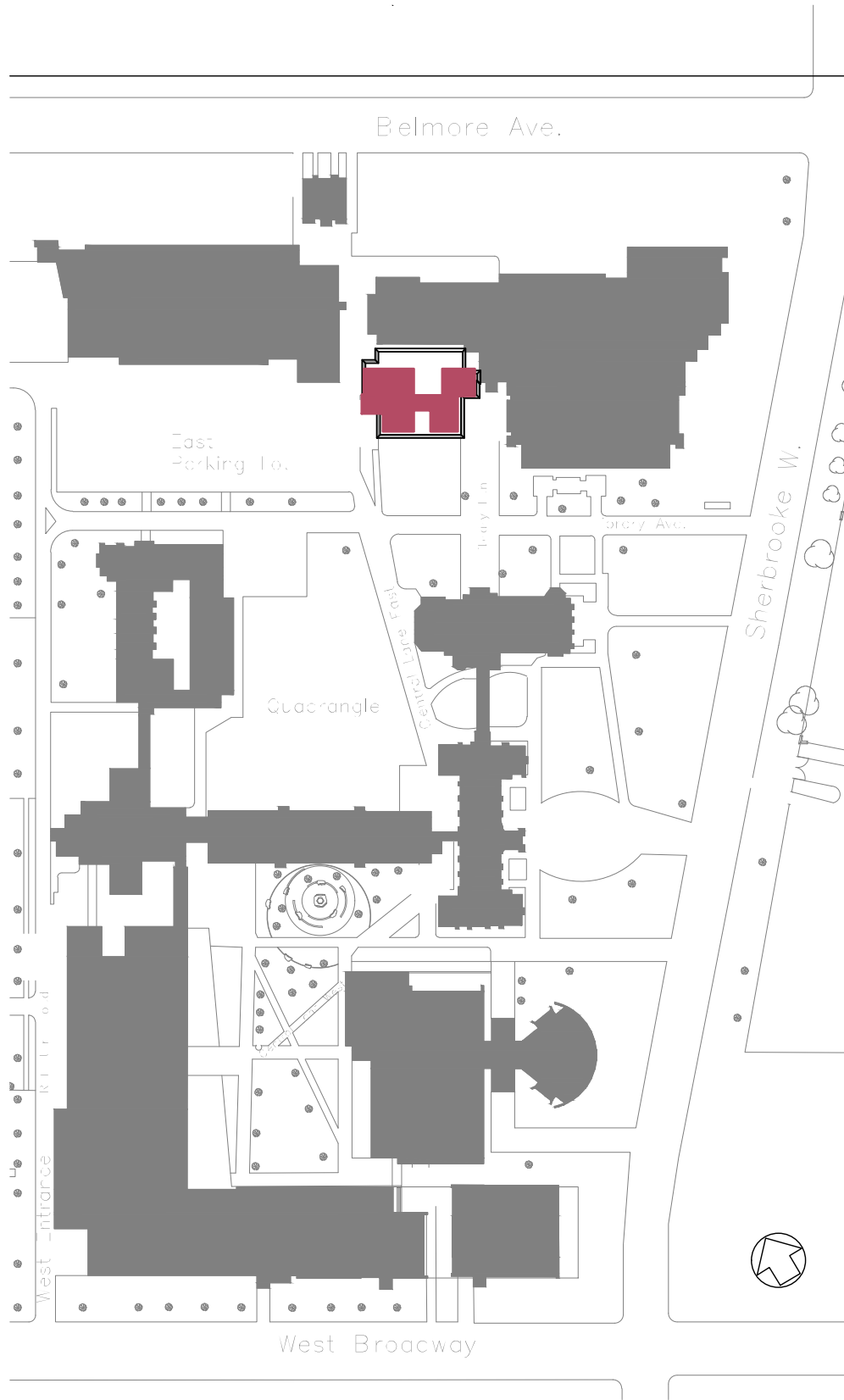


## PROJECT CONTEXT

The Concordia Student Union is studying the feasibility of constructing a greenhouse in which fresh produce would be cultivated for daily consumption on the two Concordia campuses. The three proposed sites are related to the SC Building on the Loyola Campus, and illustrated in this study.

In each case, the fruit and vegetables would be grown in soil, either directly in the ground or in elevated beds within the greenhouses. Various principles such as rainwater recuperation, anaerobic digestion, geothermal and passive solar heating have been investigated in order to reduce the dependence of the greenhouse on the existing campus and municipal infrastructures.

