

# UNDERGROWTH

Undergrowth is an urban farming project, located in an abandoned railway station underneath the Glasgow Botanic Gardens, aimed at tackling food insecurity through the implementation of innovative growing methods. By harnessing the power of bioluminescent plants to generate photosynthesis for other plants, the space is producing a range of nutritious and fresh crops throughout the year whilst also creating a desirable and educational destination for the community. In addition, the project allows for food production in spaces traditionally deemed unsuitable.

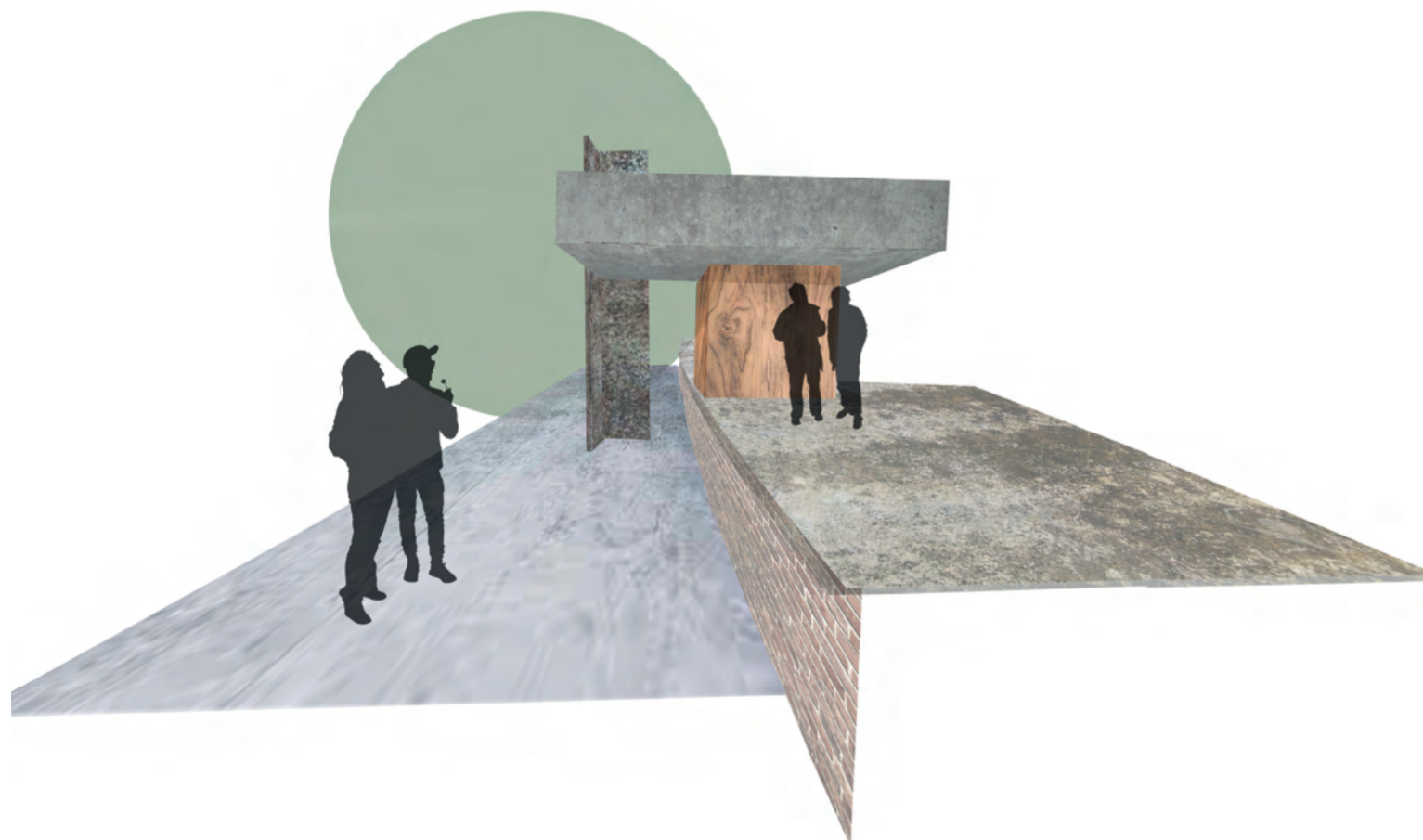
The driving force of this project is centred around growth, the growing of produce but also the growing of community and personal skills. The project will have four interconnected elements: Growing Spaces, Public Engagement Spaces, Skill Spaces, and Event Spaces. It aims at redefining the concept of public spaces by offering a space that is both functional and educational, where people can gather, learn, and connect with their surroundings.



