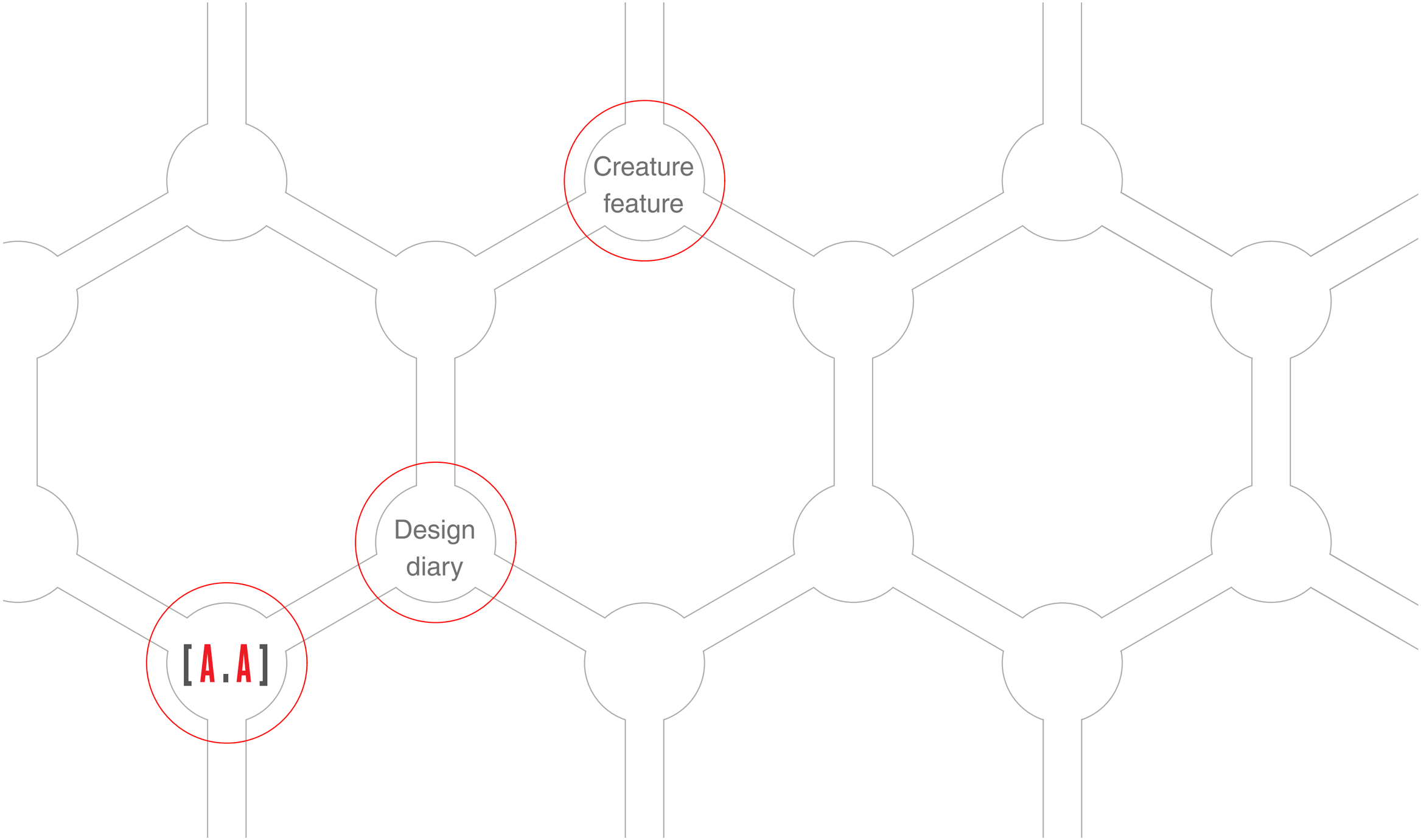
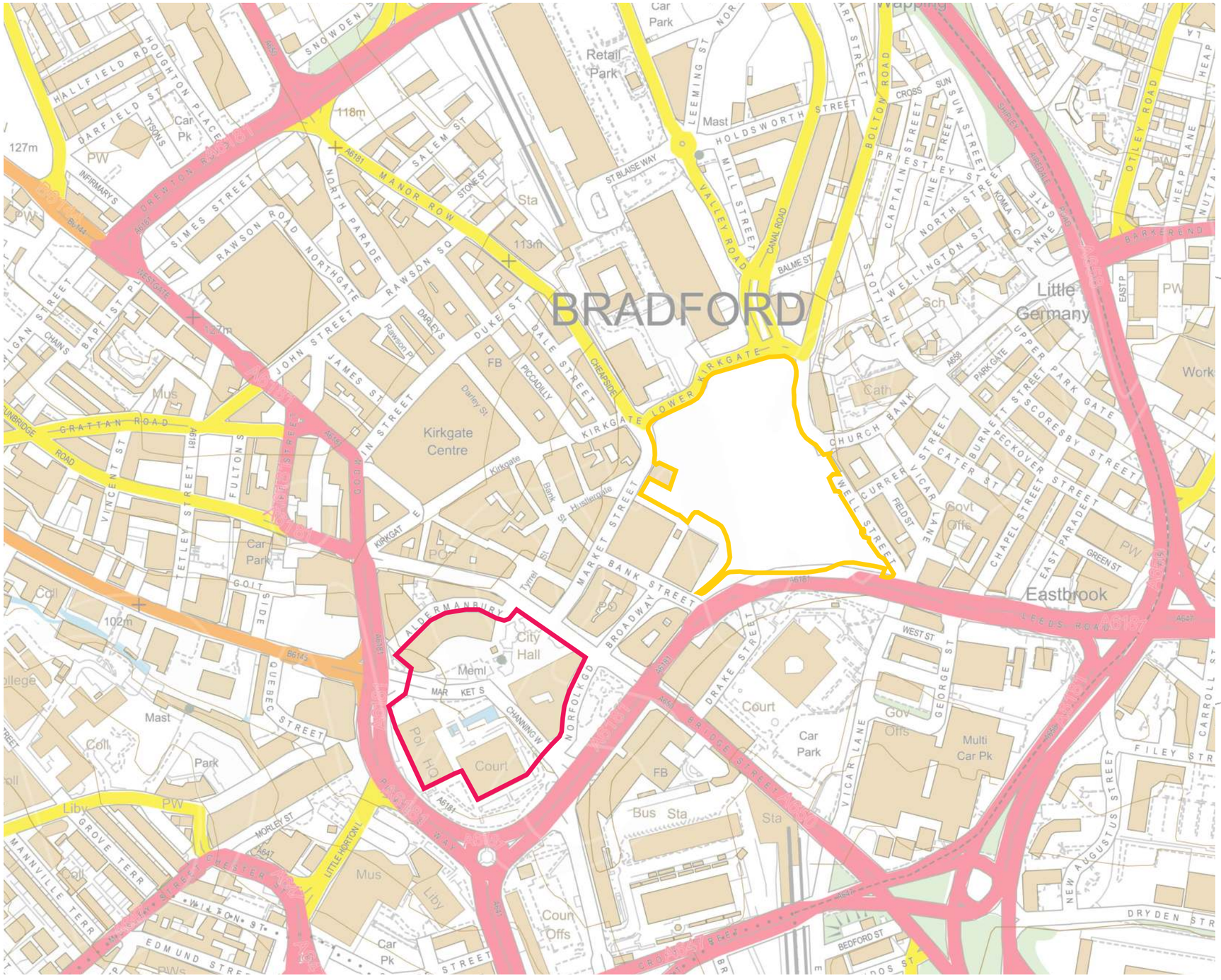
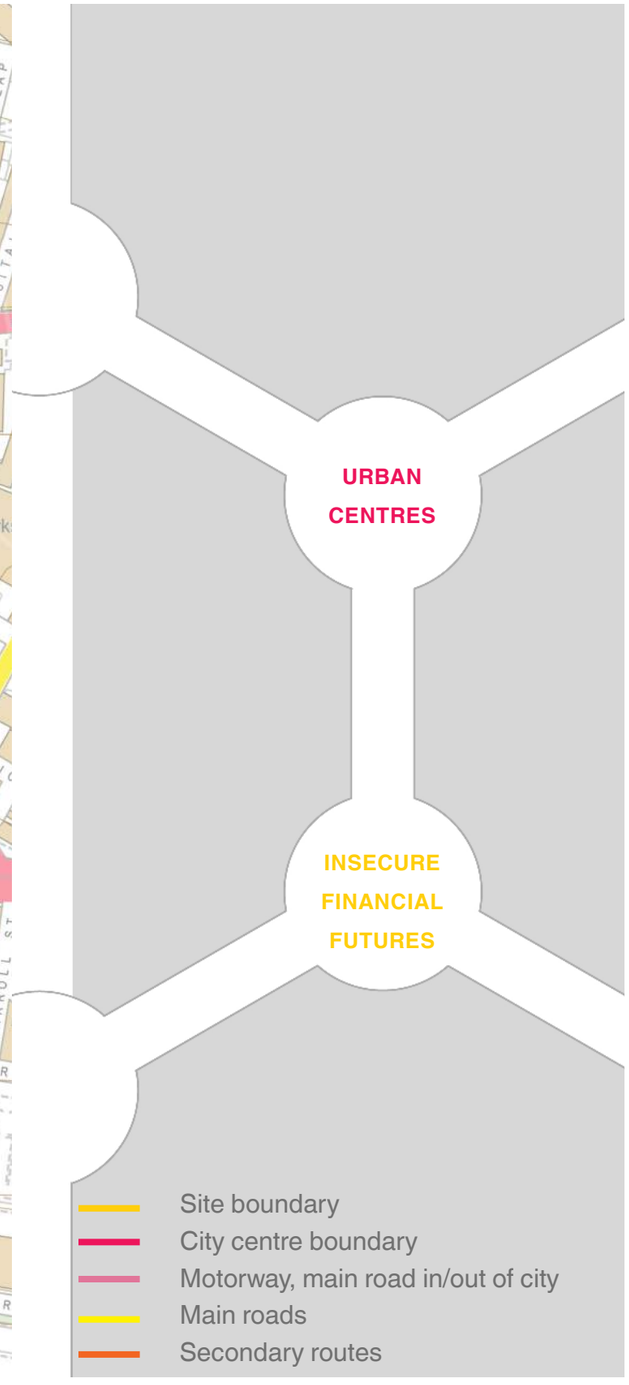


ALBENA ATANASSOVA

MMU ID:12019128 / Re-Map / Studio 4.2 / MSA





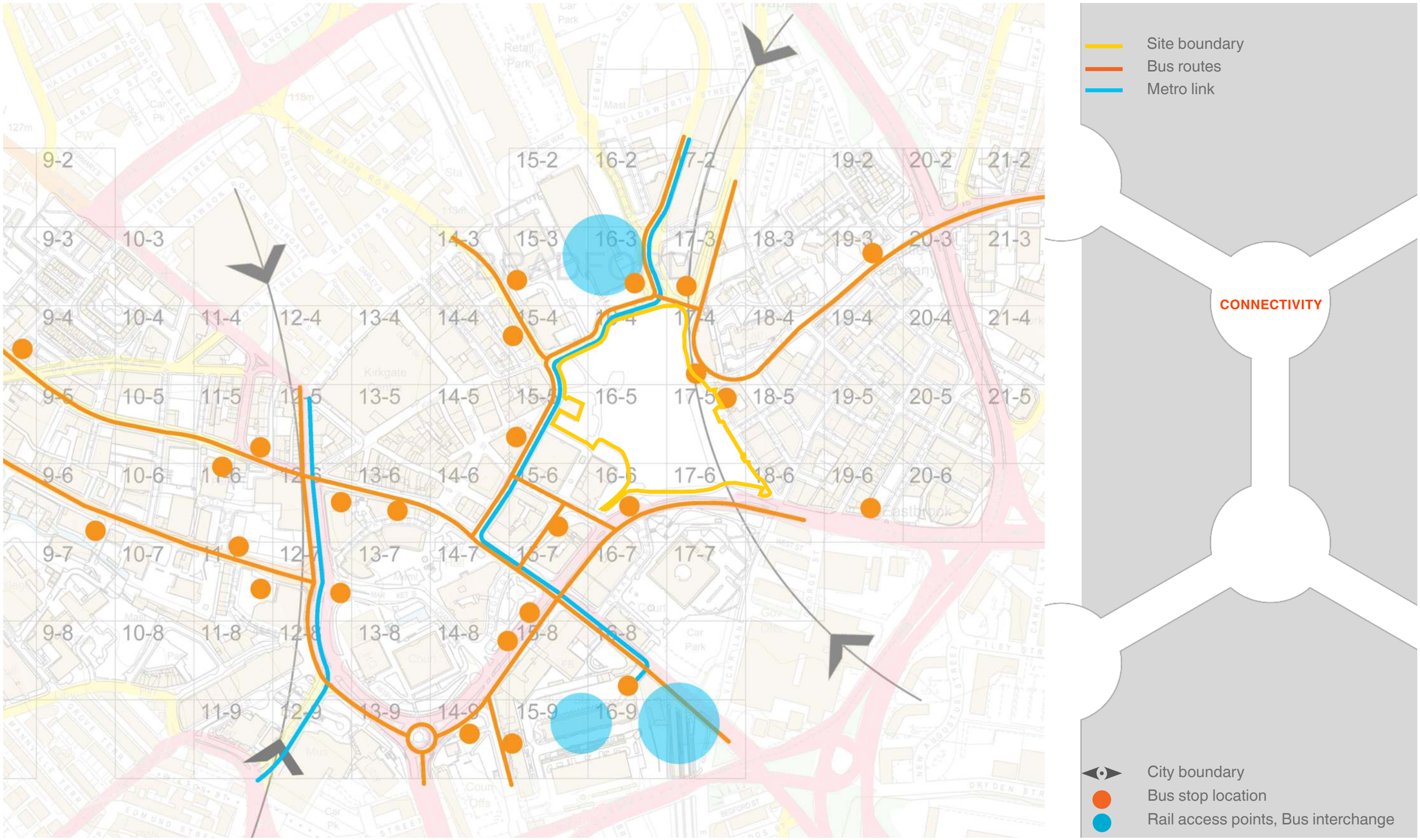
Scale: 1/5000

RE-MAP [A.A]

ALBENA ATANASSOVA

BACKGROUND STUDIES

The increased global connectivity and current financial instability raise the question of the future of contemporary urban centres. It is therefore interesting to explore the relashionship between Bradford's city centre and the Westfield site as a metaphor of such instability, towards establishing a new manufacturing technique that would render the city economically sustainable and profiatble.