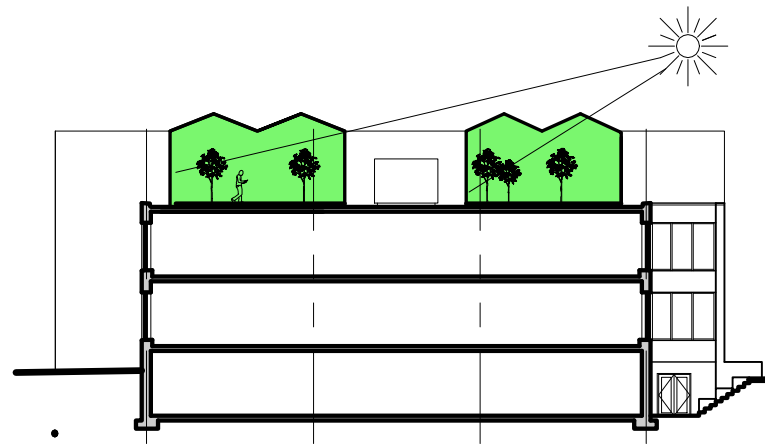




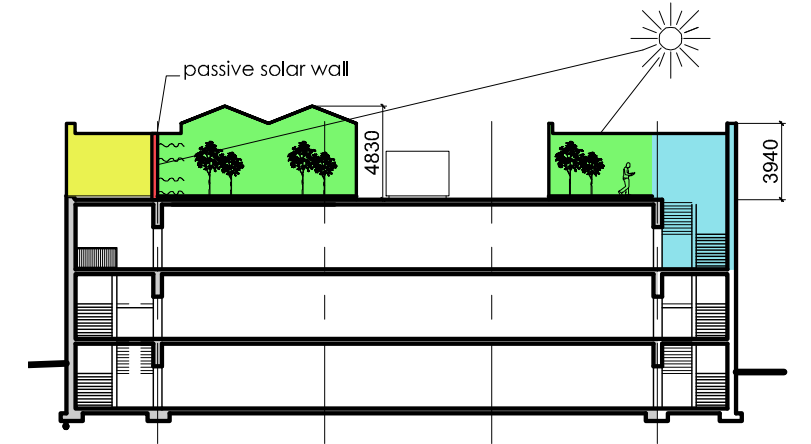
REFERENCES



ROOFTOP EQUIPMENT



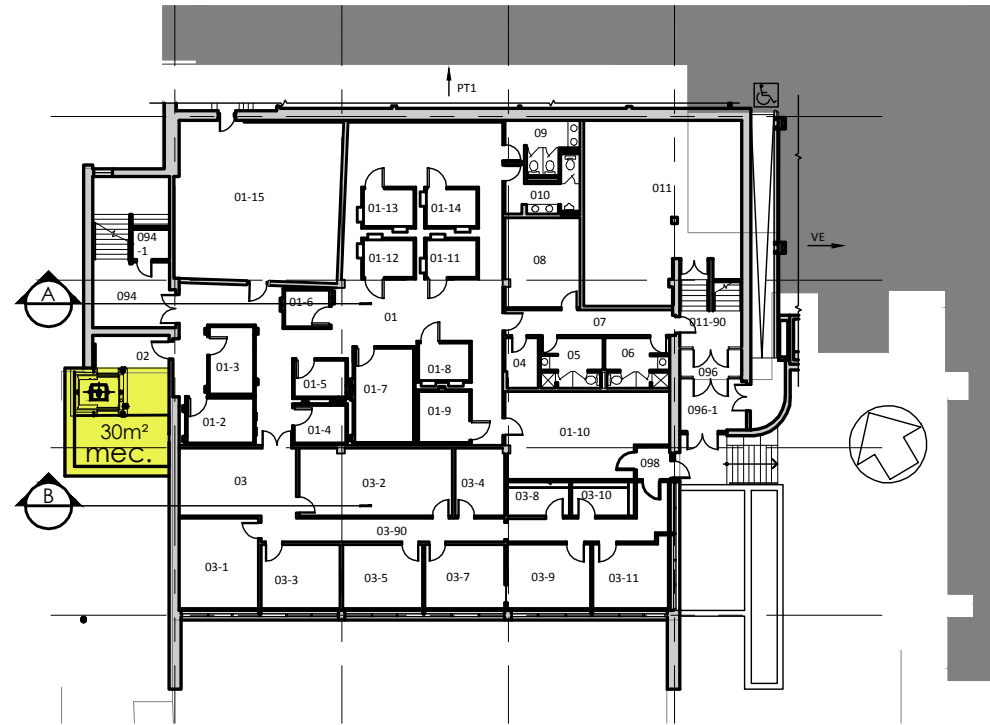
A. SECTION A



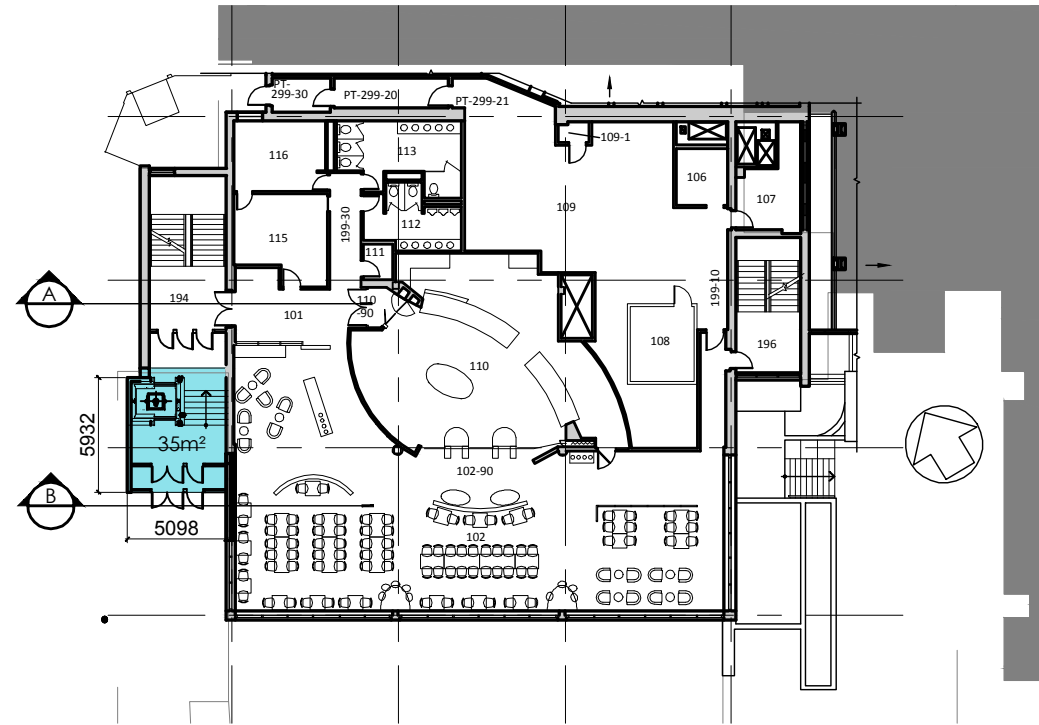
B. SECTION B

IMPLANTATION

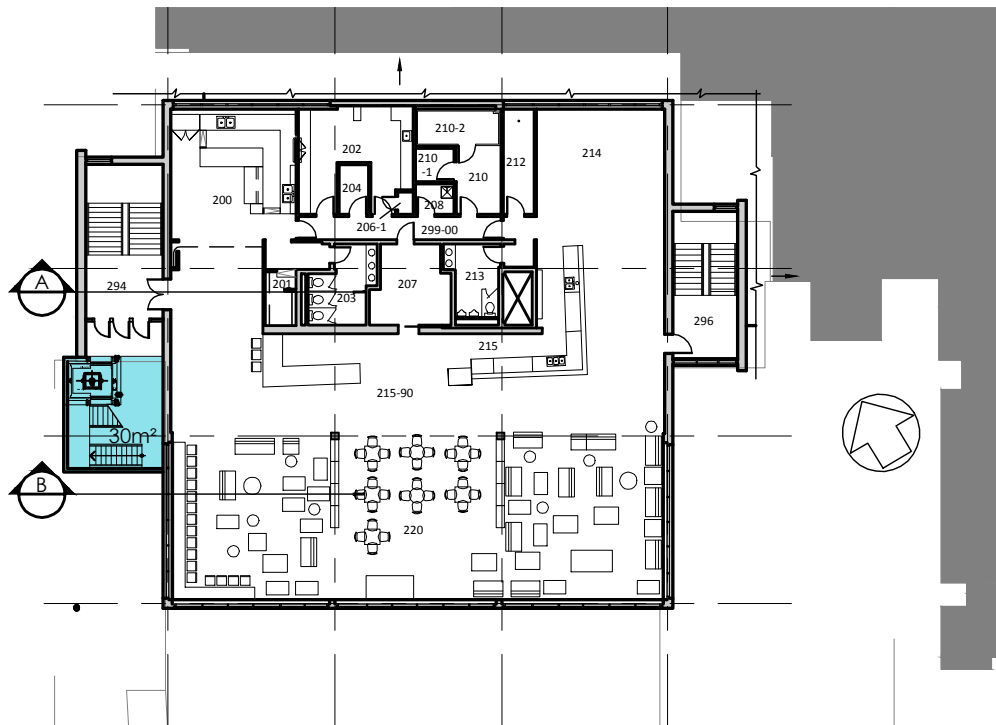
OPTION A | greenhouse located on roof of existing building