Concept Sketches of Mushroom Growth



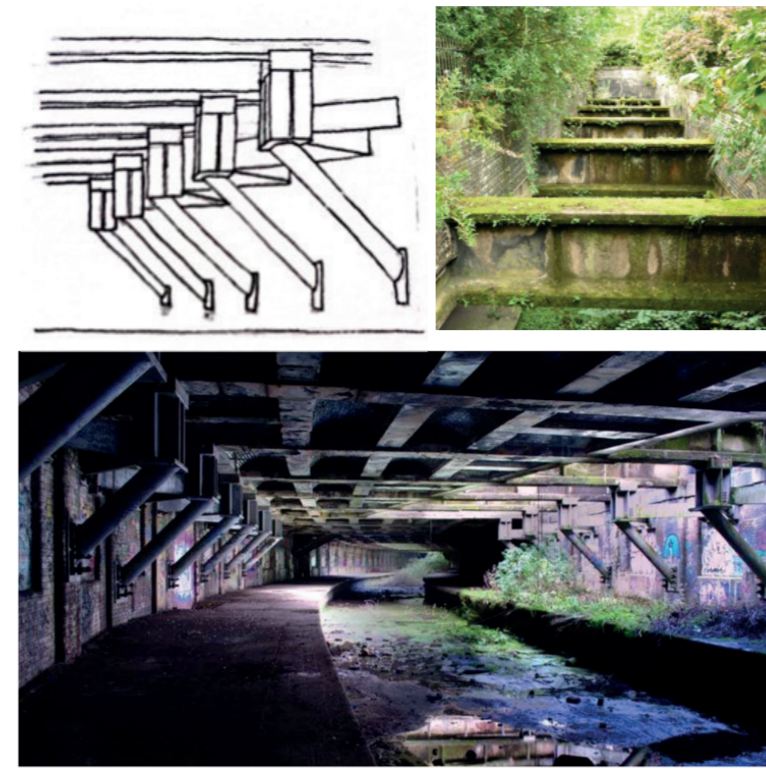
Illustrator Diagram of Concept



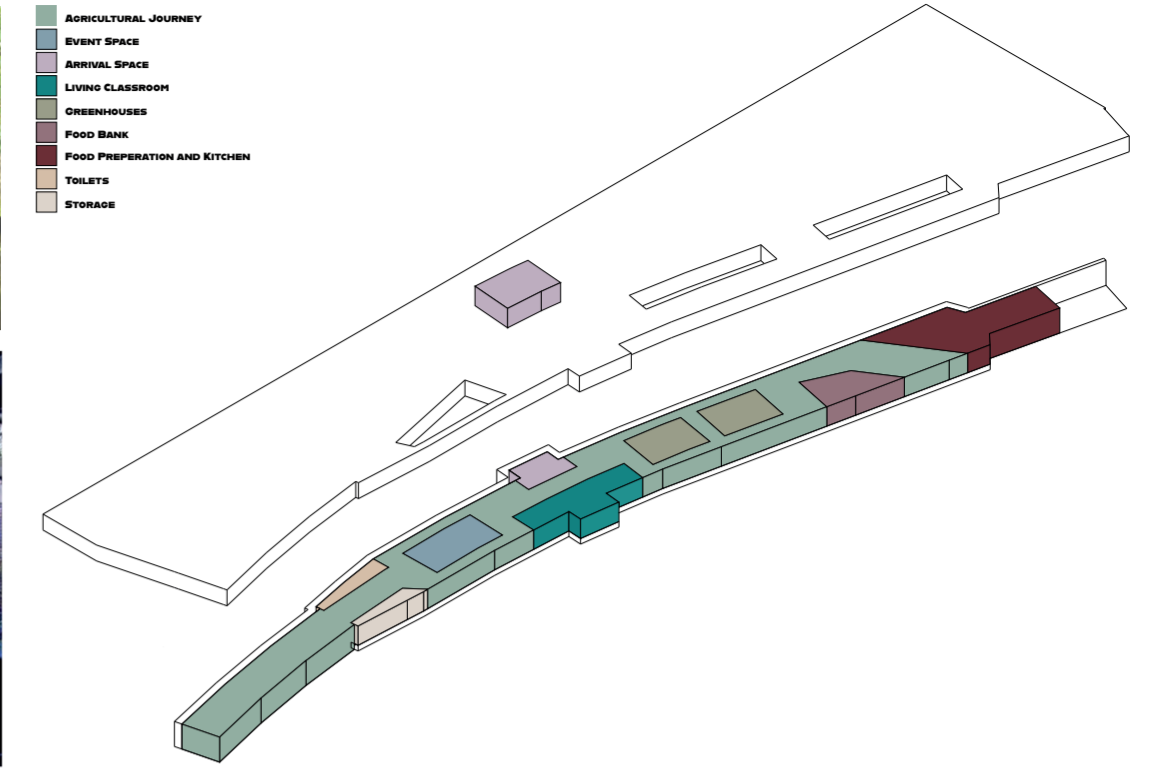
Concept Montage



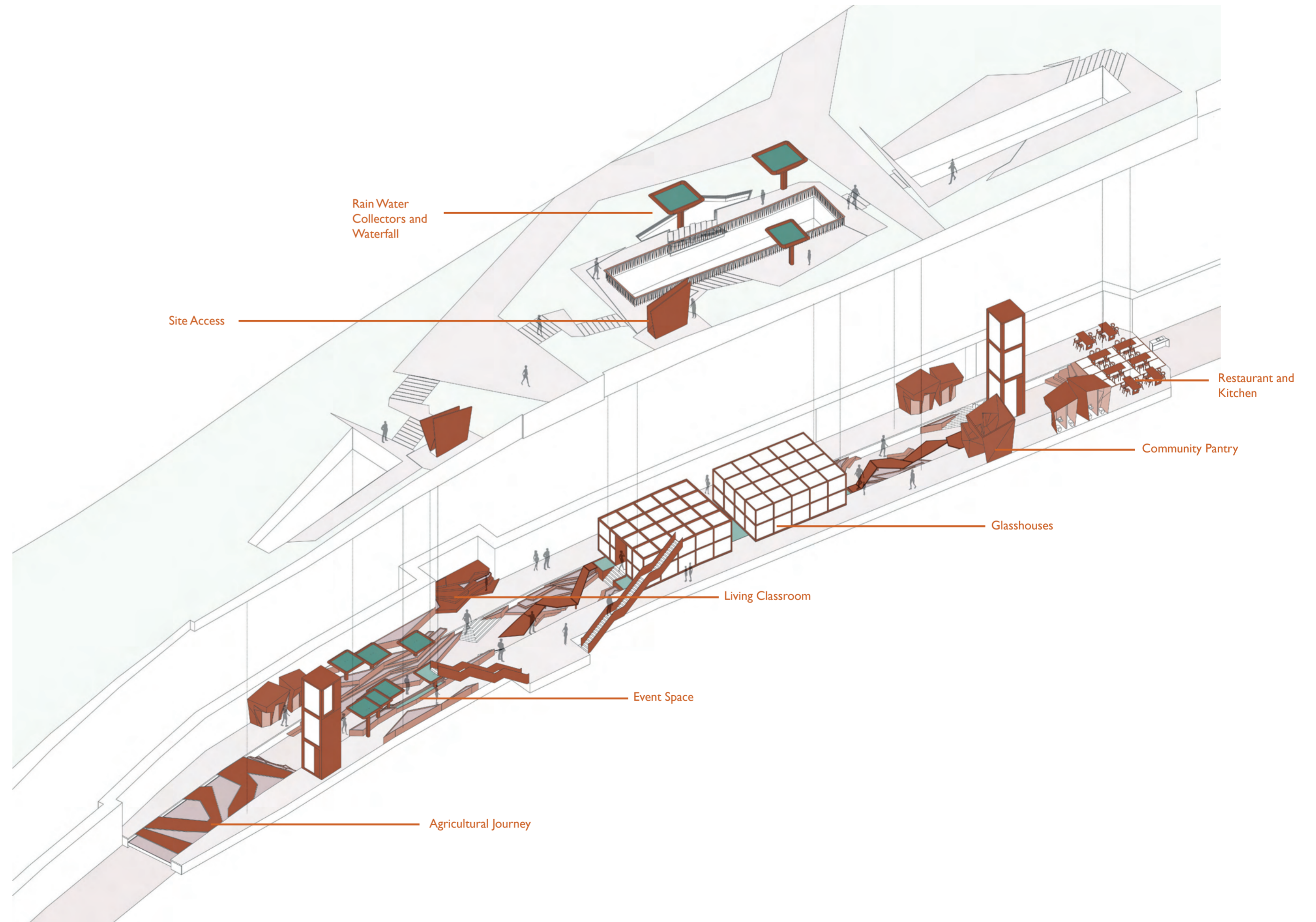
Site Analysis of Glasgow Botanic Gardens Station



Current Images of Proposed Site



Program Diagram



Exploded Axonometric of Glasgow Botanic Gardens Station and Landscaping





Concept Site Montage



Concept Montage of Bioluminescent Food Production

## BIOLUMINESCENCE

Bioluminescence is where living organisms have the ability to generate light and emit it.

Research shows bioluminescent plants can drive photosynthesis for other plants. Therefore utilising bioluminescent plants as a tool to grow other plants can enable unconventional sites to be used for food production.