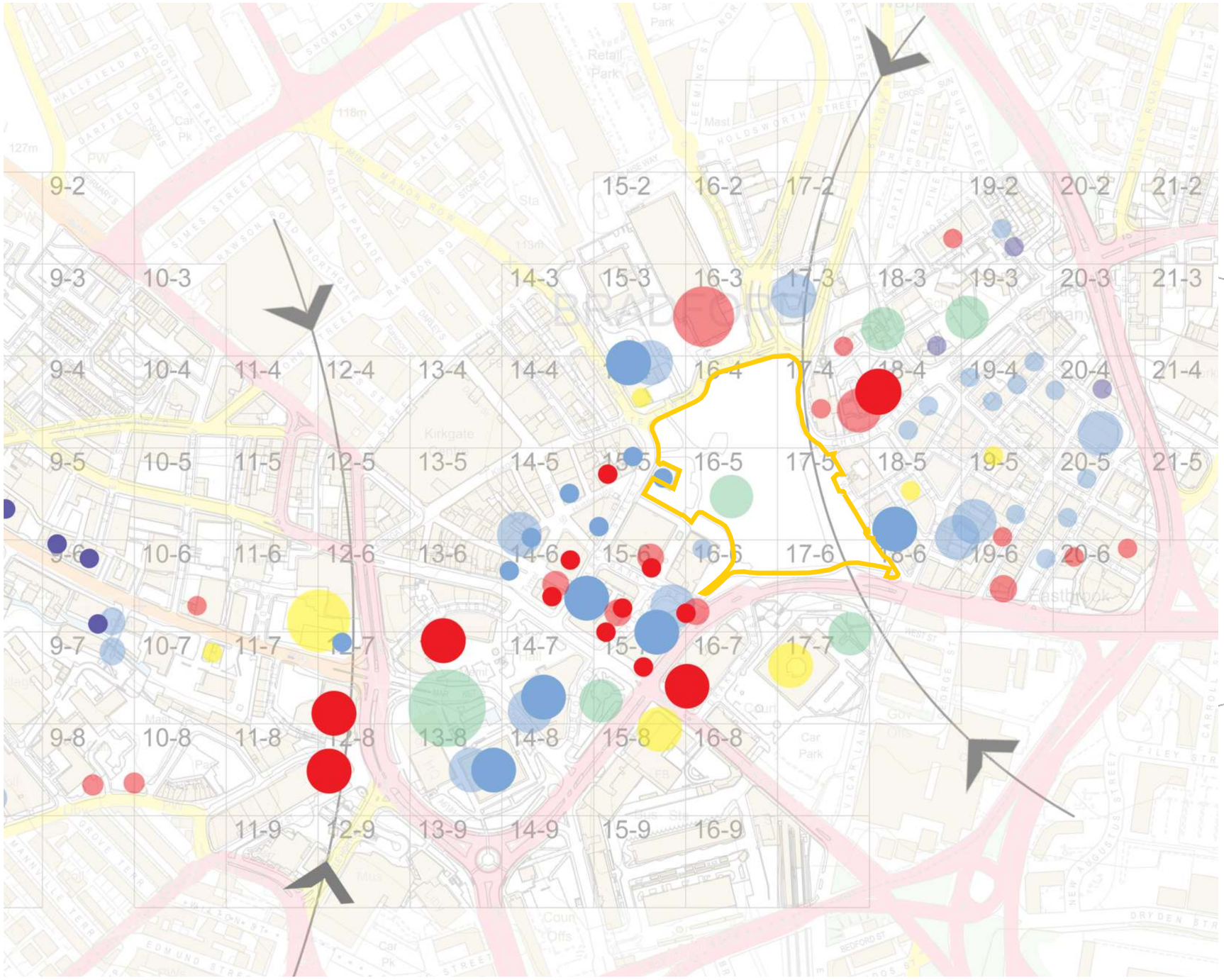
Scale: 1/5000

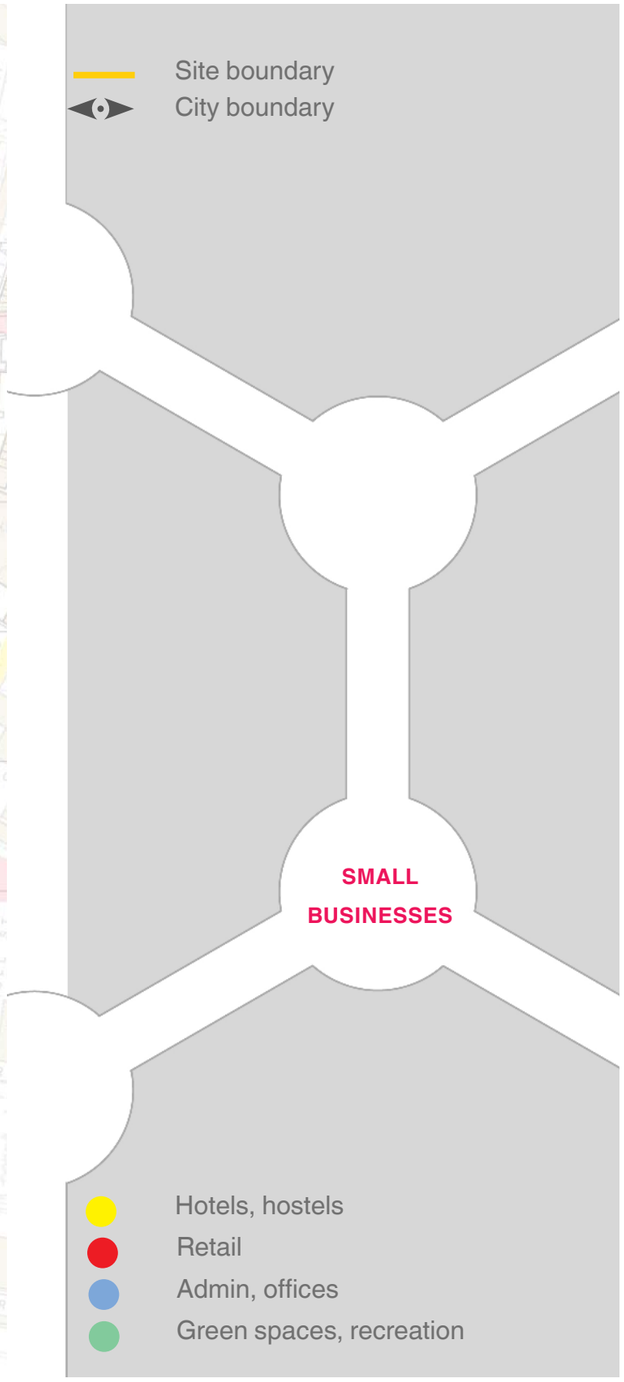
RE-MAP [A.A]

ALBENA ATANASSOVA

BACKGROUND STUDIES

The current diagram explores the transport network around the city centre, building on the previous research on Bradford's values. Well-connected in terms of public transport, the Westfield site offers potential for a future development. There is however a dominant "car over pedestrian" movement which opens space for potential redevelopment of the area, giving access to city dwellers and encouraging a more environmentally friendly mobility.





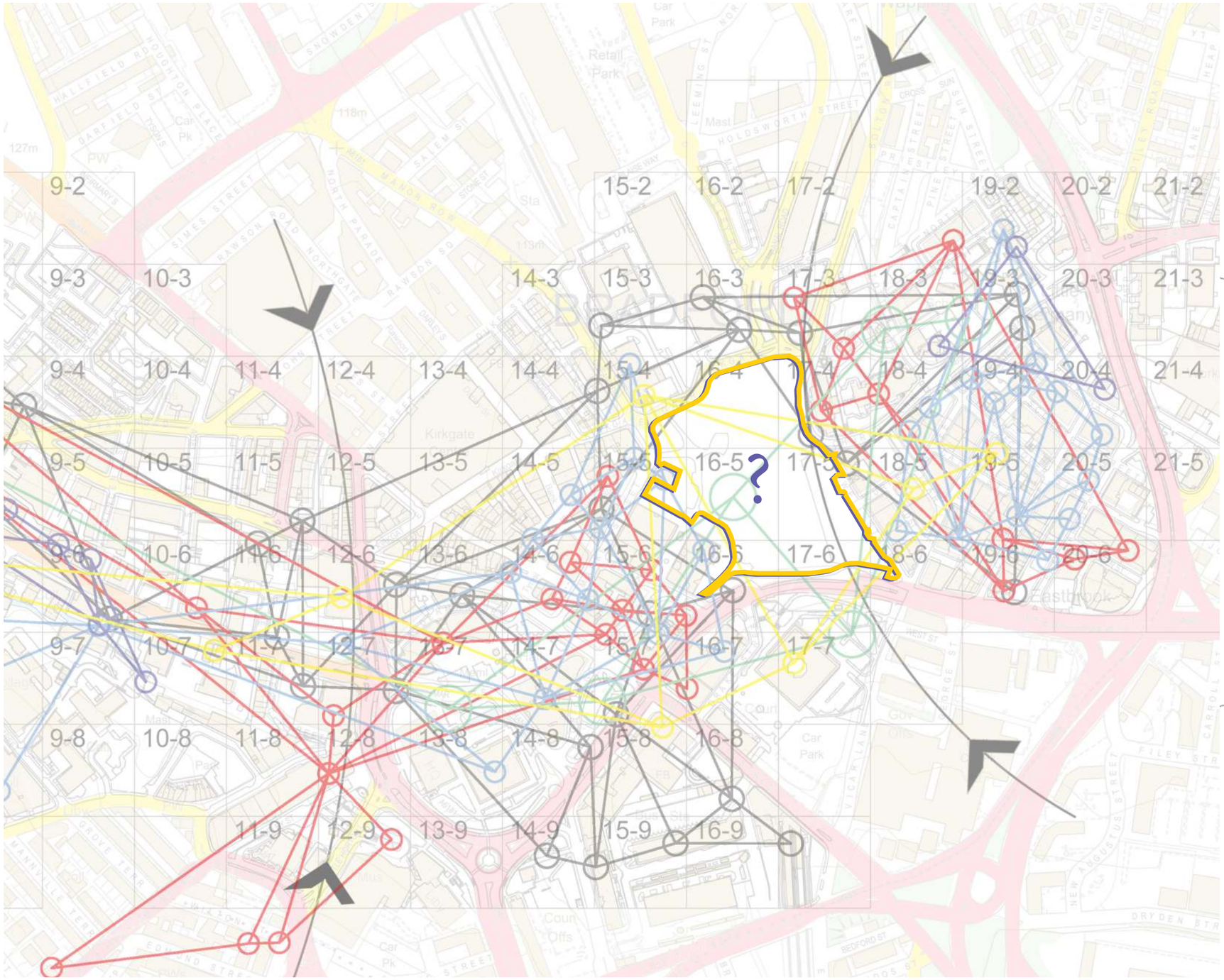
Scale: 1/5000

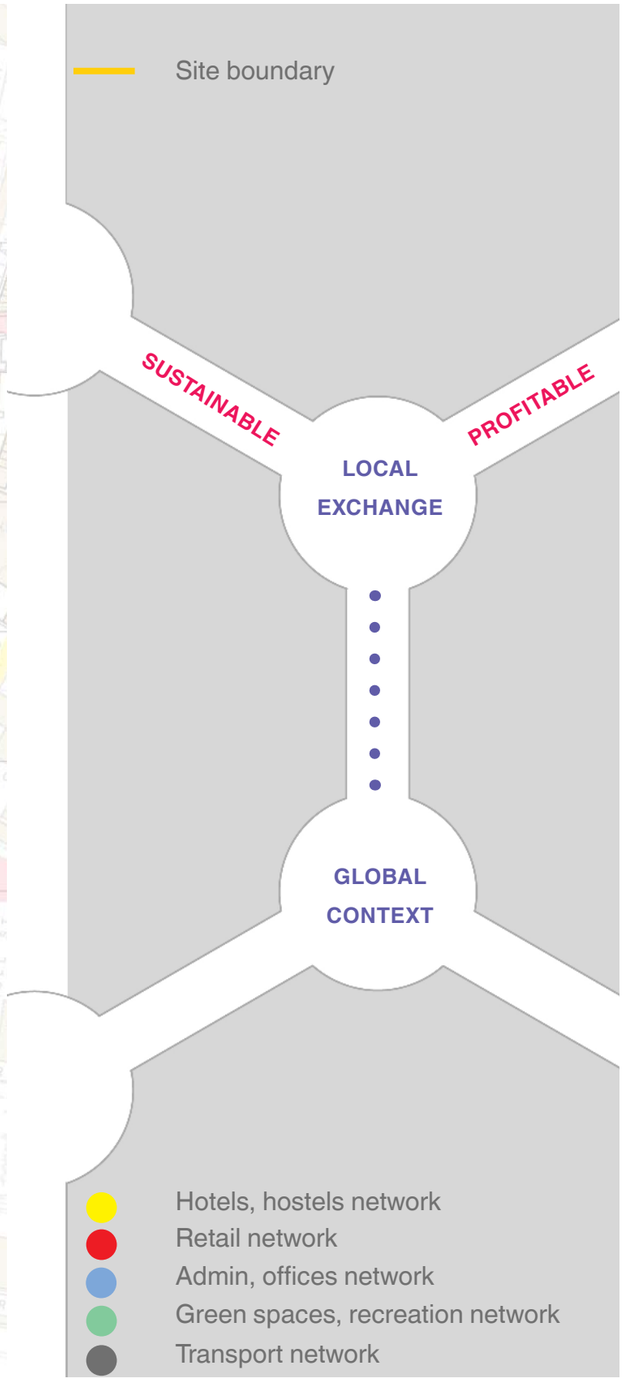
RE-MAP [A.A]

ALBENA ATANASSOVA

BACKGROUND STUDIES

Looking at the local services available, one could see a higher proportion of small and independent businesses that are suviving, if not successful. It would be feasible to propose therefore a place for successful local exchange that would correspond to Bradford's manufacturing and production history, making the city economically successful within the global context.