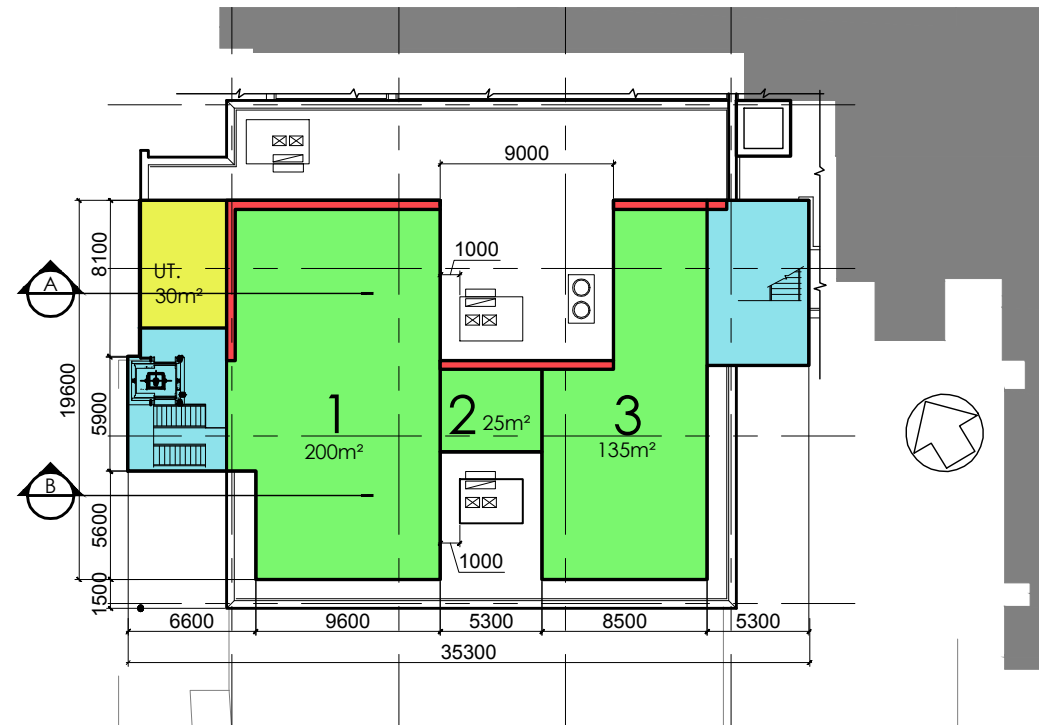
1. BASEMENT PLAN



2. FIRST FLOOR PLAN



3. SECOND FLOOR PLAN



4. ROOF PLAN - NEW LEVEL

## OPTION A

### Advantages

- 1- High levels of unobstructed natural light penetration of greenhouse.
- 2- No additional land is occupied for the construction of the greenhouse
- 3- Greenhouse could be a visually interesting addition to the building.
- 4- Secondary functions could be shared with the existing building (washrooms, storage facilities, office space, etc.) reducing building cost.

### Disadvantages

- 1- The existing rooftop mechanical units, the required access spaces surrounding them and the 1m setback from the building's exterior walls create a complex and irregular footprint available for the greenhouse construction. The resulting irregular forms increase the building envelope and energy loss from the greenhouse. The large rooftop airhandling units will shade parts of the greenhouse.
- 2- Potential structural reinforcement due to the additional weight of the greenhouse, and the seismic reinforcement could incur significant additional expenses
- 3- Roof slopes and drains would need to be reconfigured, and a new roof membrane would be required due to the construction.
- 4- A cistern for rainwater recuperation would be difficult to integrate in the new construction.
- 5- A request to modify existing zoning restrictions for the building site would be required, as the building is presently at the maximum height permitted by zoning. This would require a number of months for public hearings, and additional expenses.
- 6- Potential problems of snow accumulation around the air-handling units affecting their functioning as well as maintenance (difficult accessibility) when surrounding by the greenhouse.
- 7- New elevator and extension of two stairwells required to access the greenhouse.

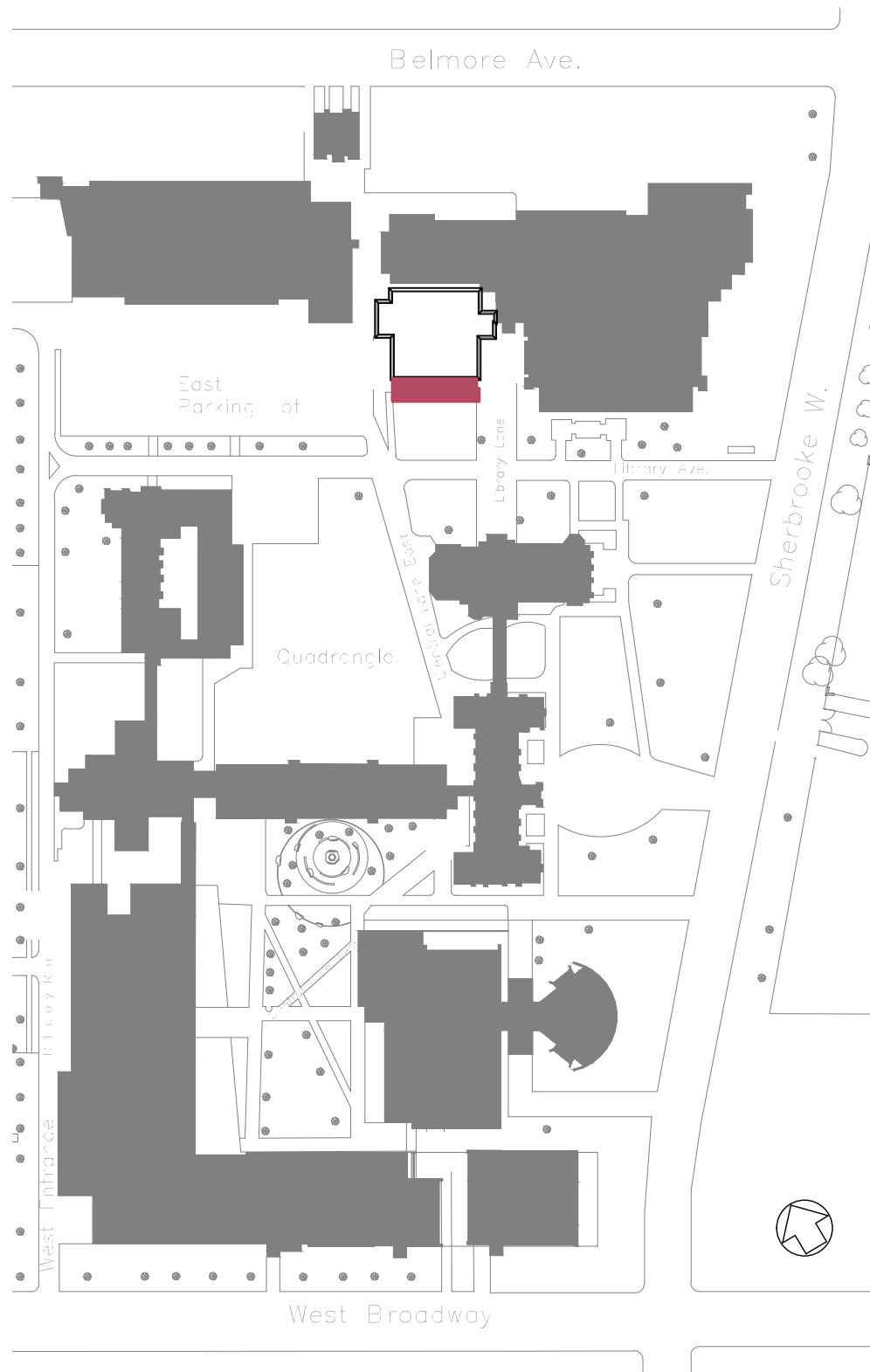
## SURFACE AREA SUMMARY

|              |                         |
|--------------|-------------------------|
| CULTIVATION  | 360m <sup>2</sup>       |
| CIRCULATION  | 145m <sup>2</sup>       |
| UTILITIES    | 060m <sup>2</sup>       |
| <b>TOTAL</b> | <b>565m<sup>2</sup></b> |