Naturally occurring bioluminescent plants are relatively rare, with there being around 80 mushrooms that emit a glow. The DNA from mushrooms can be successfully transferred into other plants, thus resulting in them glowing also.

The Bioluminescent Agricultural Journey demonstrates the importance of conservation and sustainable agriculture practices. It highlights the potential of bioluminescence as a tool for reducing energy consumption in agriculture, and hints at the future potential for other projects on a world wide scale.

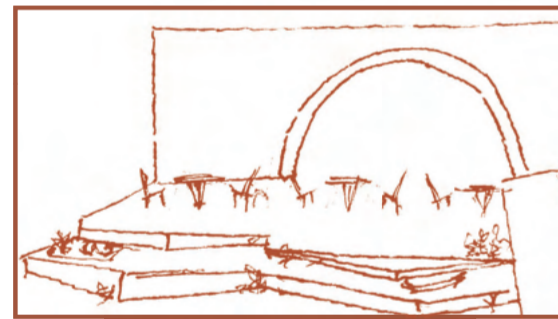
Visitors are invited to delve deeper into the science of bioluminescence and its potential application in sustainable agriculture, whilst simultaneously addressing the need for food security.



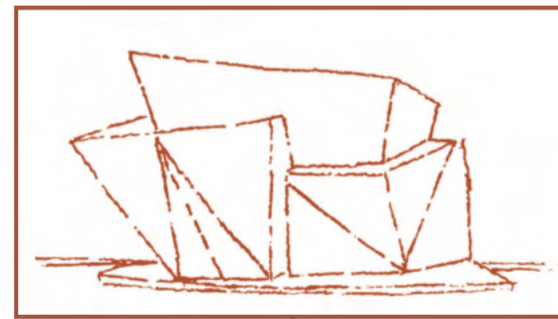
Visualisation of Event Space with Bioluminescent Glow



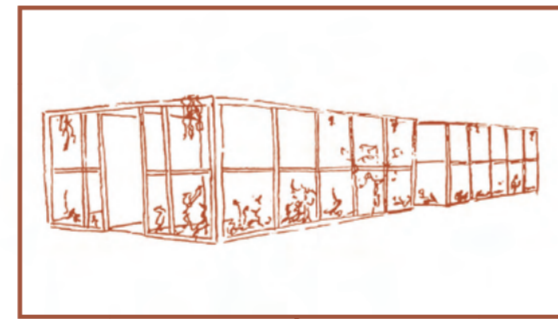
Visualisation of Above Botanic Garden Landscaping and Site Access