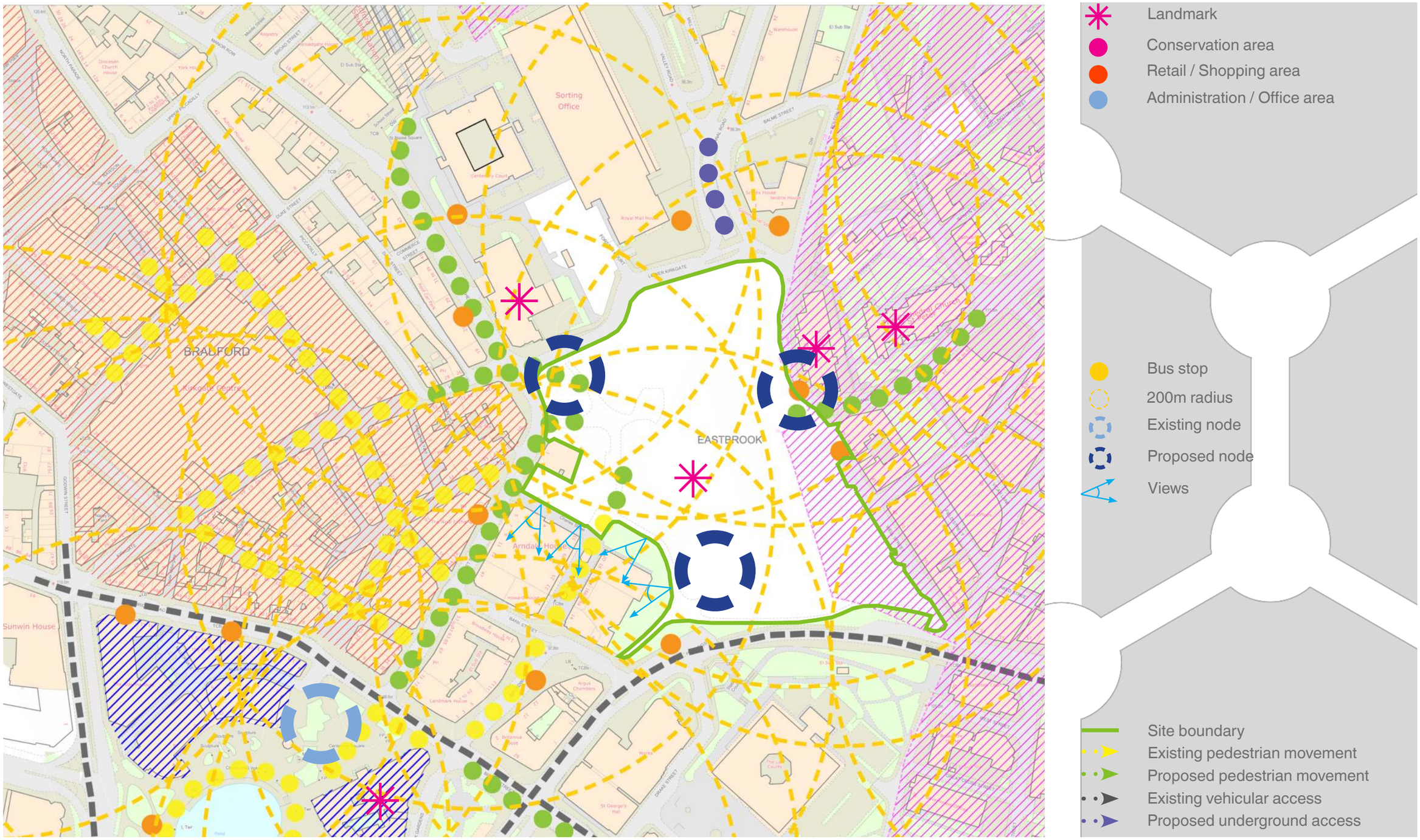
Scale: 1/5000

RE-MAP [A.A]

ALBENA ATANASSOVA

BACKGROUND STUDIES

If we were to connect the services available within the city centre and the public transport in an overlapping network one could easily spot the gap created at the Westfield site. If would be of interest to suggest the site for the current design proposal of a “feature-creature” structure to house a workshops and a place of exchange. The scheme would foster by definition a distinctive aspect realised through and edifice, as well an animate one hosting the performative and “attractive side” of the manufacturing process. It is of my interest to explore the connection between the two elements.



Scale: 1/2500

RE-MAP [A.A]

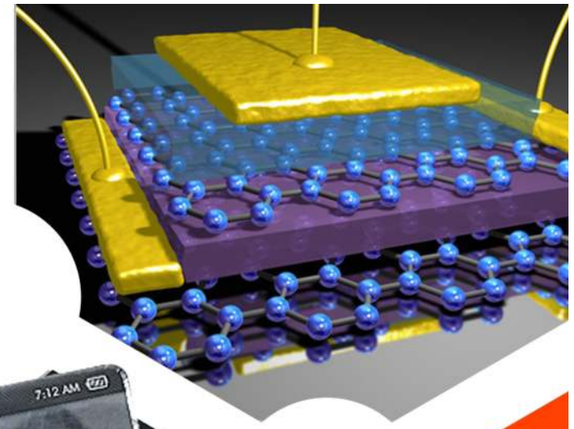
ALBENA ATANASSOVA

CONSTRAINTS AND OPPORTUNITIES

The diagram presents a thorough analysis of the constraints and opportunities within the chosen site. The idea would be to propose a flexible scheme to correspond to the overall city masterplan. Furthermore locating views and landmarks as well as proposing future nodes would attarct the public thus securing future investment in the area.

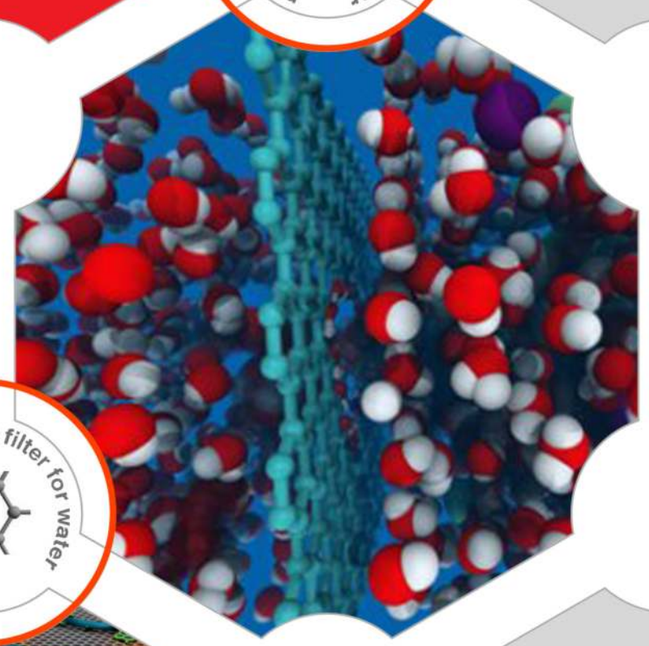
ELECTRONICS

Researchers in South Korea have produced acontinuous layer of graphene 63cm wide. 'You could roll your iPhone into a pencil and put it behind your ear'



more electrically conductive than copper

100



It can be used as the basic material for computer chips instead of silicon.

PHOTOVOLTAICS

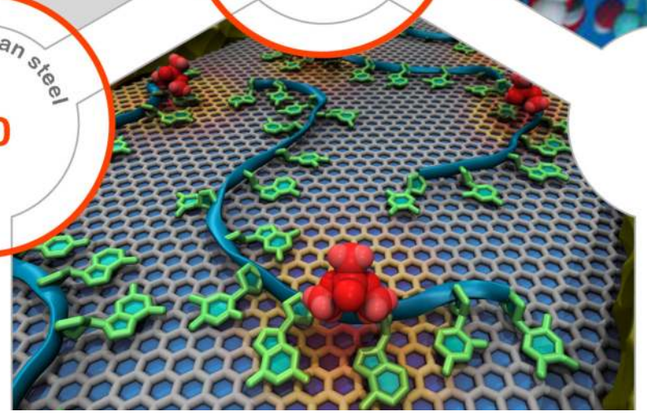
MIT have discovered that graphene could be used to make the production of electrodes in organic photo cells cheaper

could be used as filter for water

stronger than steel

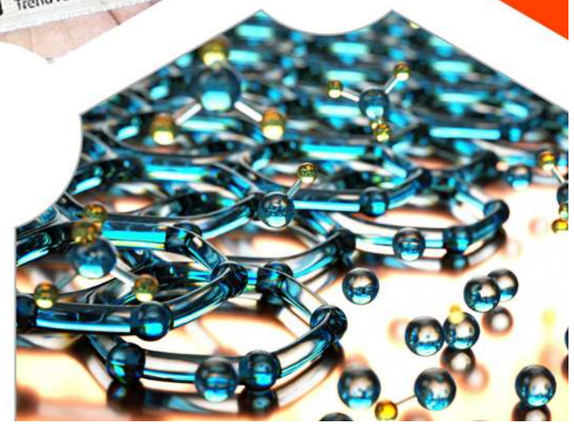
100

Graphene could reduce the cost and speed up the process of DNA sequencing



CLEAN DRINKING WATER

Graphene could cheaply and easily remove salt from seawater, potentially turning the oceans into a vast drinking supply for thirsty populations. With properly sized holes, graphene sheets may be able to serve as all-purpose filters.

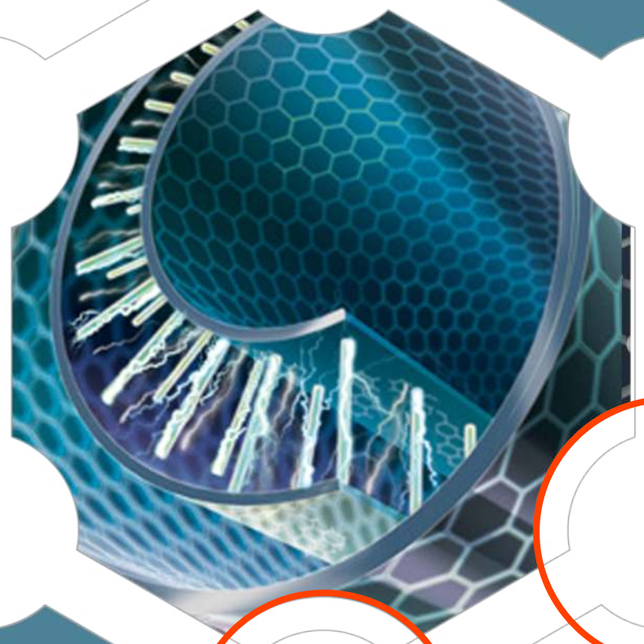


RE-MAP [A.A]

ALBENA ATANASSOVA

MATERIAL CONSIDERATIONS

Considering we live in the digital era and looking at future materials and production processes, I decided to look into graphene and its potential application. Discovered in 2010 by Andre Geim and Kostiy Novoselov at the University of Manchester, I was interested in its propoerties with regards to filtration and electronics applications. I also had a chance to meet Mr. Novoselov which further helped me understand the manufacturing process behind graphene's production.



Electronic properties of graphene

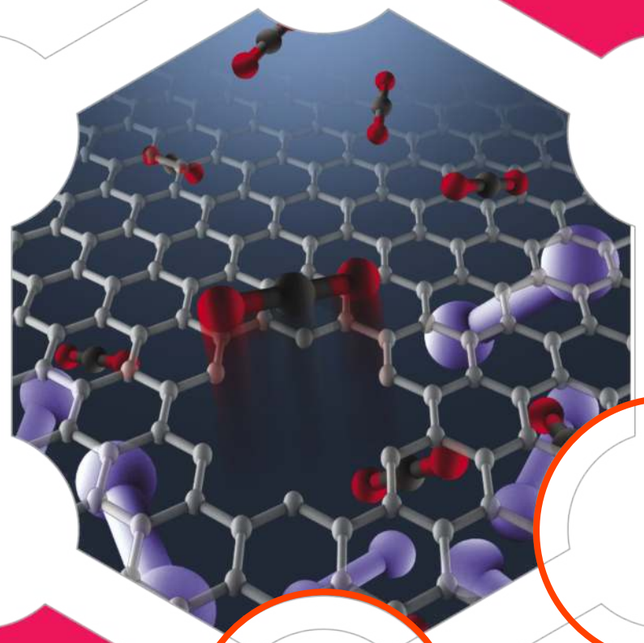
Graphene is a unique system in many ways. It is truly 2D, has unusual electronic excitations described in terms of Dirac fermions that move in a curved space, is an interesting **mix of a semiconductors zero density of states and a metals gaplessness, and has properties of soft matter**. The electrons in graphene seem to be almost insensitive to disorder and electron-electron interactions and have very long mean free paths. Hence, graphene's properties are different from what is found in usual metals and semiconductors. Graphene has also **a robust but flexible structure** with unusual phonon modes that do not exist in ordinary 3D solids. In some sense, graphene brings together issues in quantum gravity and particle physics, and also from soft and hard condensed matter. Interestingly enough, these properties can be easily modified with the application of electric and magnetic fields, addition of layers, control of its geometry, and chemical doping. Moreover, graphene can be directly and relatively easily probed by various scanning probe techniques from mesoscopic down to atomic scales, because it is not buried inside a 3D structure. This makes graphene one of the most versatile systems in condensed-matter research.

REVIEWS OF MODERN PHYSICS, VOLUME 81, JANUARY–MARCH 2009

Graphene is a one-atom-thick planar sheet of sp2-bonded carbon atoms stacked in a two-dimensional honeycomb lattice, and is the basic building block for carbon allotropes of any dimensionality, such as graphite, nanotubes and fullereness.

NATURE COMMUNICATIONS | 2:255 | DOI: 10.1038/ncomms1247 | www.nature.com/naturecommunications

My next step was to look at recent articles on graphene's properties in order to establish a connection between potential applications and end product and the manufaturing process. I was also interested in required initial resource for the production of graphene as well as looking into the production cycle and how sustainable it would be in the long term considering the site I am proposing is located within the city centre.