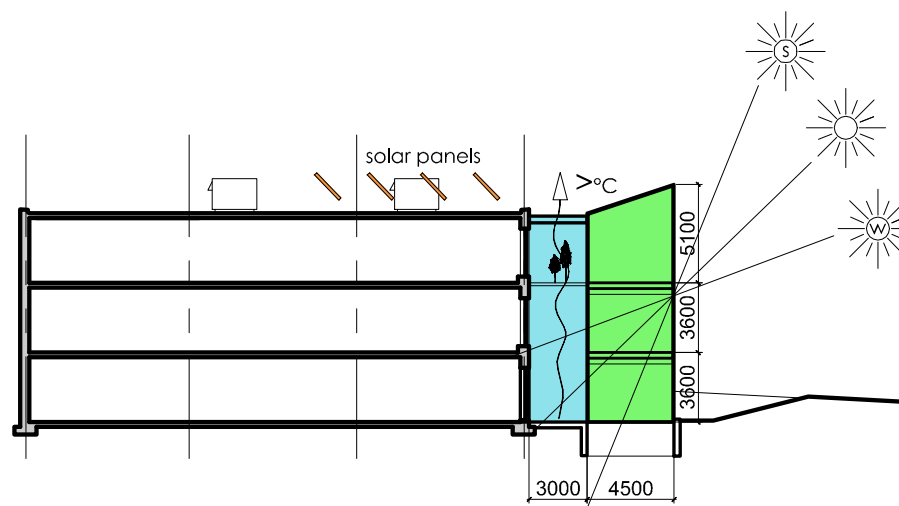
**PASSIVE SOLAR WALL**



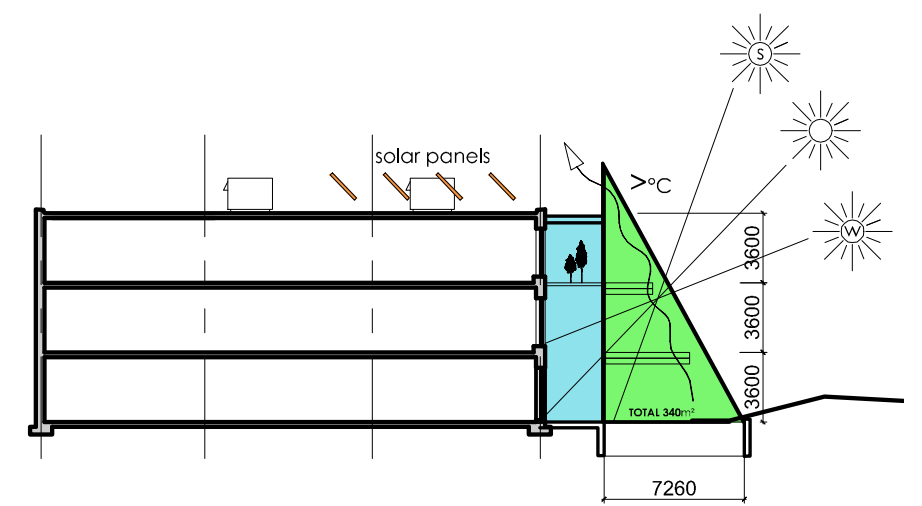




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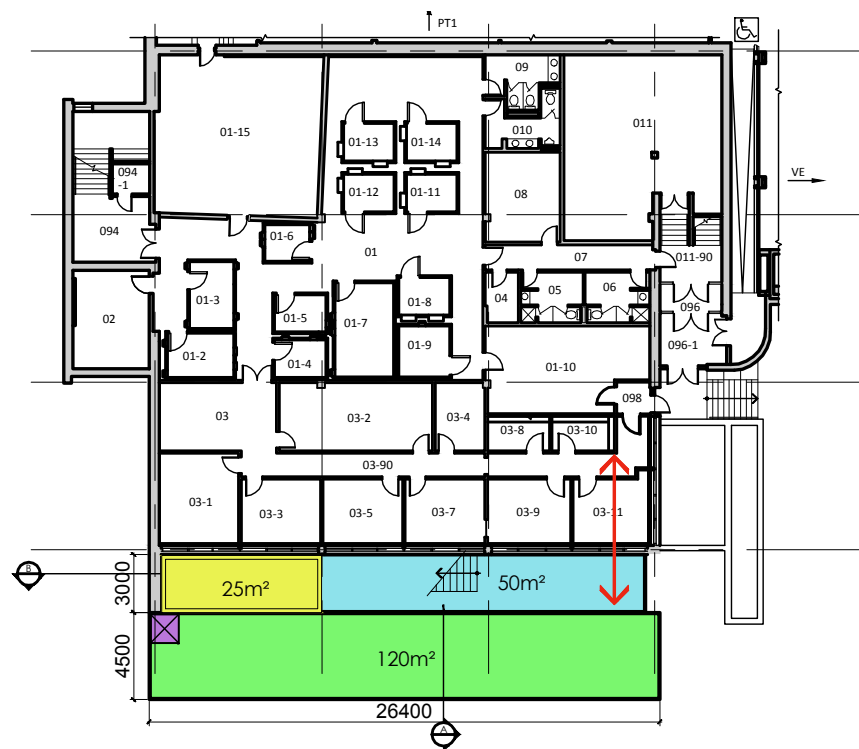
A. SECTION A