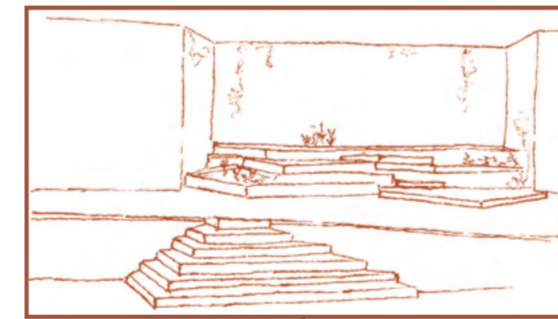
Restaurant



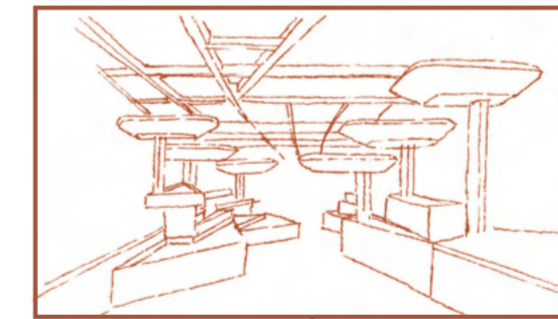
Community Pantry



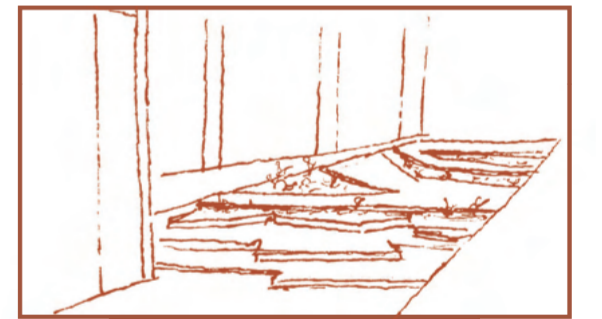
Glasshouses



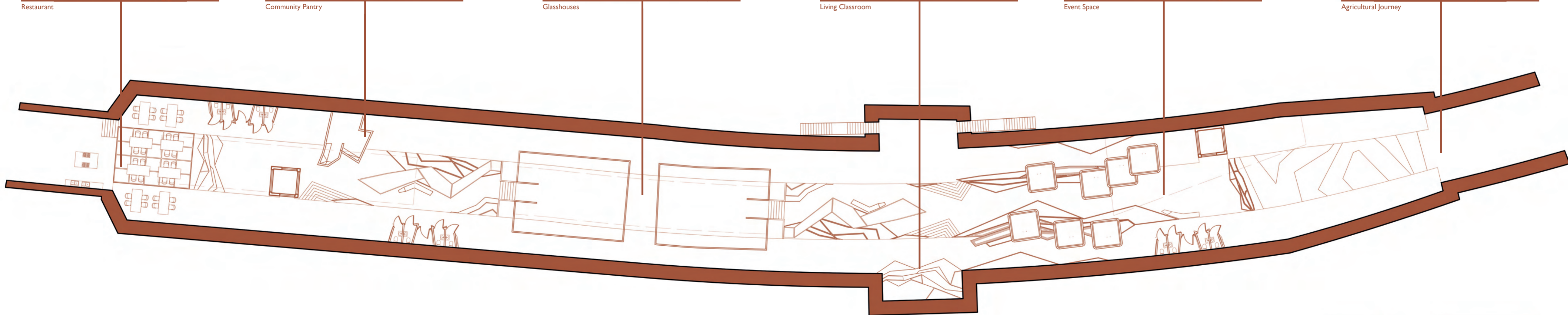
Living Classroom



Event Space



Agricultural Journey







- Worrying about the ability to obtain food
- Comprising quality and variety of food
- Reducing quantities, skipping meals
- Experiencing hunger

## FOOD INSECURITY

This project is centred around food security, especially children living within Glasgow. Food security is the quantification of available food and then individuals' ability to access this food. People should always have access to nutritious food - physically, economically, and socially. Locally grown food can help regeneration and development within areas of cities that need it, in turn increasing community wealth.

Research showed that there were clear benefits to repurposing railway infrastructure for urban food production. The outcome delivers food security and social inclusion. This is relevant as there has been an increase in food poverty and the use of food banks. The aim is that this model could be applied on a wider scale, adaptively reusing industrial infrastructure for food production, thus increasing food security on a national scale.

**1 in 3 children in Glasgow lives in poverty, children in poverty are more likely to experience food insecurity.**

**Single parent households with three or more children are the most insecure group, with 41% of this group experienced food insecurity.**

- Improved health and well-being
- Food grown in environmentally friendly ways
- Increased use and availability of seasonal and locally grown food
- Increased opportunity for communities to grow and cook together
- Enhanced understanding of food systems, specifically in terms of nutrition and sustainability
- A local food economy - the promotion of sustainability and fair labour



Visualisation of Glasshouse and Agricultural Journey



Visualisation Showing Waterfall Between Glass Houses for Irrigation



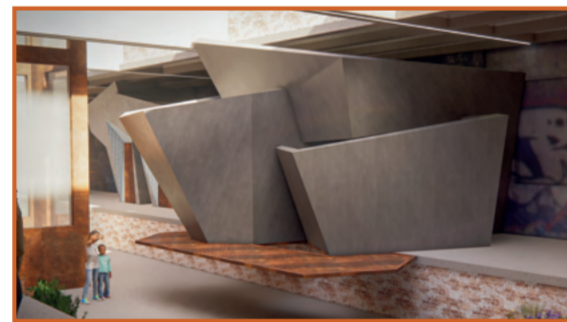
Visualisation Showing Living Classroom with Original Station Walls