Permetation of water through graphene based membranes

Permeation through nanometer pores is important in the design of materials for filtration and separation techniques and because of unusual fundamental behavior arising at the molecular scale. We found that submicrometer-thick **membranes made from graphene oxide can be completely impermeable to liquids, vapors, and gases**, including helium, but these membranes allow unimpeded permeation of water (H2O permeates through the membranes at least 1010 times faster than He).

www.sciencemag.org SCIENCE VOL 335
27 JANUARY 2012

Graphene is a rapidly rising star on the horizon of materials science and condensed-matter physics. This strictly two-dimensional material exhibits exceptionally **high crystal and electronic quality**, and, despite its short history, has already revealed a cornucopia of new physics and potential applications...More generally, graphene represents a conceptually **new class of materials** that are only **one atom thick**, and, on this basis, offers new inroads into low-dimensional physics that has never ceased to surprise and continues to provide a fertile ground for applications.

nature materials | VOL 6 | MARCH 2007 | www.nature.com/naturematerials

RE-MAP
[A.A]

ALBENA ATANASSOVA

ARTICLES / RESEARCH

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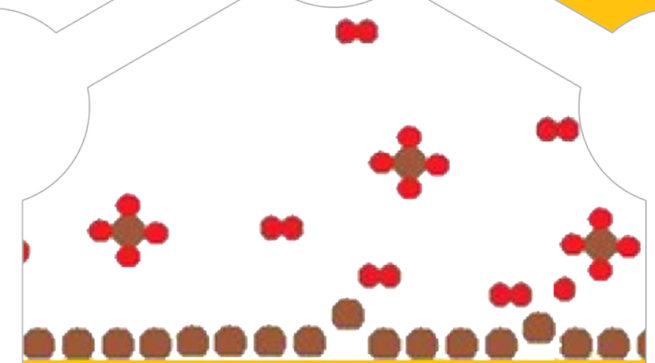

Production of graphene

A more recent alternative to the scotch tape method is that of chemical vapor deposition, or CVD. In CVD, a metal substrate such as copper is put into a furnace and heated under low vacuum to around 1000°C. The heat anneals the copper, increasing its domain size. **Methane and hydrogen gases** are then lowed through the furnace. The hydrogen catalyzes a reaction between methane and the surface of the metal substrate, causing carbon atoms from the methane to be deposited onto the surface of the metal through chemical adsorption. The furnace is quickly cooled to keep the deposited carbon layer from aggregating into bulk graphite, which crystallizes into a contiguous graphene layer on the surface of the metal.

Growing Graphene via Chemical Vapor Deposition
Benjamin Pollard, Department of Physics,
Pomona College,May 2, 2011

Graphene

is a wonder material with many superlatives to its name. It is the **thinnest known material** in the universe and **the strongest ever measured**. Its charge carriers exhibit giant intrinsic mobility, have zero effective mass, and can travel for micrometers without scattering at room temperature. Graphene can sustain current densities **six orders of magnitude higher than that of copper**, shows record thermal conductivity and stiffness, is impermeable to gases, and reconciles such conflicting qualities as brittleness and ductility.

19 JUNE 2009 VOL 324 SCIENCE www.sciencemag.org

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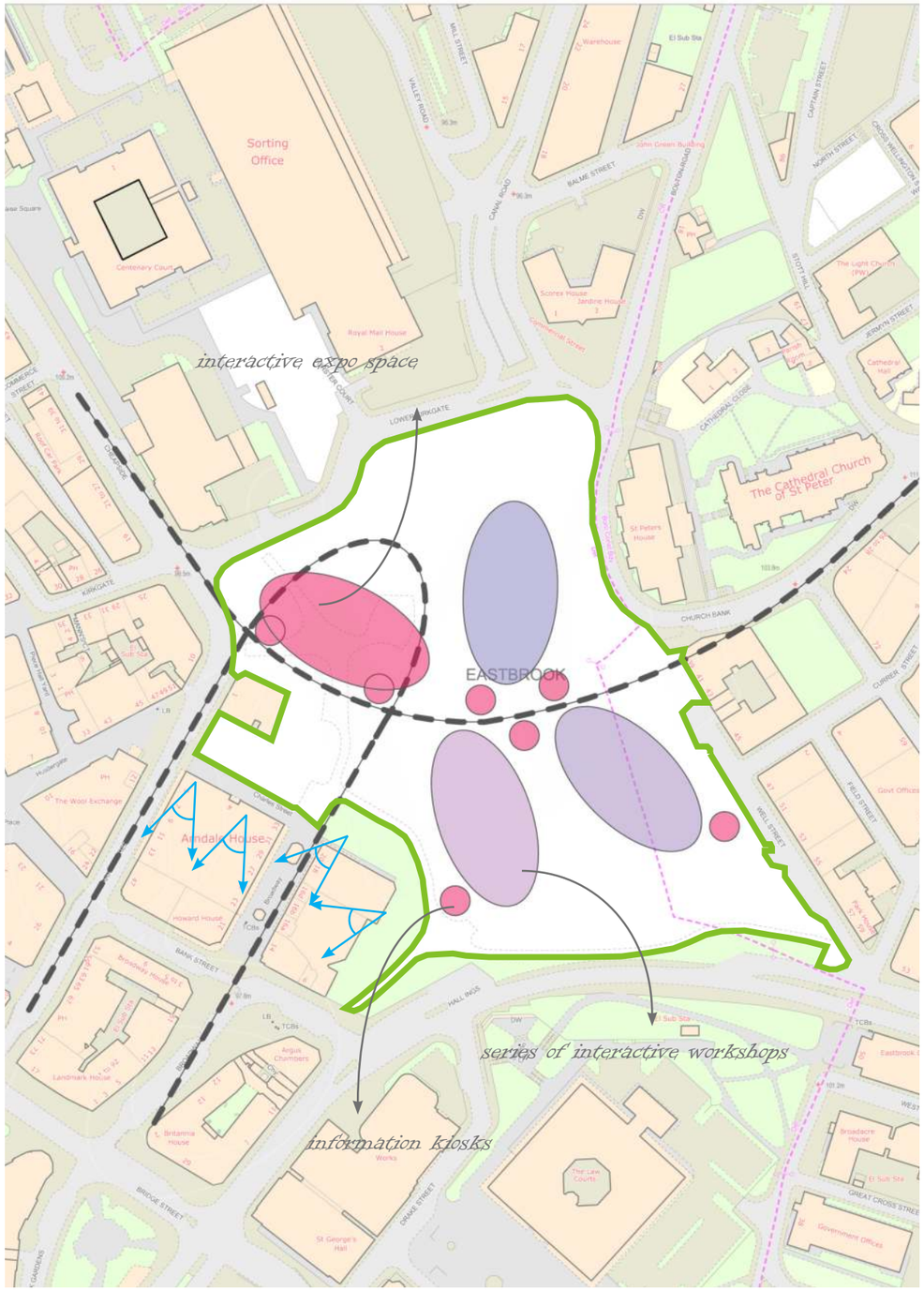
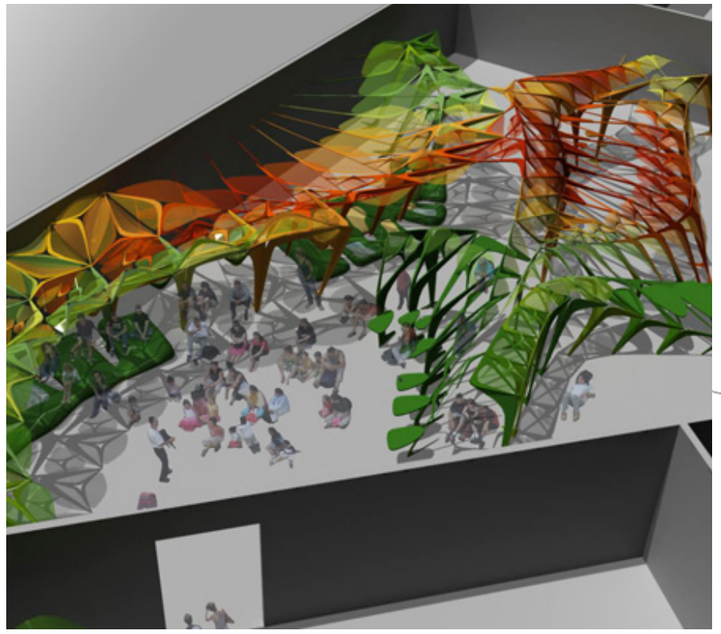
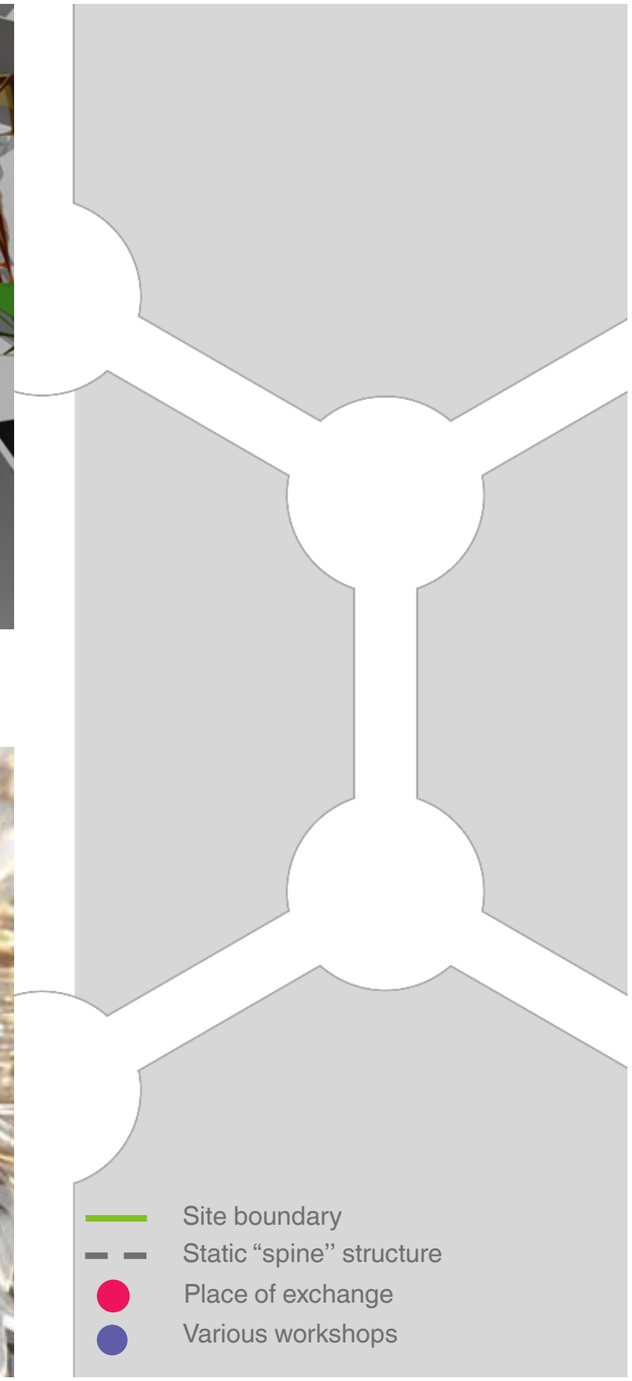


Scale: 1/2500



Chromazon, SU11

Changeling, SU11



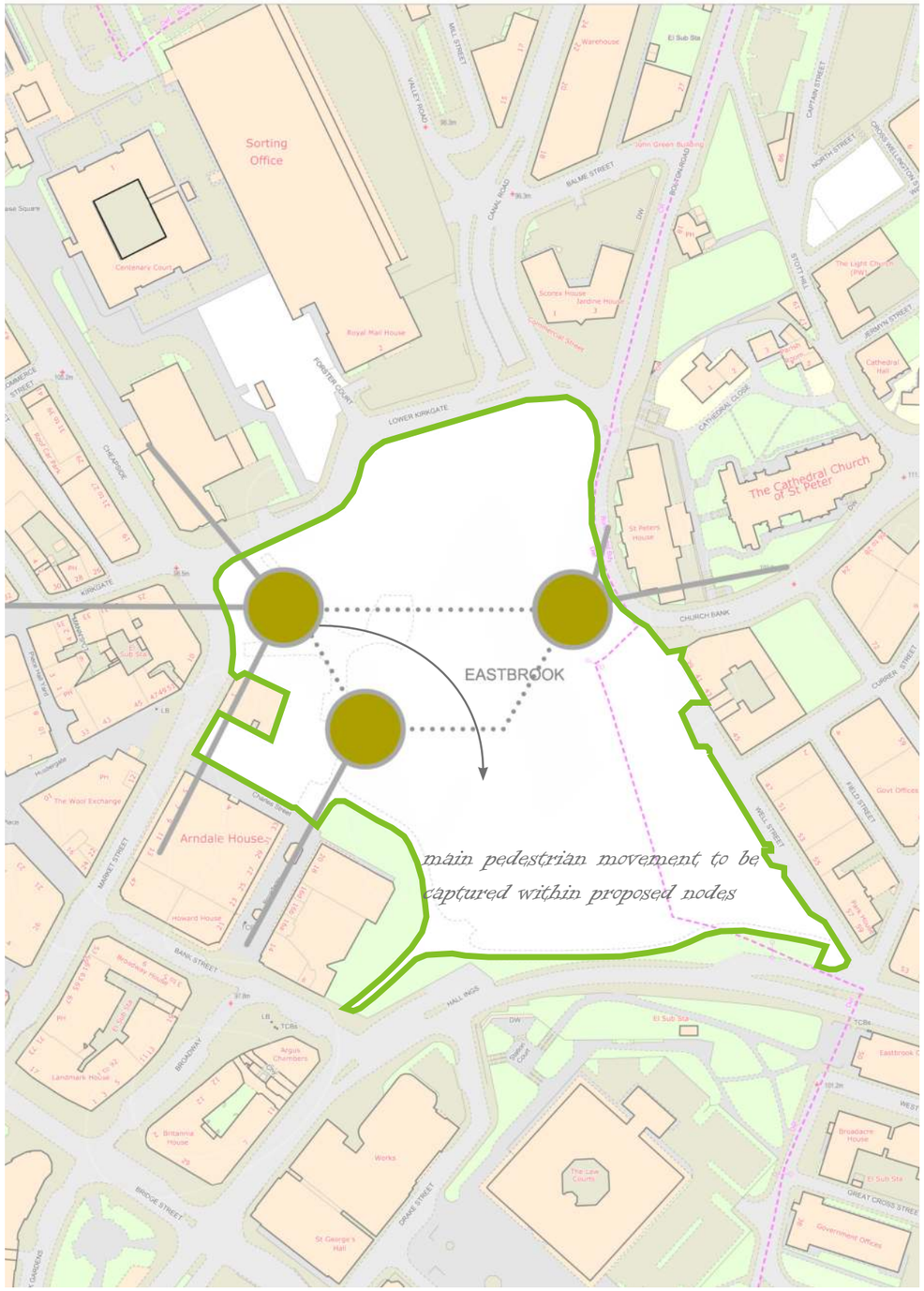
RE-MAP [A.A]

ALBENA ATANASSOVA

PROGRAM AND PRECEDENTS

After establishing the requiremnts for production and potential applcations of my chosen material, I then moved back to the site and looked into how I could masterplan the "feature" and "creature" aspects of my scheme.