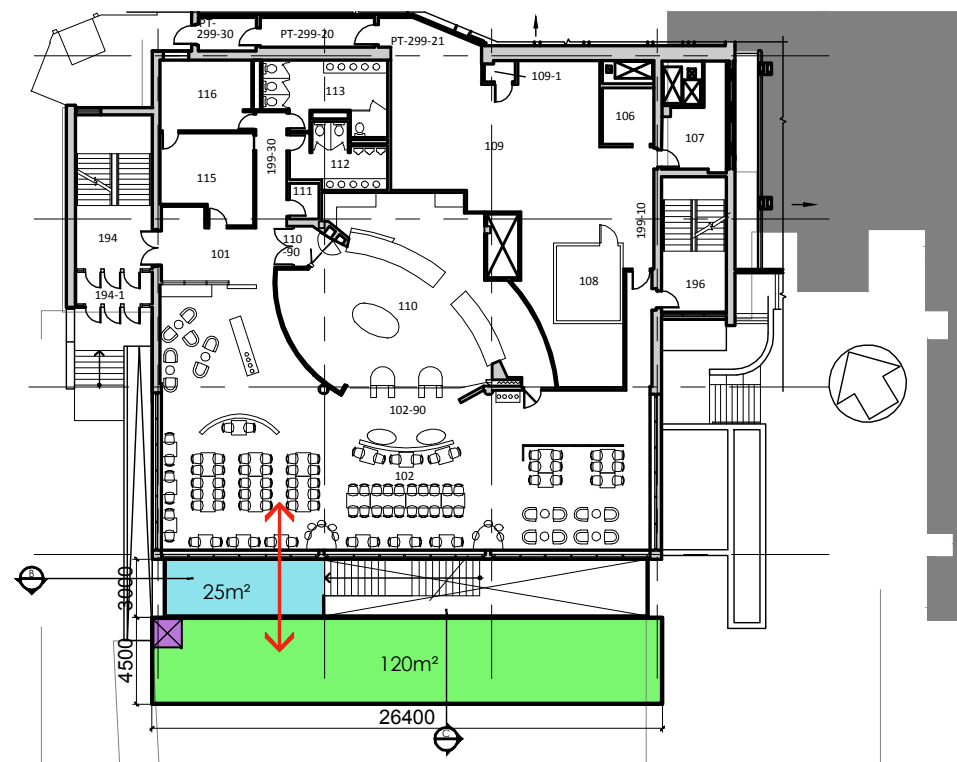
B. SECTION A - VARIATION

IMPLANTATION

OPTION B | vertical greenhouse located in front of the building



1. BASEMENT PLAN



2. FIRST FLOOR PLAN

## OPTION B

### Avantages





- 1- Fewer interventions to the existing building during construction and hence, reduced disturbance of day-to-day operations.
- 2- Secondary functions could be shared with the existing building (washrooms, storage facilities, office space, etc.) reducing building cost.
- 3- A direct visual and physical link between the Hive, CSU functions and the greenhouse spaces would stimulate interest in and optimize the greenhouse's additional role as a prototypical example of vertical urban agriculture integrating self-sufficient energy sources.
- 4- Possibility to cultivate plants in natural soil conditions on the lowest level.
- 5- The roof of the existing building would be available for solar panels (solar panels to generate heating and/or electricity for lighting).
- 6- Rational integration of rainwater retention for the greenhouse.
- 7- Reduced building envelope of the greenhouse and its adjacency to the existing building would minimize heat loss during the winter season.

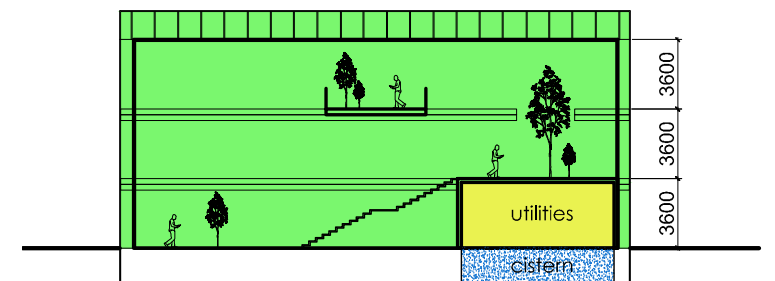
### Disadvantages

- 1- Removal of two or three mature trees adjacent to the proposed building site (new trees would be planted elsewhere to compensate for their removal).
- 2- Greenhouse accessed via existing occupied spaces.

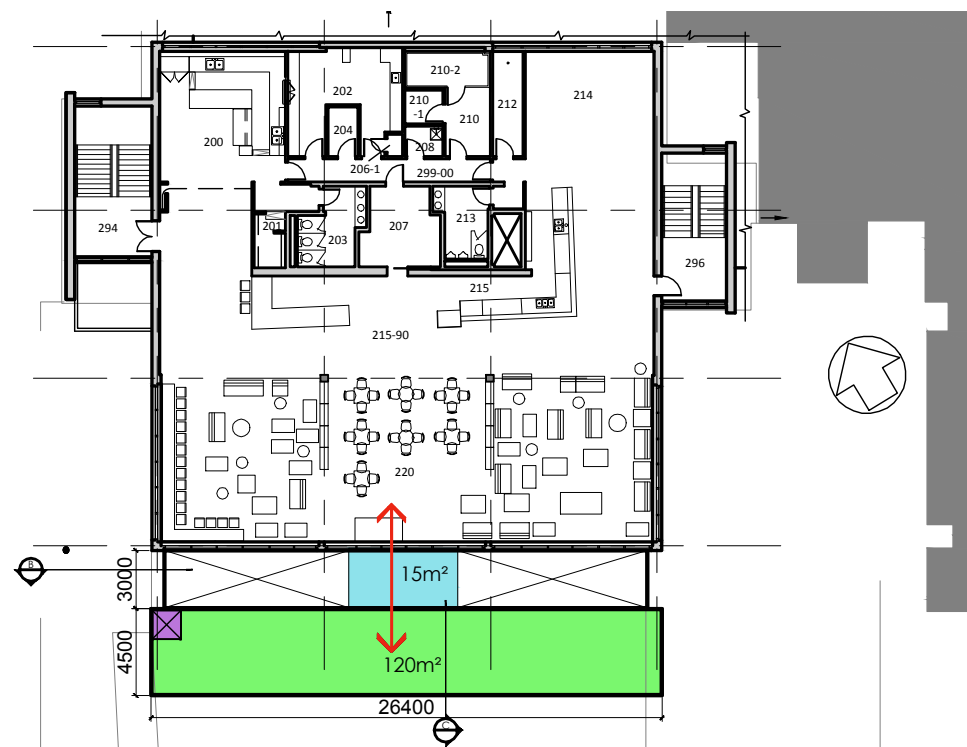
## SURFACE AREA SUMMARY

|              |                         |
|--------------|-------------------------|
| CULTIVATION  | 360m <sup>2</sup>       |
| CIRCULATION  | 090m <sup>2</sup>       |
| UTILITIES    | 055m <sup>2</sup>       |
| <b>TOTAL</b> | <b>505m<sup>2</sup></b> |