Visualisation Showing Living Classroom and Event Space



Restaurant and Kitchen



Community Pantry



Glasshouses



Site Access



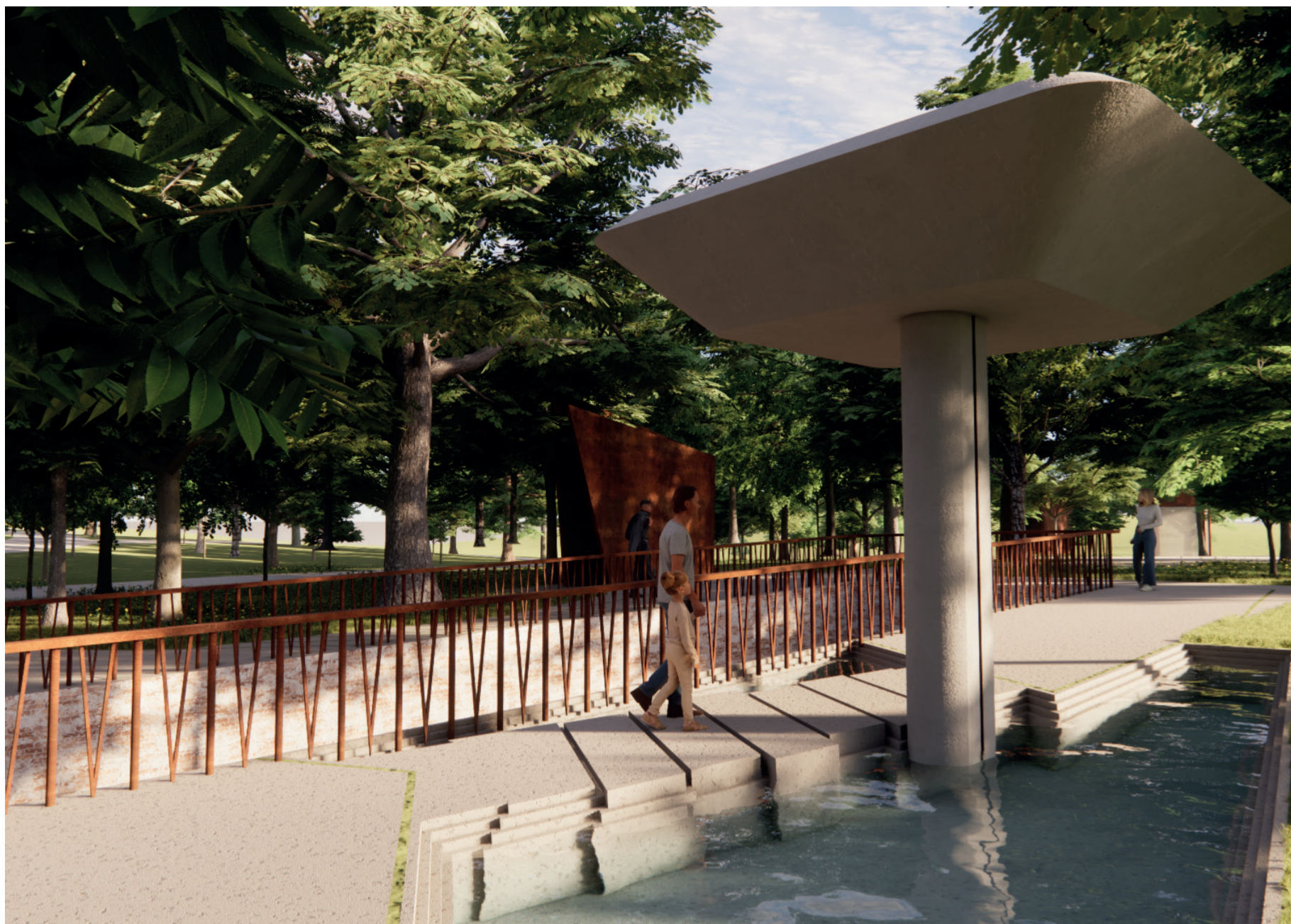
Event Space



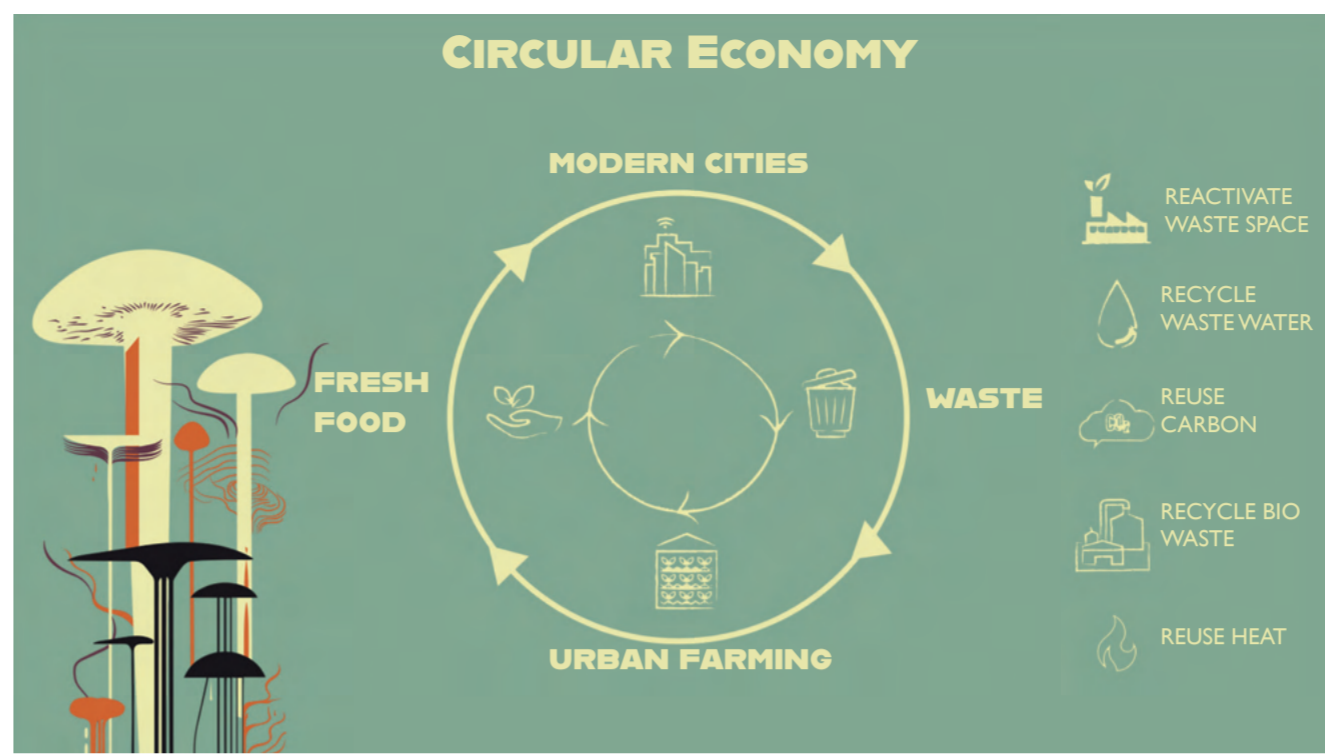
Agricultural Journey







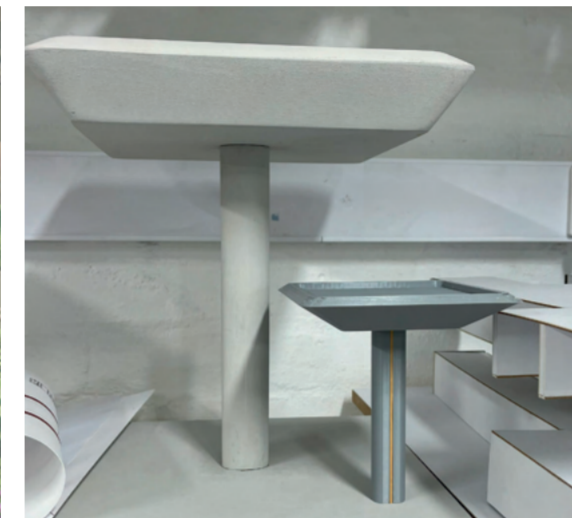
Visualisation of Above Botanic Garden Landscaping and Site Access



Circular Economy Diagram



Visualisation Looking at Platform and Rain Collector From Event Space



Model of Rain Water Collector, Left at 1:10, Right at 1:20

## PRIMARY RESEARCH

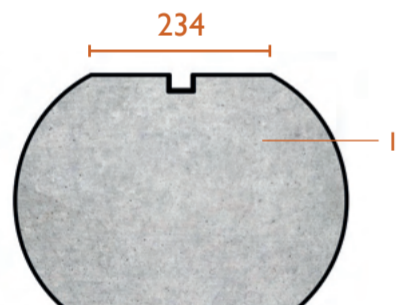
Research was conducted in the form of interviews and cultural probes. From this it was determined that designing an agriculturally focused public space should consider: site maintenance; community engagement; circular economy practices; and the site context.

The local community should be a part of the design process as they are the target user group. In addition the long-term success of the project is reliant on the community being engaged with it. The project must nurture a community relationship with nature, encouraging the sharing of knowledge and the feeling of being part of something.

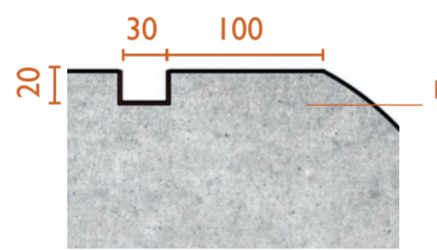
The social value of food production should be acknowledged and supported as this plays a vital role in place making and community building. Providing opportunities for people to participate, volunteer, learn and grow their own food can help with community participation, giving the users the power to choose what they eat and support healthy lifestyles.

A recurring theme in the research study was around sustainability, specifically the creation of a circular economy with a primary focus on water security. An important design step is understanding how to collect suitable water for irrigation, e.g. rainwater and filtering road water runoff. There is an opportunity here to design new methods or to modify existing solutions, like rain gardens. The results determined consideration must be given to ensure water quality is safe for food production. This is relevant in this site as it is a post-industrial brownfield site.