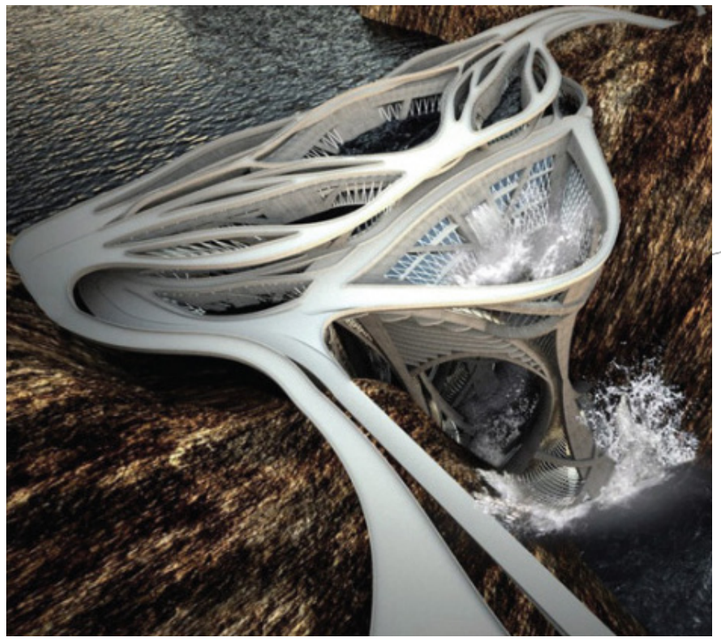
Here I was trying to propose a connection between different sides of the Westfield gap , where people could simbolically "walk over the crisis" towards a sucessful future. The proposal envisions a split between a variety of workshops that could manufacture various graphene products with a central opened place of exchange. Exchange could be seen as a market exchange in the direct interpretation but also as a place for people from various background to meet and exchange ideas.



Scale: 1/2500

Shi Ling bridge, ARUP

Bridging, competition idea



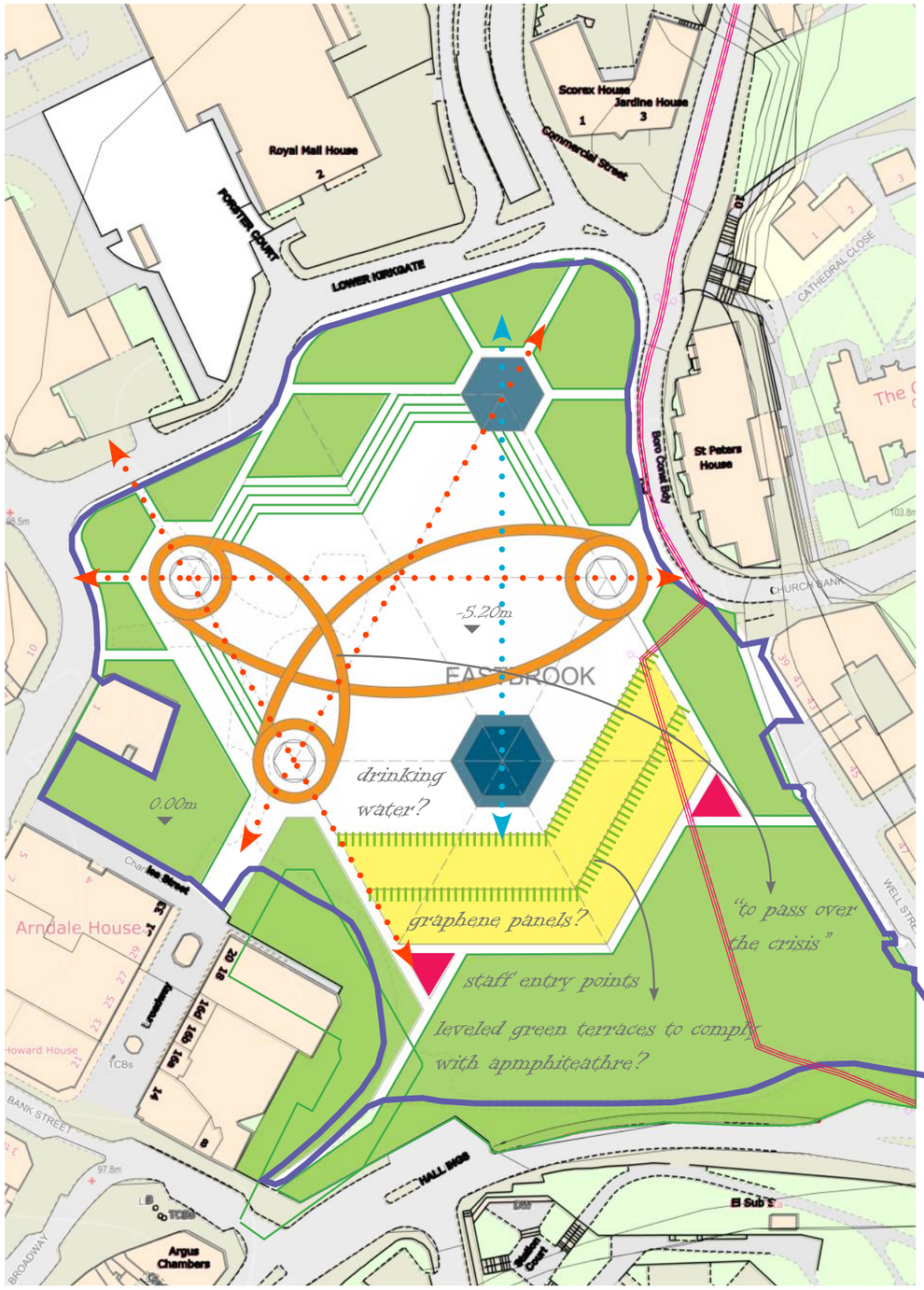
RE-MAP
[A.A]

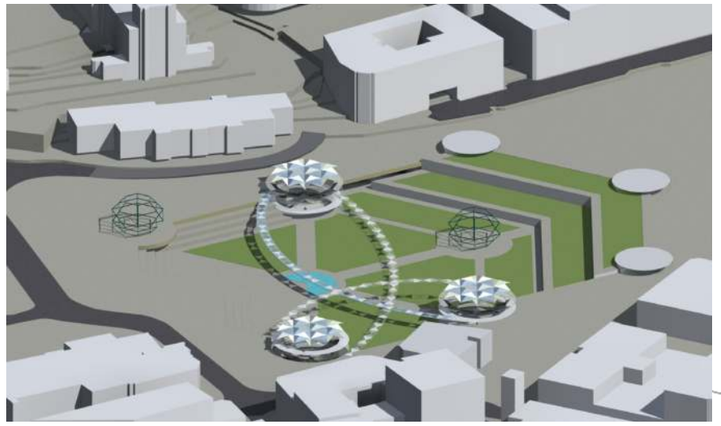
ALBENA ATANASSOVA

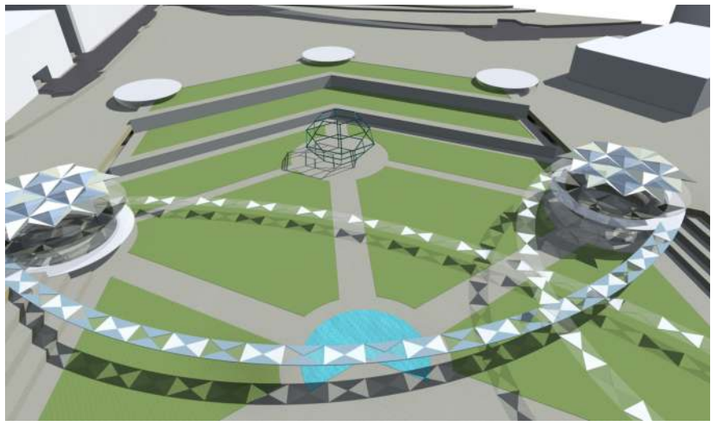
PROGRAM AND PRECEDENTS

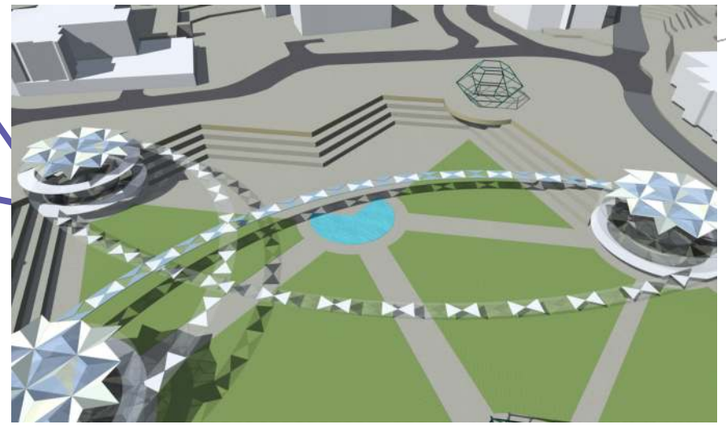
After establishing the requiremnts for production and potential applcations of my chosen material, I then moved back to the site and looked into how I could masterplan the “feature’’ and “creature’’ aspects of my scheme.

I then went into further options of exploring the connection between various access points along the site. I further looked into precedents for such “bridged”structures and positioning the place of exchange in the intersection of the latter, thus creating the “creature “ aspect of my scheme.









Scale: 1/1250

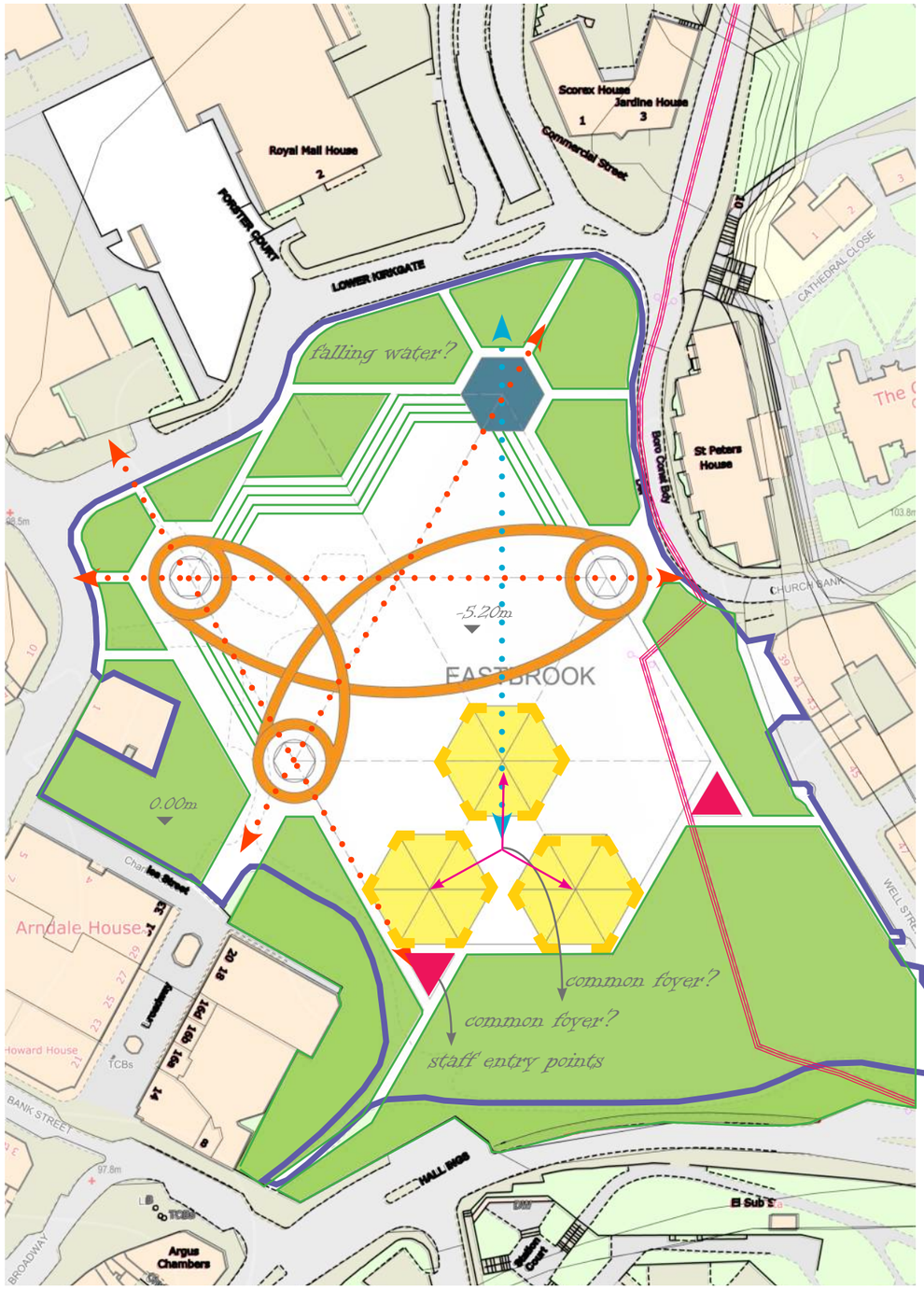
RE-MAP [A.A]

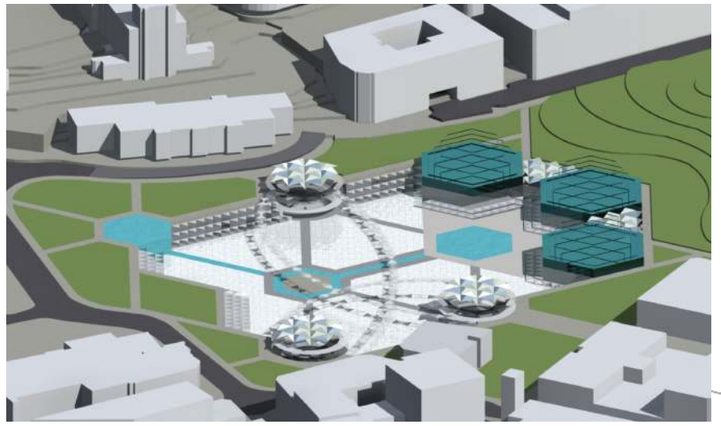
ALBENA ATANASSOVA

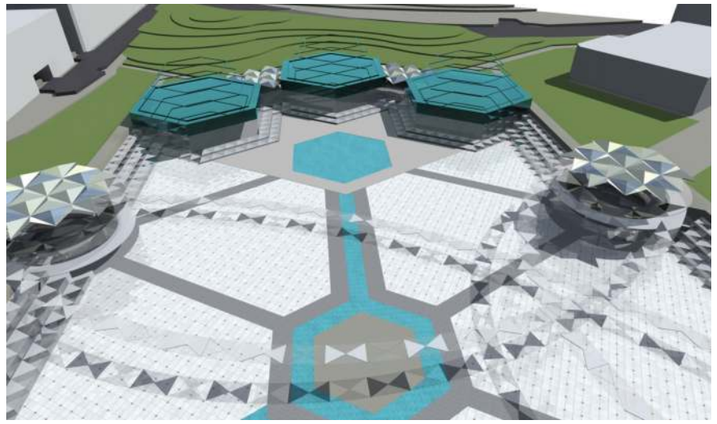
PROGRAM EVOLUTION

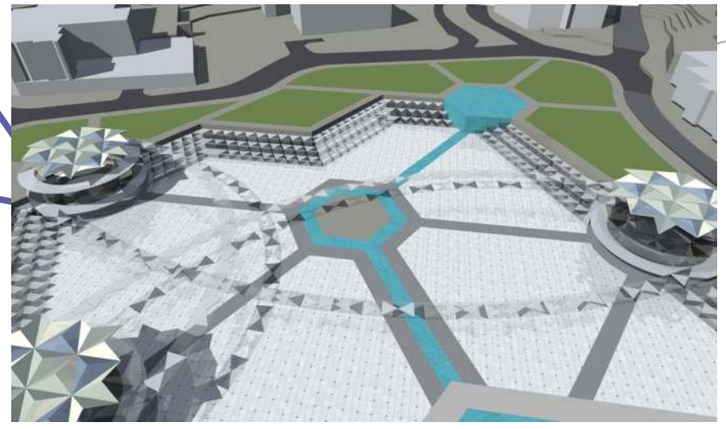
After establishing the requiremnts for production and potential applcations of my chosen material, I then moved back to the site and looked into how I could masterplan the “feature’’ and “creature’’ aspects of my scheme.