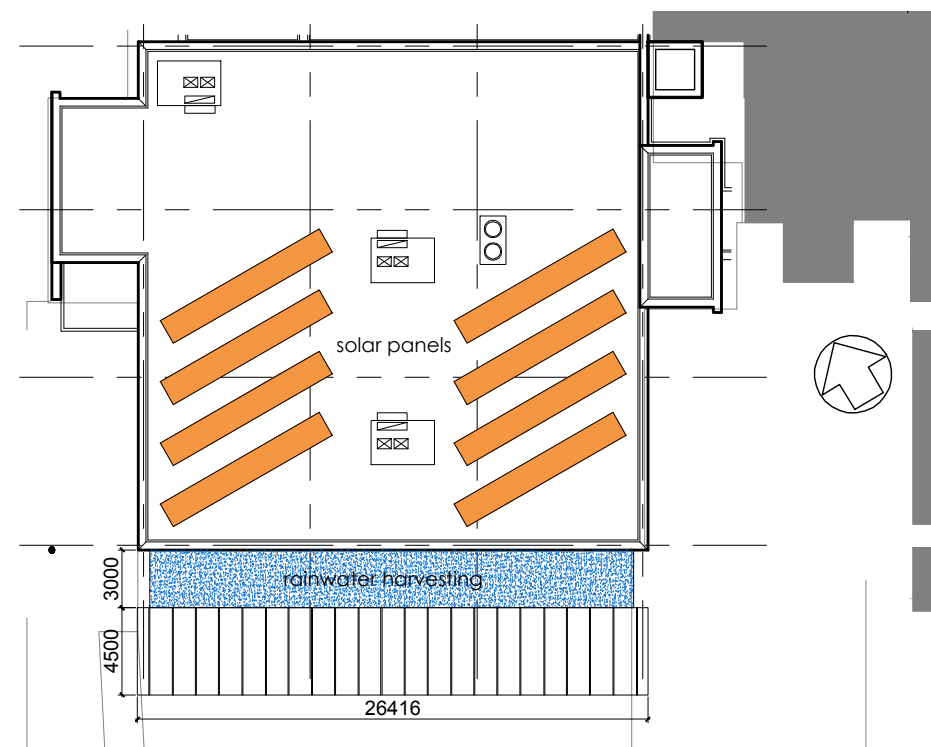
-  RAINWATER HARVESTING
-  SOLAR PANELS
-  DUMBWAITER
-  DIRECT ACCESS



SECTION B

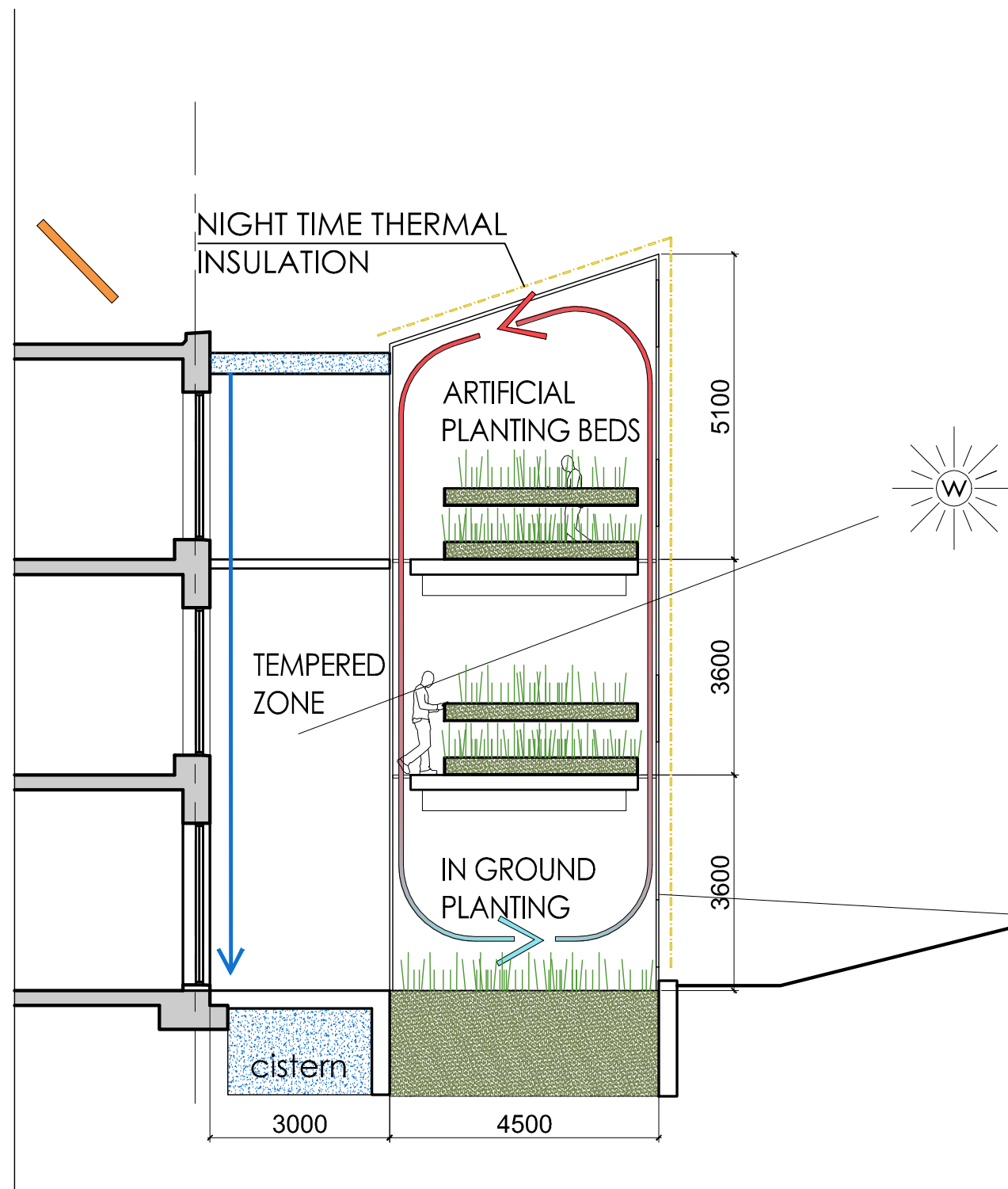