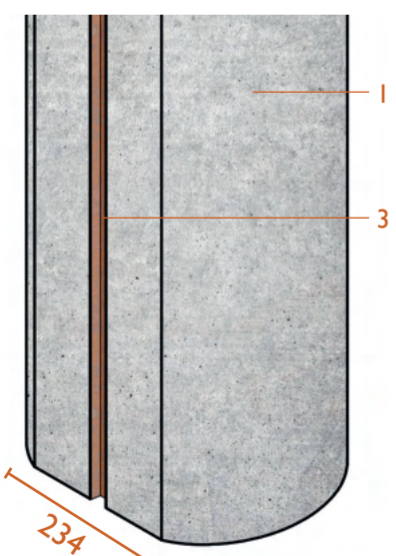
## RAIN WATER COLLECTOR DETAIL



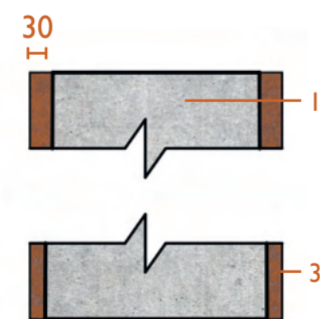
Section Detail of Water Channel at 1:10



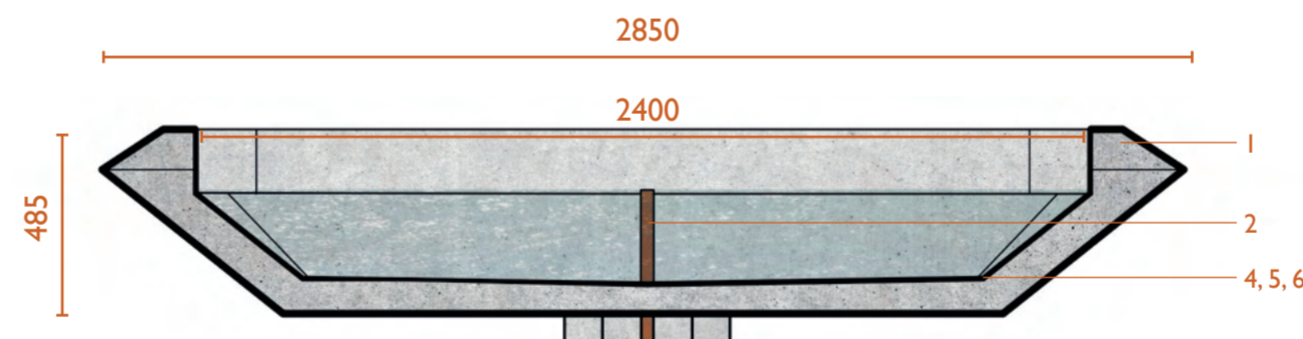
Section Detail of Water Channel at 1:5



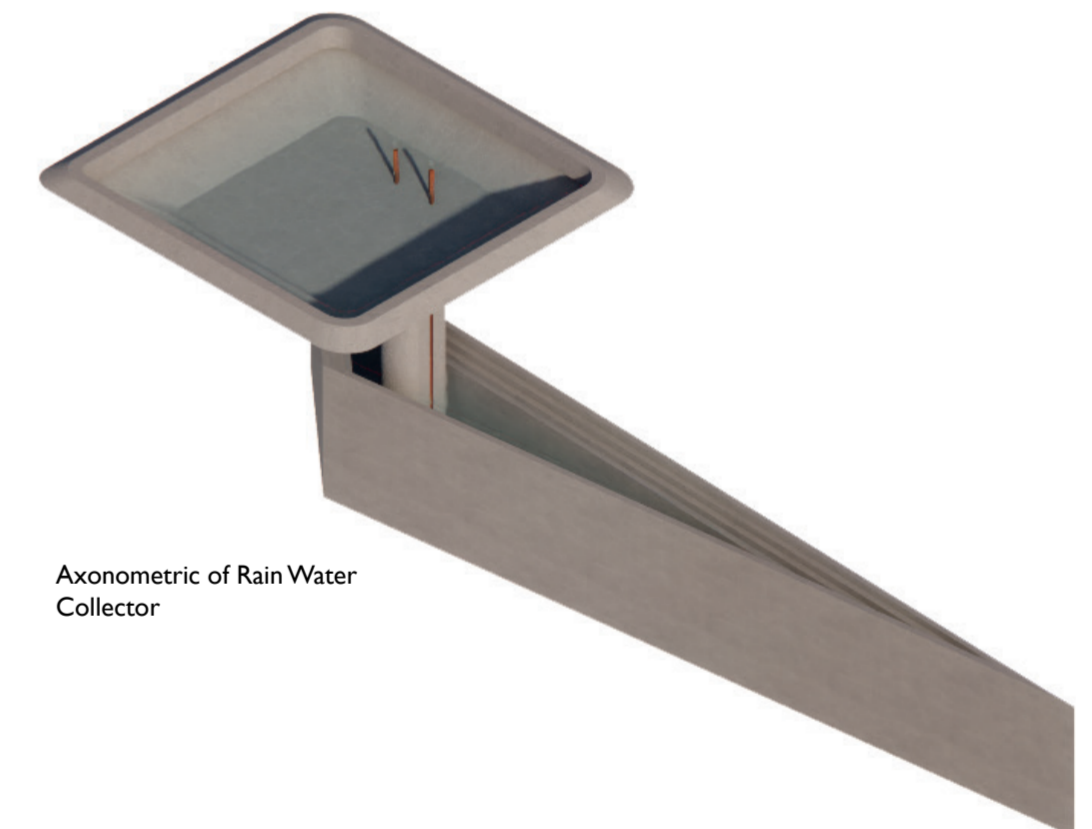
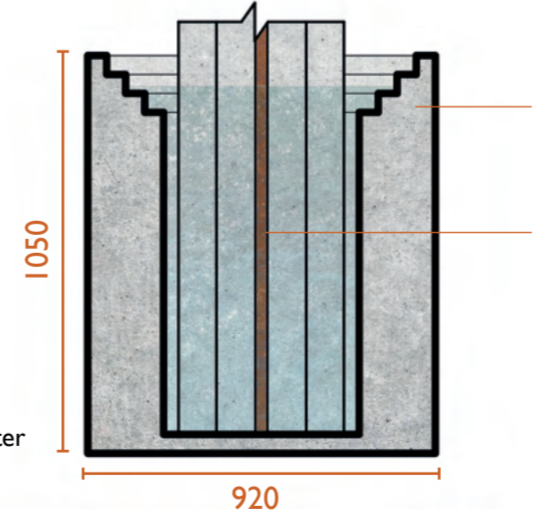
Axonometric of Base Detail at 1:10