The diagram suggests a further elaboration of my design proposal with a focus on the feature side of the project. I also looked into modelling the overall terrain thus creating a stepped building to the south that would foster laboratories and research facilities for the production of graphene.









Scale: 1/1250

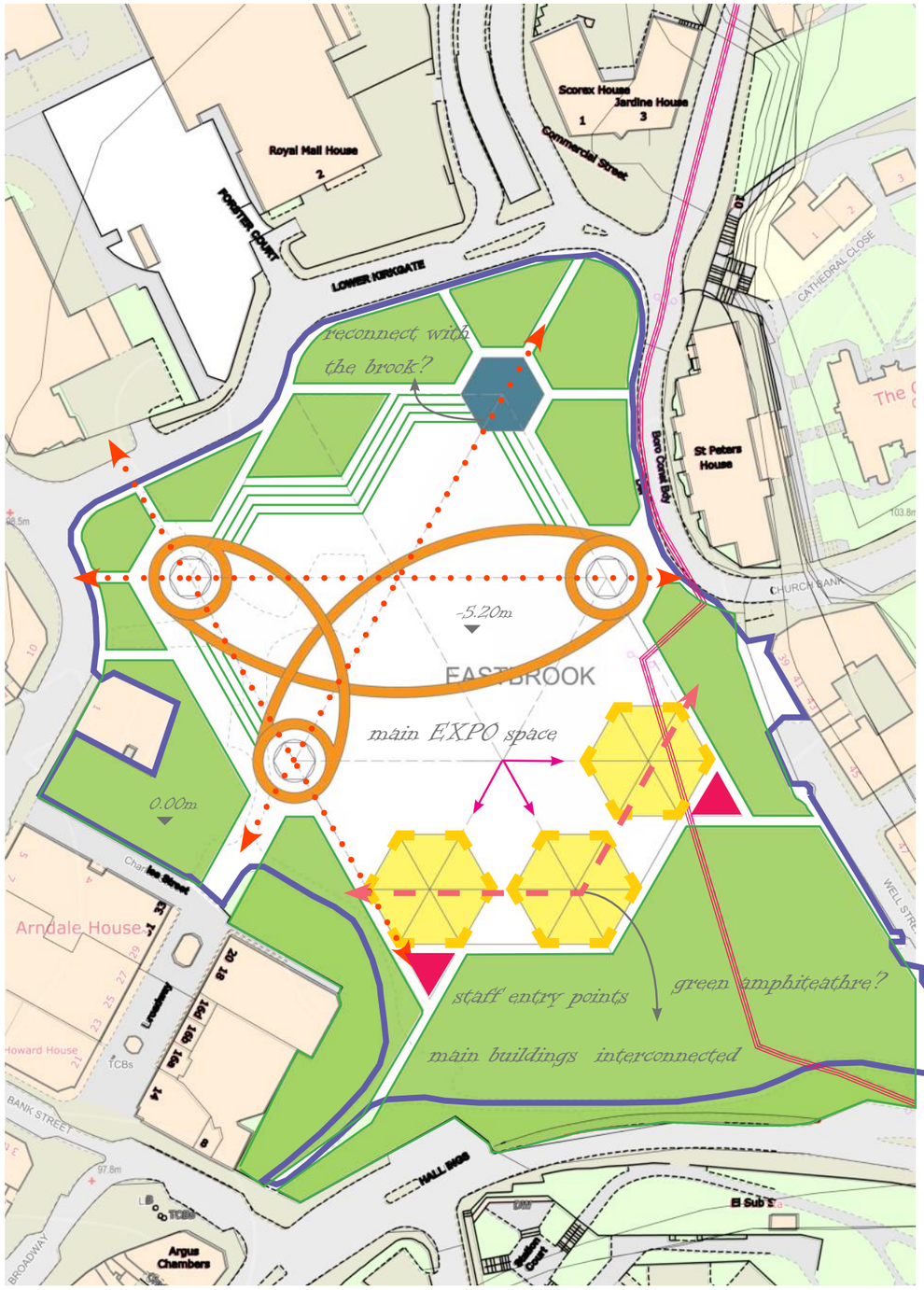
RE-MAP
[A.A]

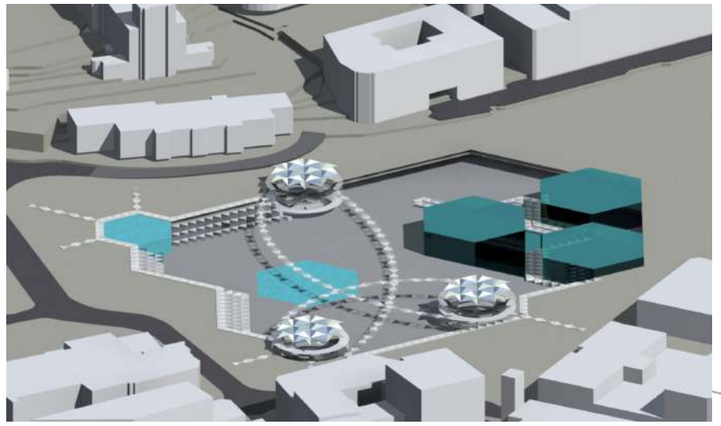
ALBENA ATANASSOVA

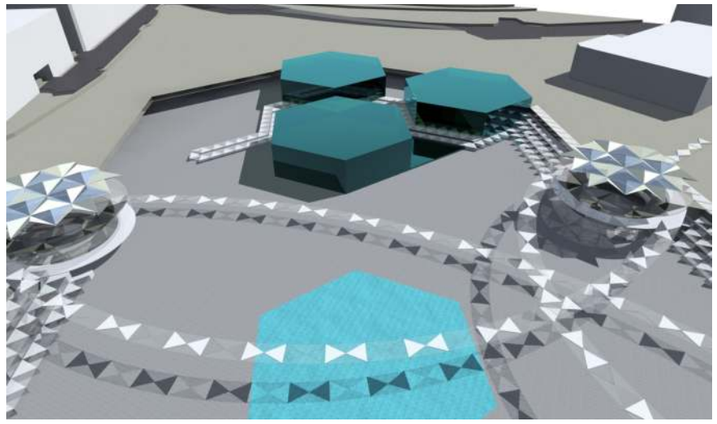
PROGRAM EVOLUTION

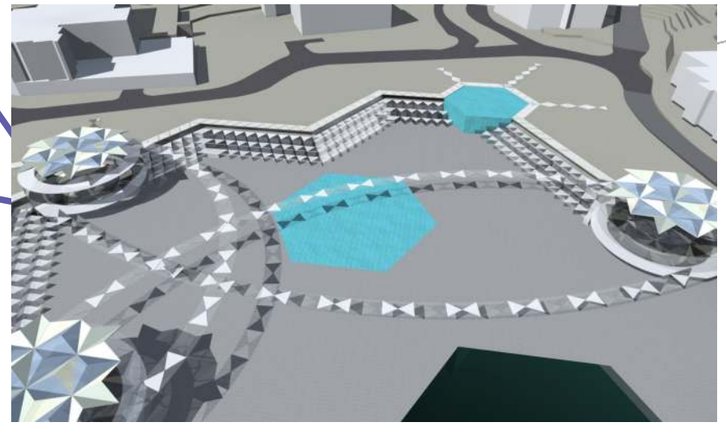
After establishing the requiremnts for production and potential applcations of my chosen material, I then moved back to the site and looked into how I could masterplan the “feature’’ and “creature’’ aspects of my scheme.

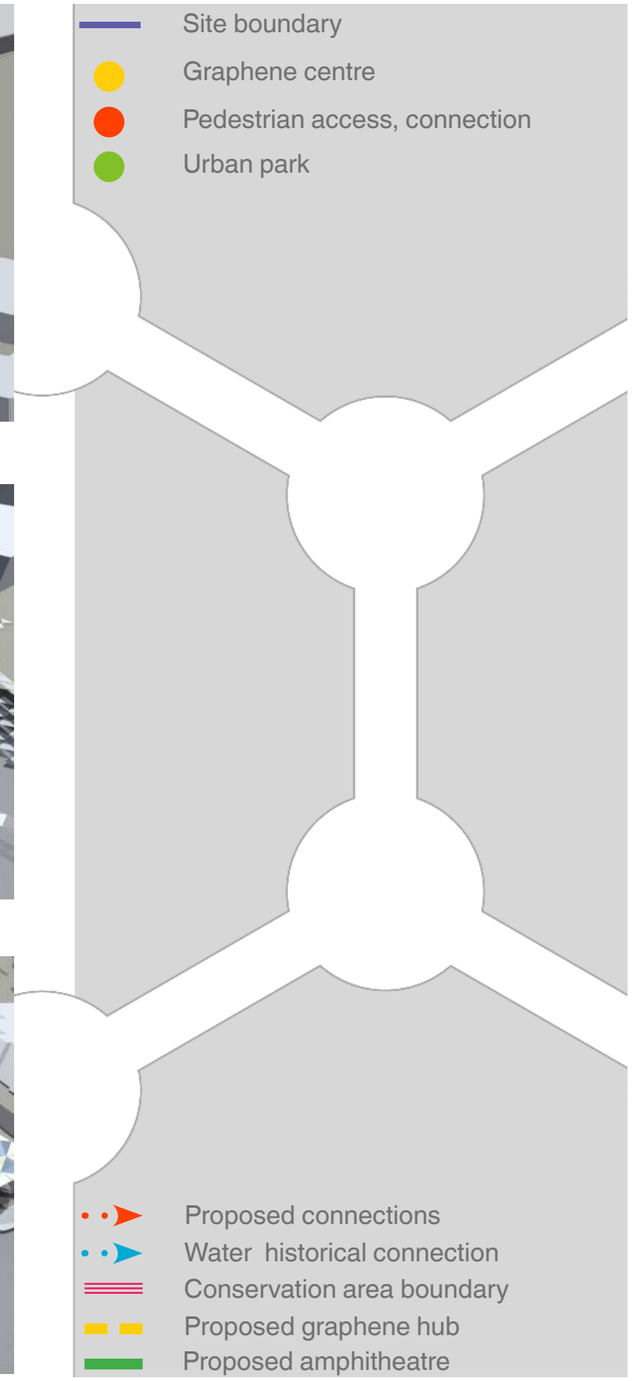
The diagram suggests a further elaboration of my design proposal with a focus on the feature side of the project. Here I elaborated on the position of the graphene hub in a rather different spacial orientation that would be easily read as the graphene molecule.











Scale: 1/1250

RE-MAP [A.A]

ALBENA ATANASSOVA

PROGRAM EVOLUTION

After establishing the requiremnts for production and potential applcations of my chosen material, I then moved back to the site and looked into how I could masterplan the “feature” and “creature” aspects of my scheme.

The diagram suggests a further elaboration of my design proposal with a focus on the feature side of the project. Here I elaborated on the position of the graphene hub as a series of interconnected volumes and a central access point. I also looked into splitting the bridge connections into varous level heights in order to encourage the notion of mobility.