3. SECOND FLOOR PLAN

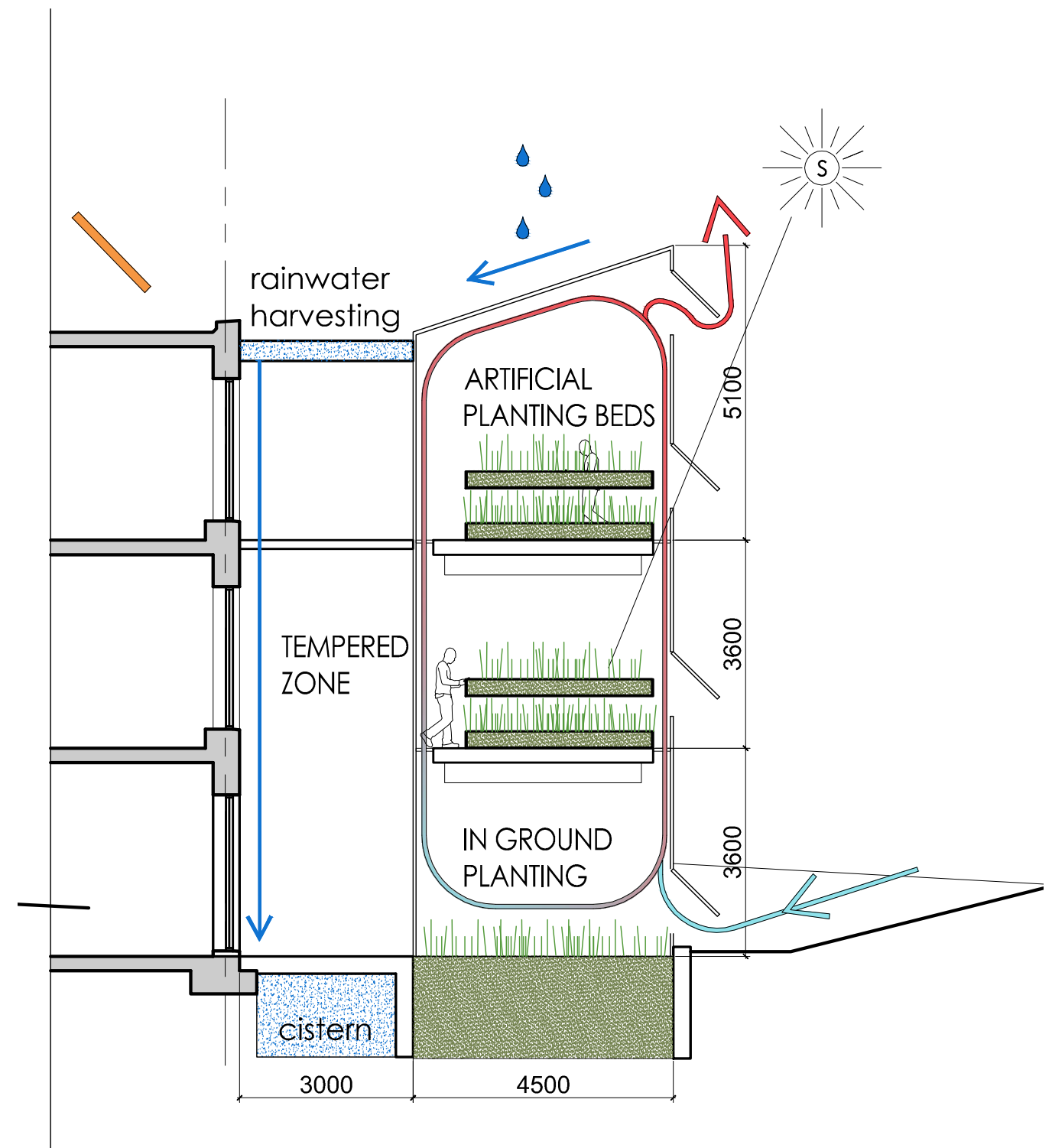


4. ROOF PLAN - NEW LEVEL



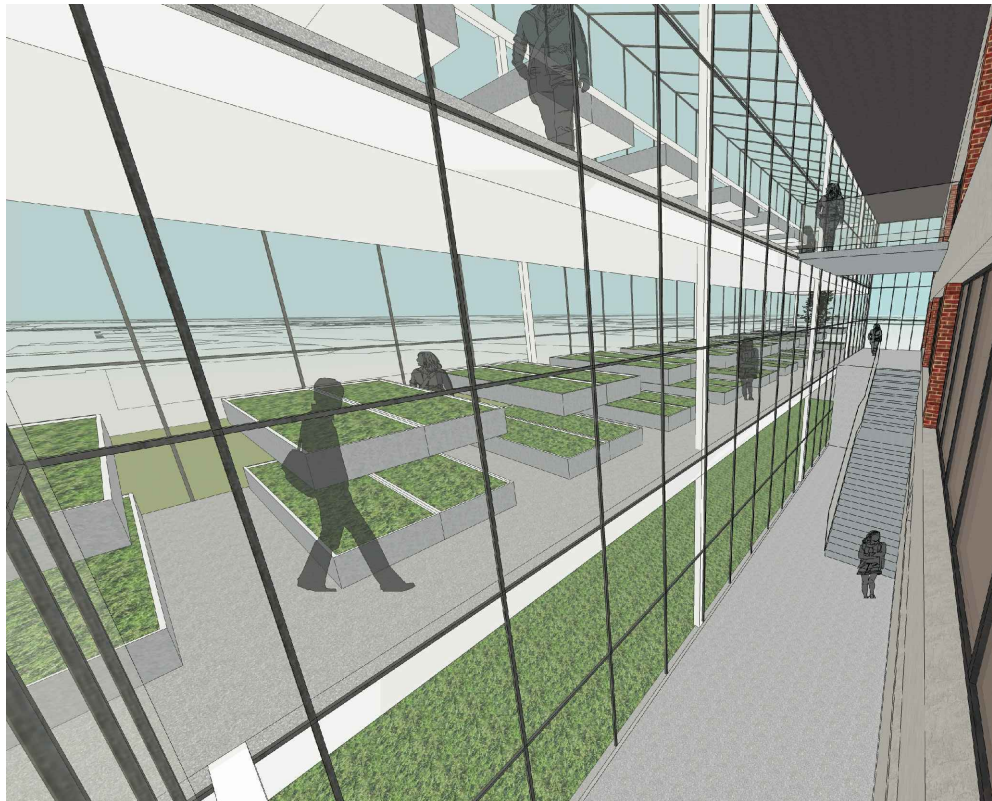
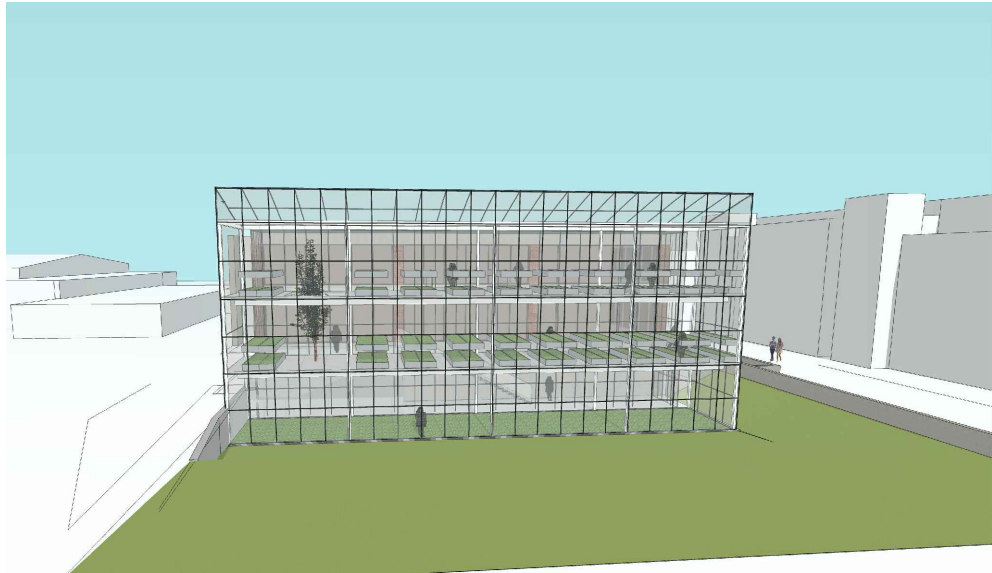