Section Detail of Water Channel at 1:10



Section of Rain Water Collector at 1:20



Axonometric of Rain Water Collector

### KEY

1. In situ off form concrete
2. 2mm thick treated mild steel, Powder coated with: Interpon Mars 2525 Sable To imitate corten steel as not to contaminate irrigation water
3. 2mm thick treated mild steel channel Powder coated with: Interpon Mars 2525 Sable Angled to direct water to collection pool
4. Waterproof liquid membrane 2 coats, each coat 15ml Let each coat dry before applying next coat Membrane: Semco Liquid Membrane
5. Fabric Reinforcement
6. Waterproof liquid membrane 2 coats, each coat 15ml Let each coat dry before applying next coat





Short Section of Event Space at 1:50



Stakeholder Diagram

**Local Community Residents:** They would be primary stakeholders, benefiting from improved public space, and access to fresh produce.

**Local Government:** Significant stakeholder as they own the station and are interested in the community benefits.

**Local Businesses:** Could bring more footfall to the area, boosting nearby business.

**Education Institutions:** Interested as they could offer educational courses related to agriculture and farming.

**Community Groups and Associations:** Could be interested if they share similar objectives.

**Tourism Industry:** Due to its location and potential to attract visitors, the tourism sector might have an interest.

**Agricultural and Environmental Groups:** Organisations focused on urban agriculture and sustainability may be interested in the project. They could provide insight and expertise on the project.



Model Photography Showing Community Pantry



Model Photography Showing Glasshouses



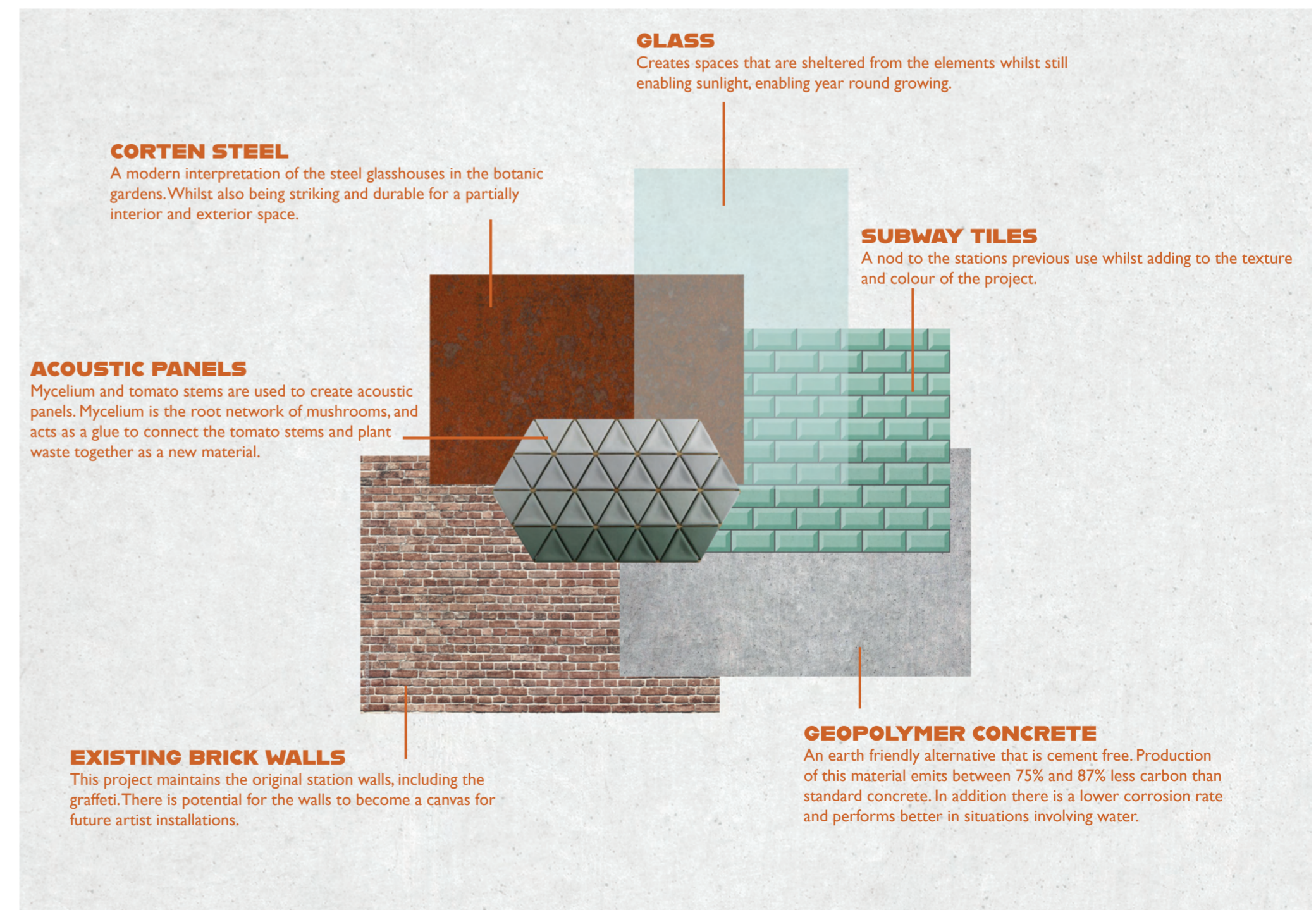
Model Photography Showing Event Space



Visualisation Through Event Space to Glasshouses



Visualisation of Agricultural Journey and Access Point



Material Samples