- ◌ Existing node
- ◌ Proposed node
- ● Conservation area
- ● Retail / Shopping area
- ● Administration / Office area

- ━ Site boundary
- • • ➤ Proposed pedestrian movement
- • • ➤ Existing vehicular access
- • • ➤ Proposed underground access
- ∠ Views
- ✳ Landmark

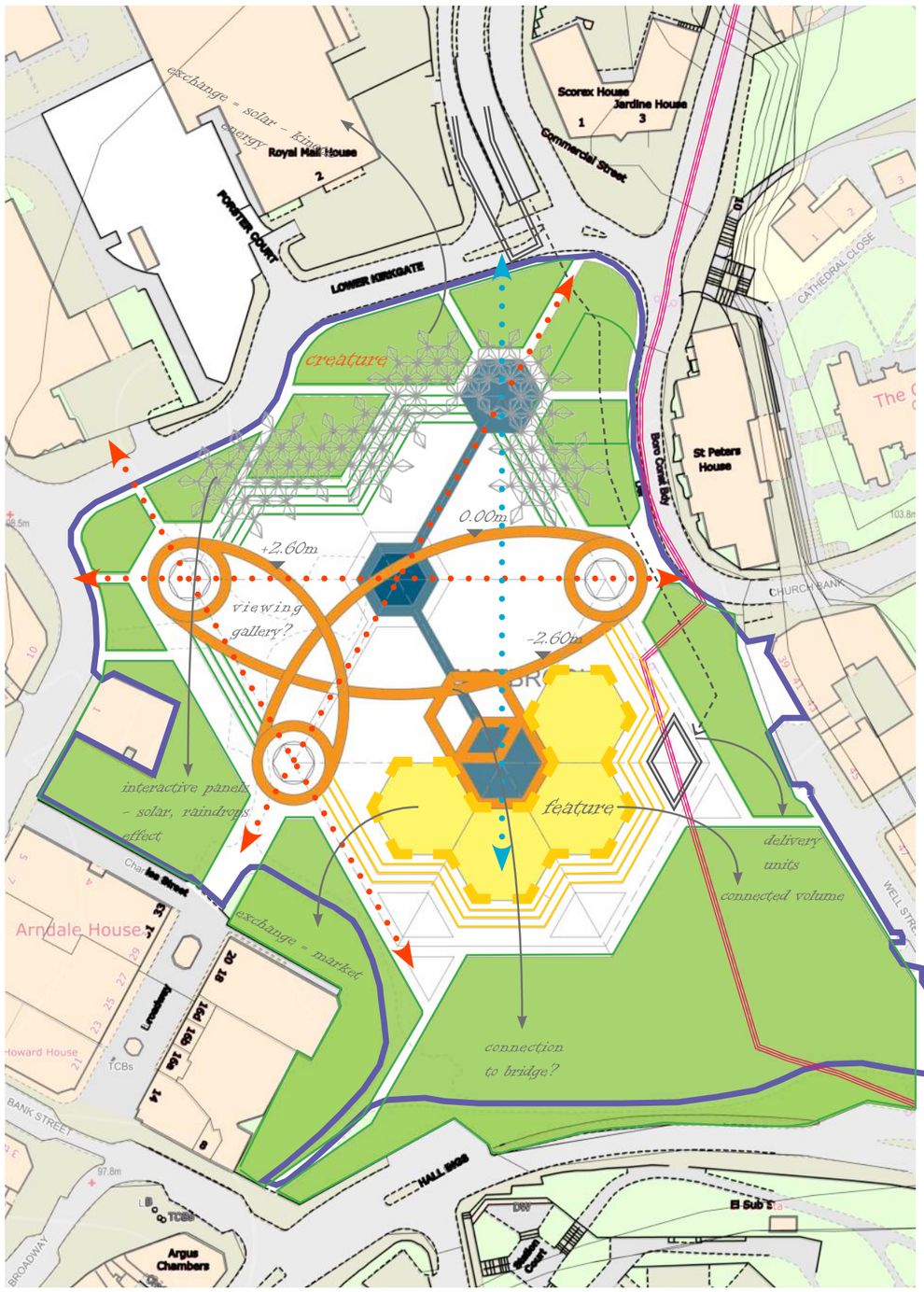
Scale: 1/2500

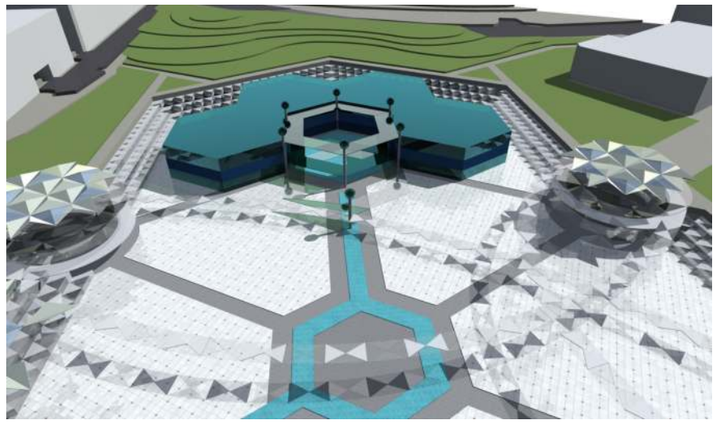
RE-MAP
[A . A]

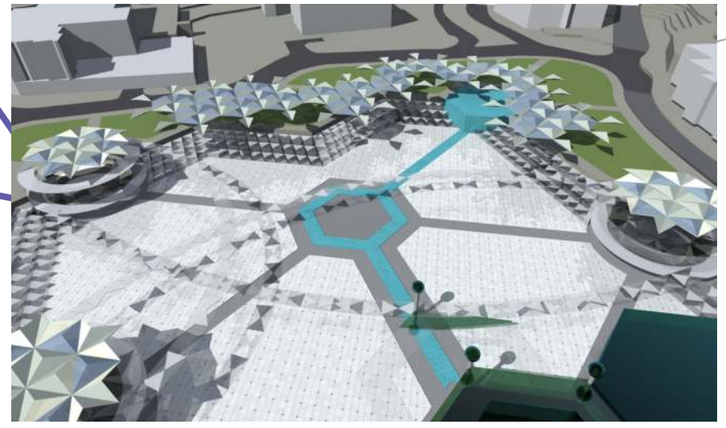
ALBENA ATANASSOVA

CONSTRAINTS AND OPPORTUNITIES

After further considerations I stepped back into reconsidering the overall masterplanning of the westfield site. I explored the existent ladmarks axis and the notion of further strengthening the latter. The leveled bridges would create a viewing gallery to open up panoramas of the site as well as the city centre, while attracting visitors from all points of the main pedestrian routes.







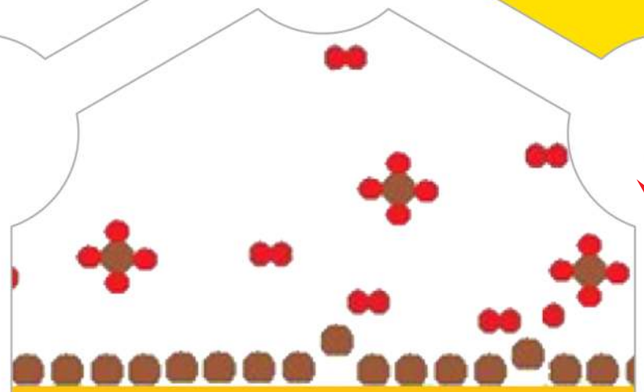
Scale: 1/1250

RE-MAP [A.A]

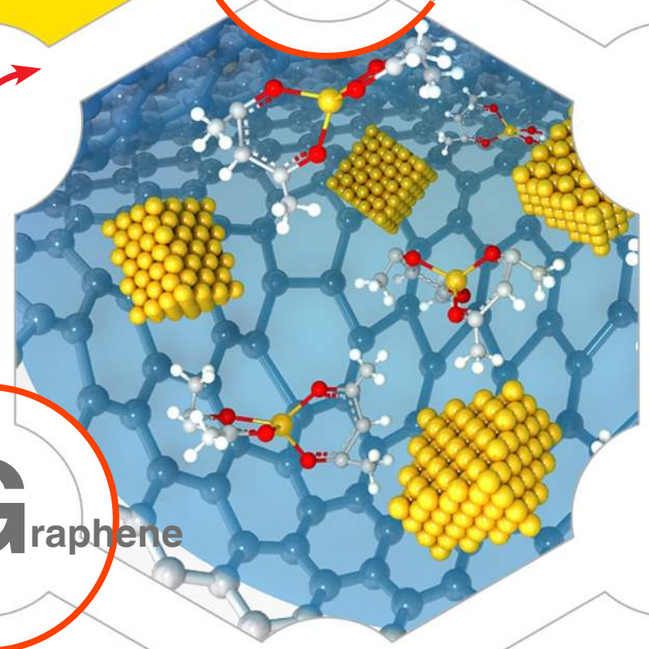
ALBENA ATANASSOVA

PROGRAM EVOLUTION

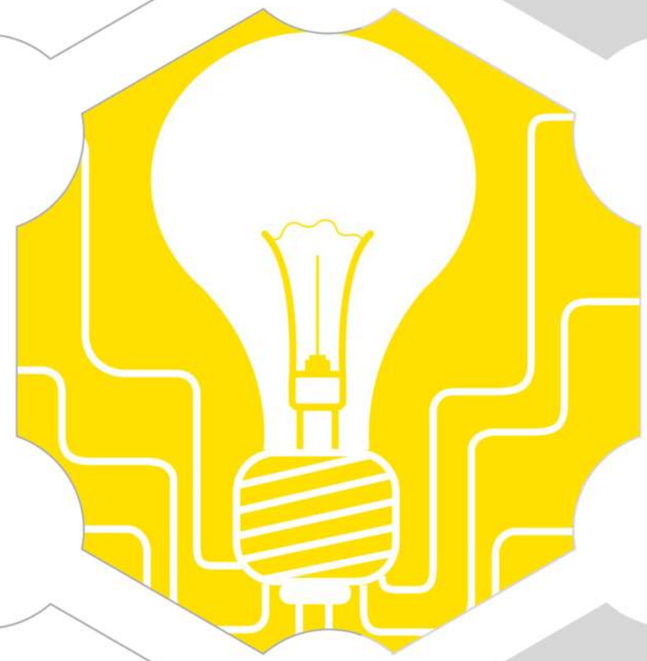
My final scheme continues the notion of bridges and a graphene shaped hub to foster production and distribution of graphene. I looked into exploring the terrain moderation and developing an interactive folding canopy that could generate its own operational energy as well as encourage people to stay and use the space also as a community hub. My next step is to look at the specific requirements for graphene production.



A pplication : on any material that creates properties of a PV cell,which generates electricity



G raphene



CVD

Chemical vapour deposition:
utilises methane extracted from the air, which is a greenhouse gas and copper base

L iquid graphene:

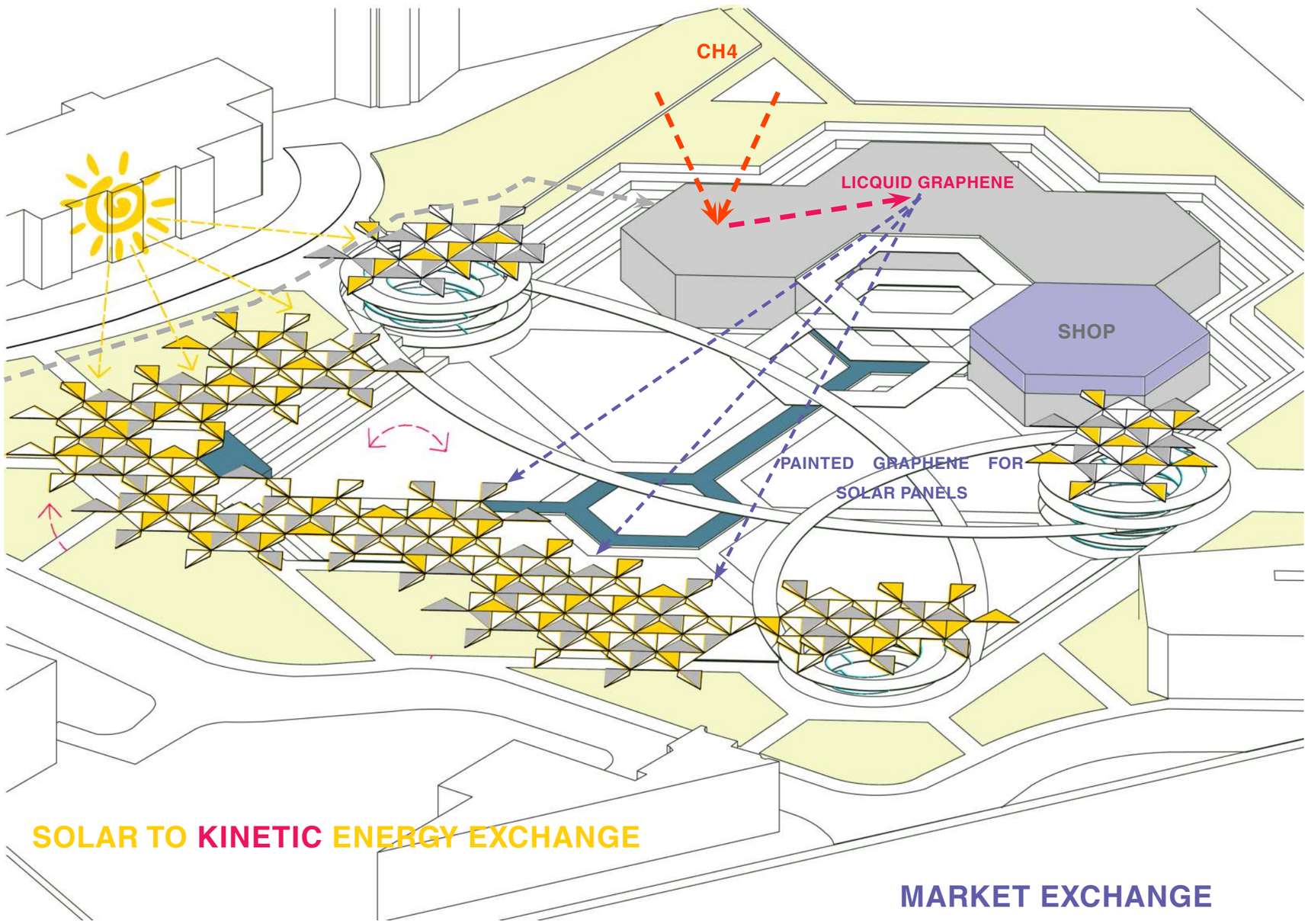
due to the graphite flakes with opened carboxilated edges, created within the CVD process, when the probe is introduced in a probic solvent such as water it generates graphene nanosheets of 5 and fewer layers

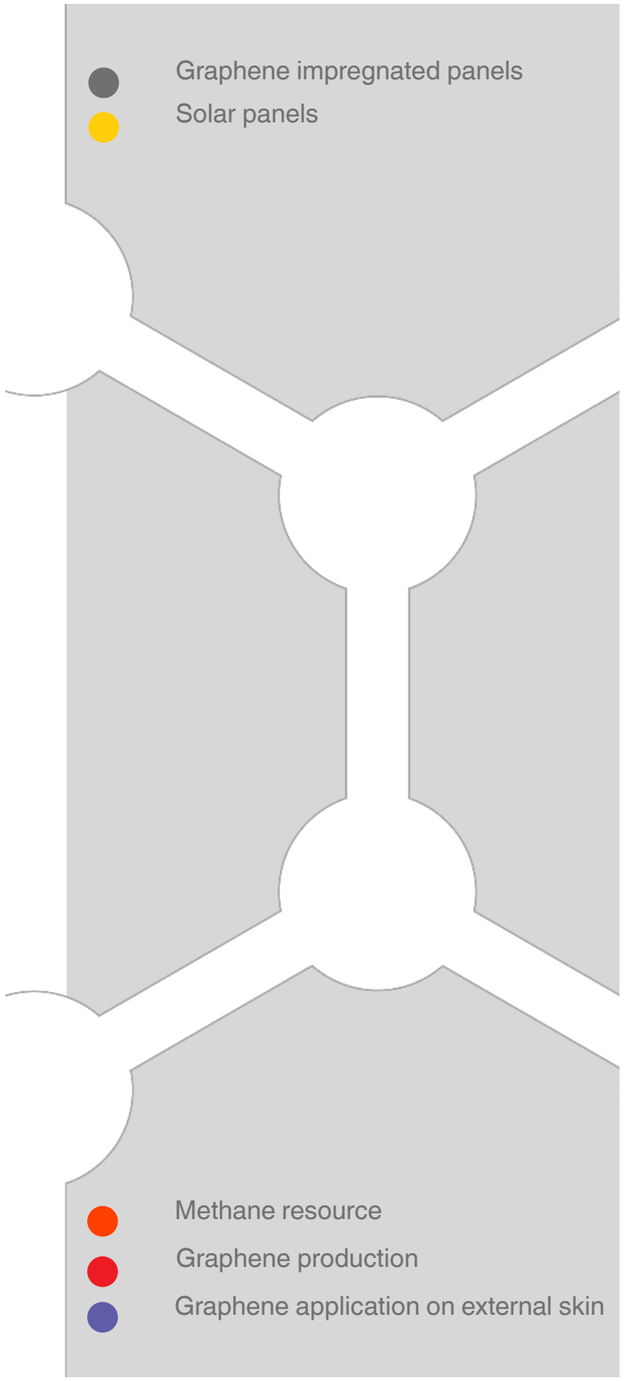
RE-MAP
[A . A]

ALBENA ATANASSOVA

MANUFACTURE TECHNOLOGY

There are several ways of producing graphene but the most popular and sustainable is through Chemical Vapour Deposition. Looking into the actual process my scheme would require metal resources for the evapouration and formation of graphene flakes, water that could be generated from water harvesting systems and filtration of rainwater and last but not least methane, which could be extracted from the air and thus reduce greenhouse gases in the atmosphere. Overall the process is clean and doesnt pollute the surrounding area which makes it suitable for a city centre environment such as Bradford.