SCHEMATIC SECTION - WINTER

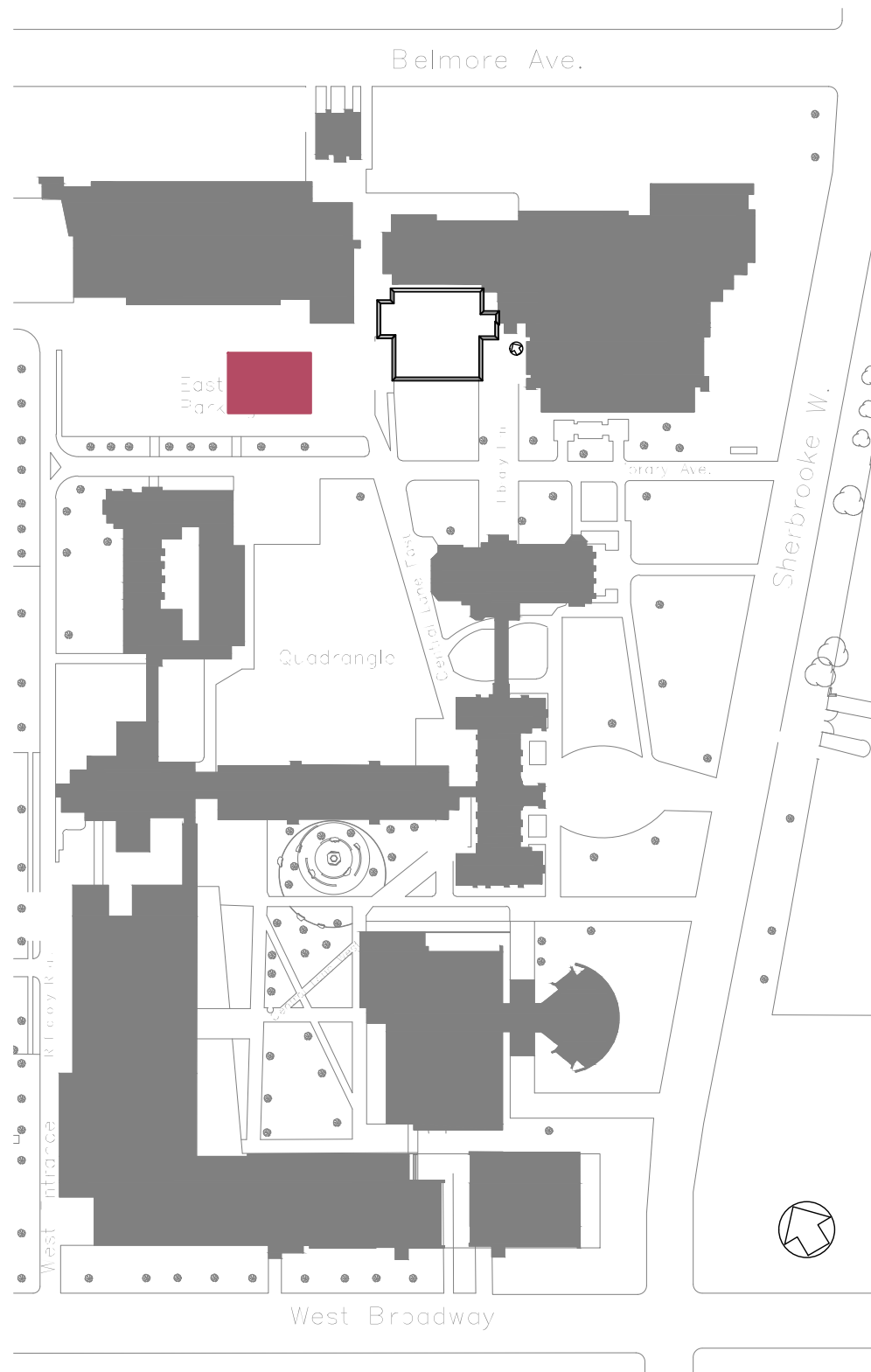


SCHEMATIC SECTION - SUMMER









IMPLANTATION

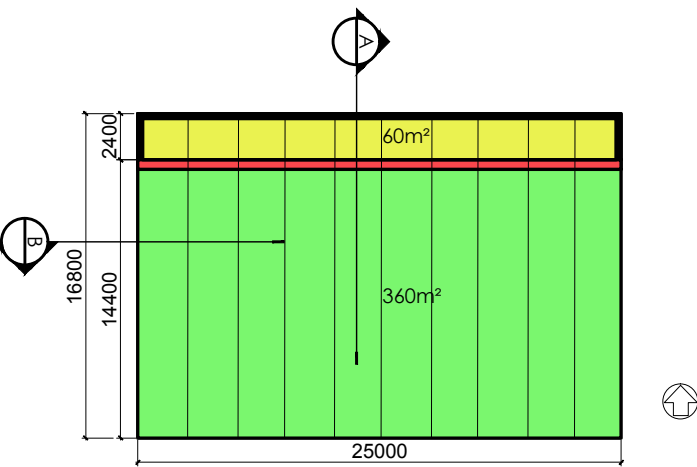
REFERENCES

OPTION C | on-grade greenhouse located on a site to be determined

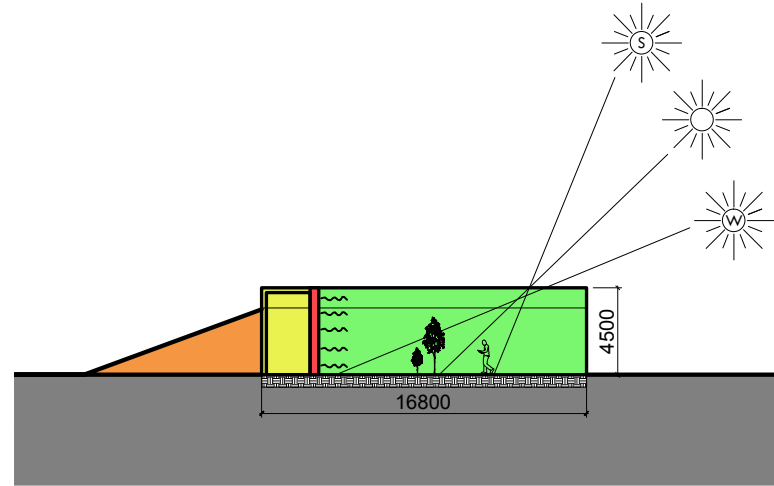




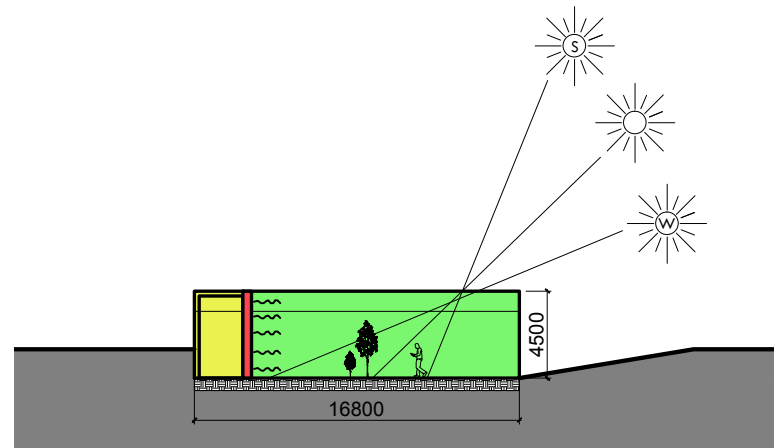
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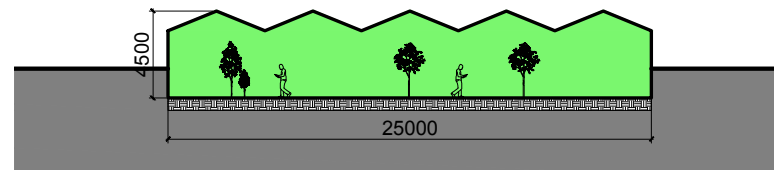
PLAN



SECTION A



SECTION A - VARIATION



SECTION B

## OPTION C

### Advantages

- 1- This option would require no modifications to the existing building. An autonomous site would permit a rational and simple construction using prefabricated elements.
- 2- In-ground agriculture would be possible depending upon the selected site.
- 3- Possibility to build the greenhouse with polycarbonate panels to reduce building costs and increase thermal resistance.
- 4- Potential for anaerobic digestion to generate biogas as a heat source.
- 5- Evolutive greenhouse dimensions; the project can be phased and grow.

### Disadvantages

- 1- Potentially less accessible and less visible from the CSU functions in the existing building, hence reducing its pedagogic role.
- 2- Availability of an appropriate site on campus to be determined.
- 3- potential decontamination of greenhouse site.
- 2- New infrastructure would be required for the greenhouse (hook-up to aquaduct and sewer, gas, electricity, etc.).

## SURFACE AREA SUMMARY

|              |                         |
|--------------|-------------------------|
| CULTIVATION  | 360m <sup>2</sup>       |
| UTILITIES    | 060m <sup>2</sup>       |
| <b>TOTAL</b> | <b>420m<sup>2</sup></b> |

- PASSIVE SOLAR WALL
- BERM MADE OF BACKFILL