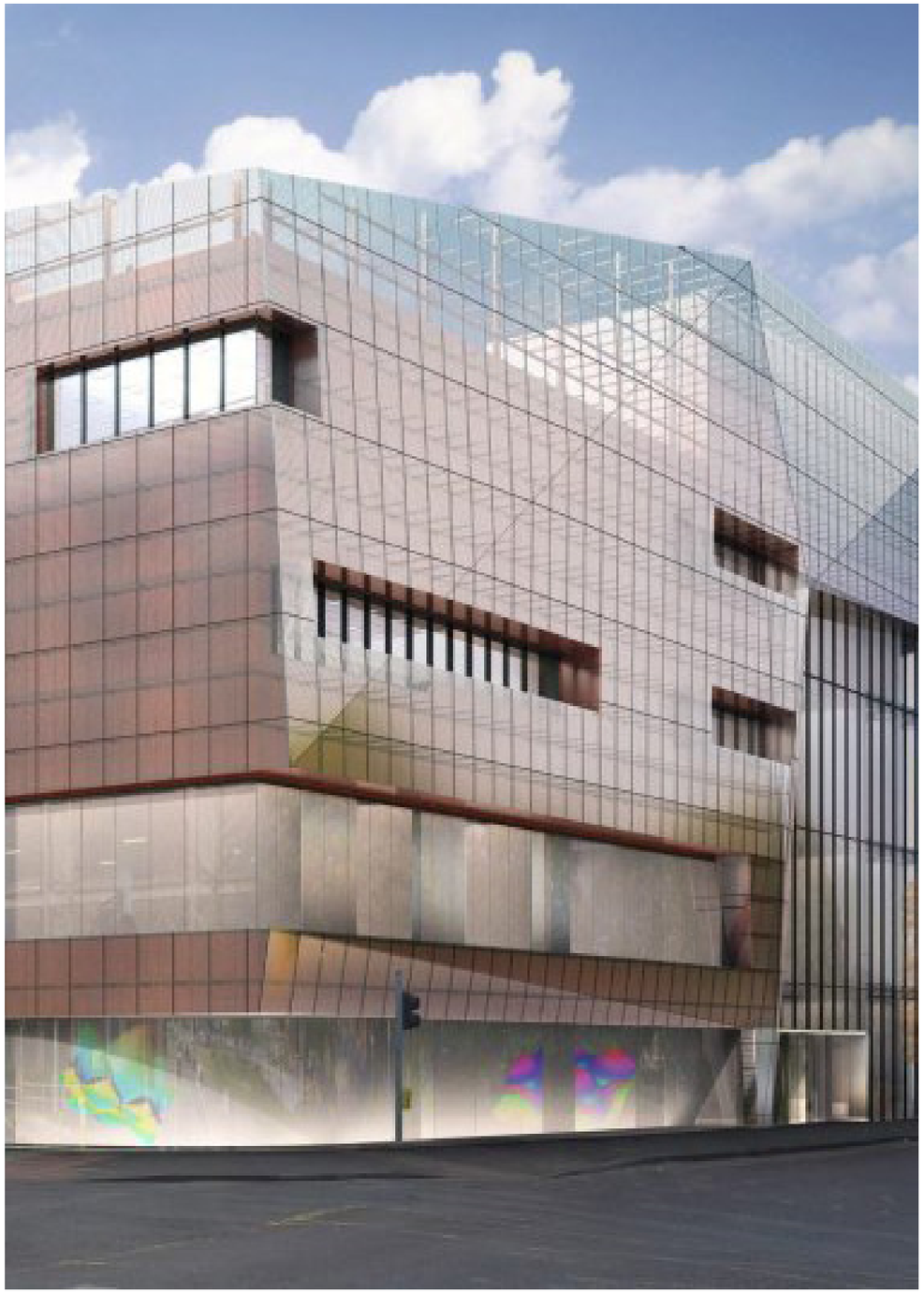


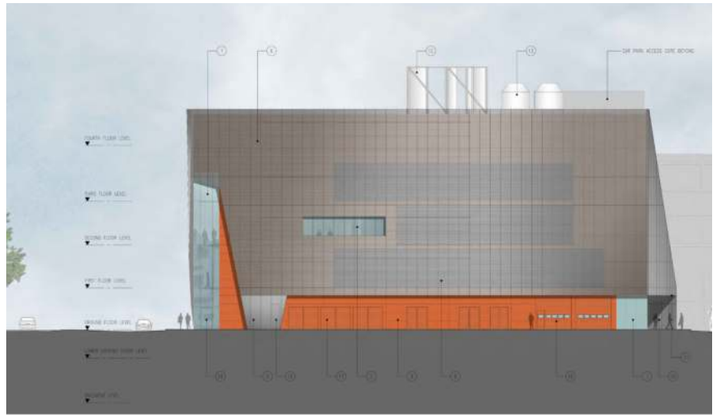
RE-MAP [A.A]

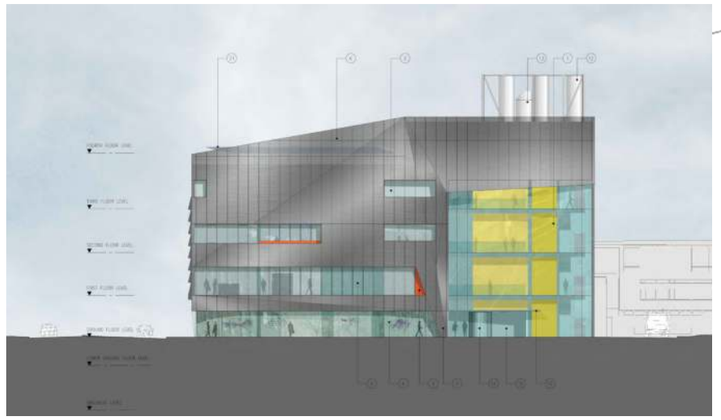
ALBENA ATANASSOVA

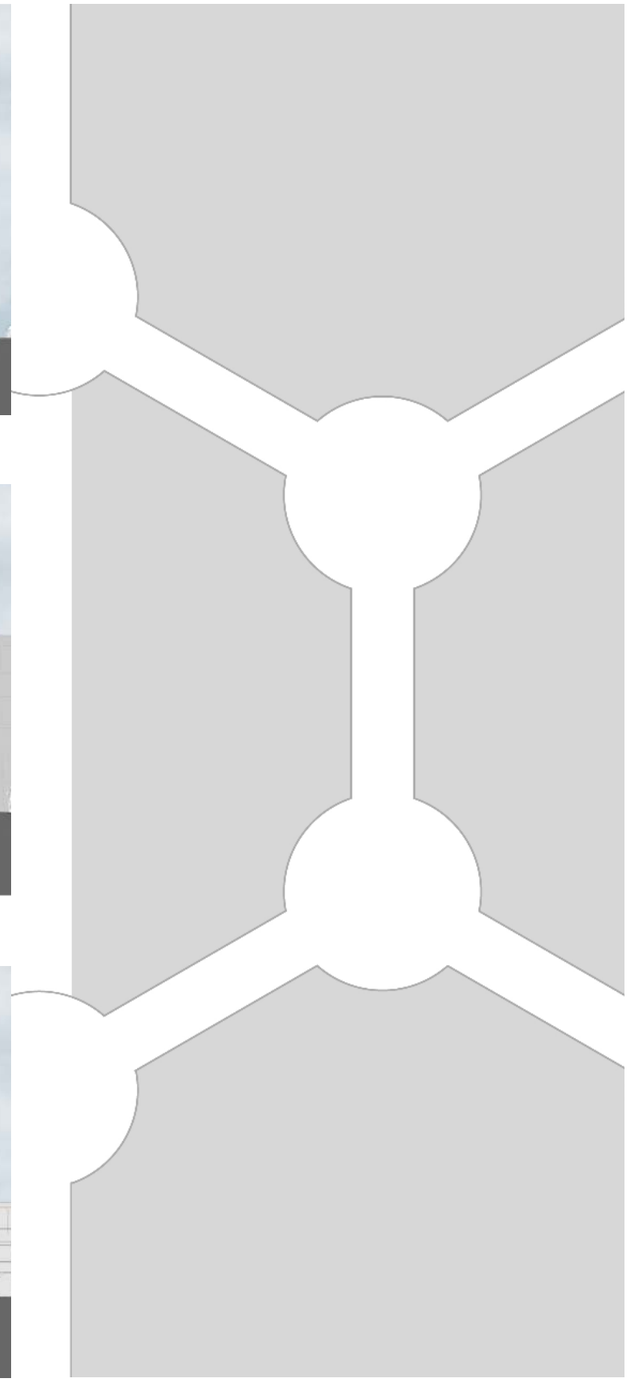
MANUFACTURE UNDER CURRENT SCHEME

Following the research of graphene production, the diagram demonstrates how the site could encorporate the manufacturing cycle as a overall feature of the scheme. Undeground delivery of goods and air extraction of methane would provide the necessary starting materials that would then be distributed within the hub for the production of graphene paint as and end process material. Graphene paint, as discussed with Mr. Novoselov's current research could be applied to any material as a coating that would be able to completelly substitute PV cells and panels. Paint could be distributed to the public in the shop area of the hub. Exchange is also seen in an abstract way as exchange of state within the production process, but also as means of energy exchange if the paint were to be applied onto the folding canopy where solar energy could be transformed into kinetic energy used for the folding and unfolding of the canopy.







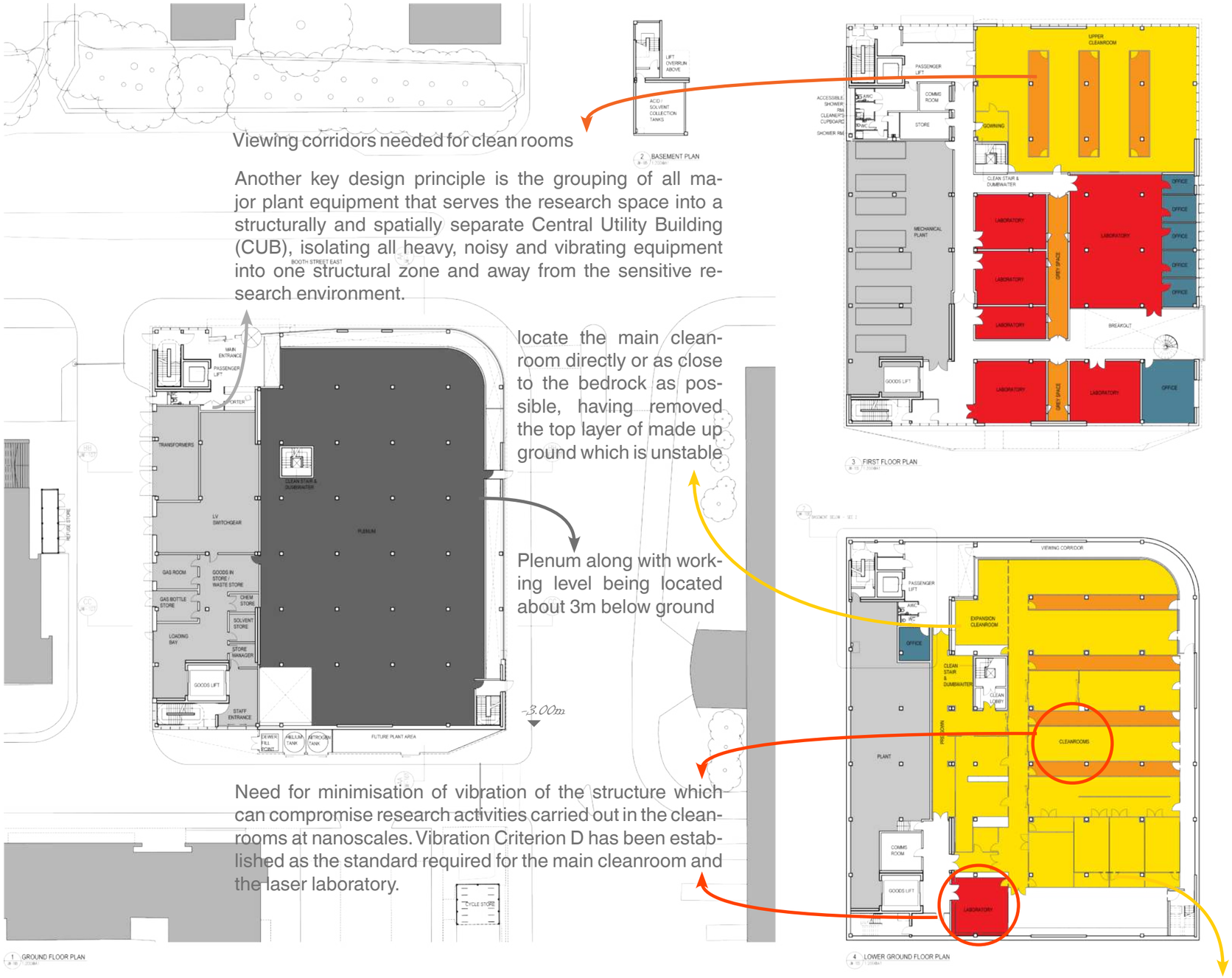


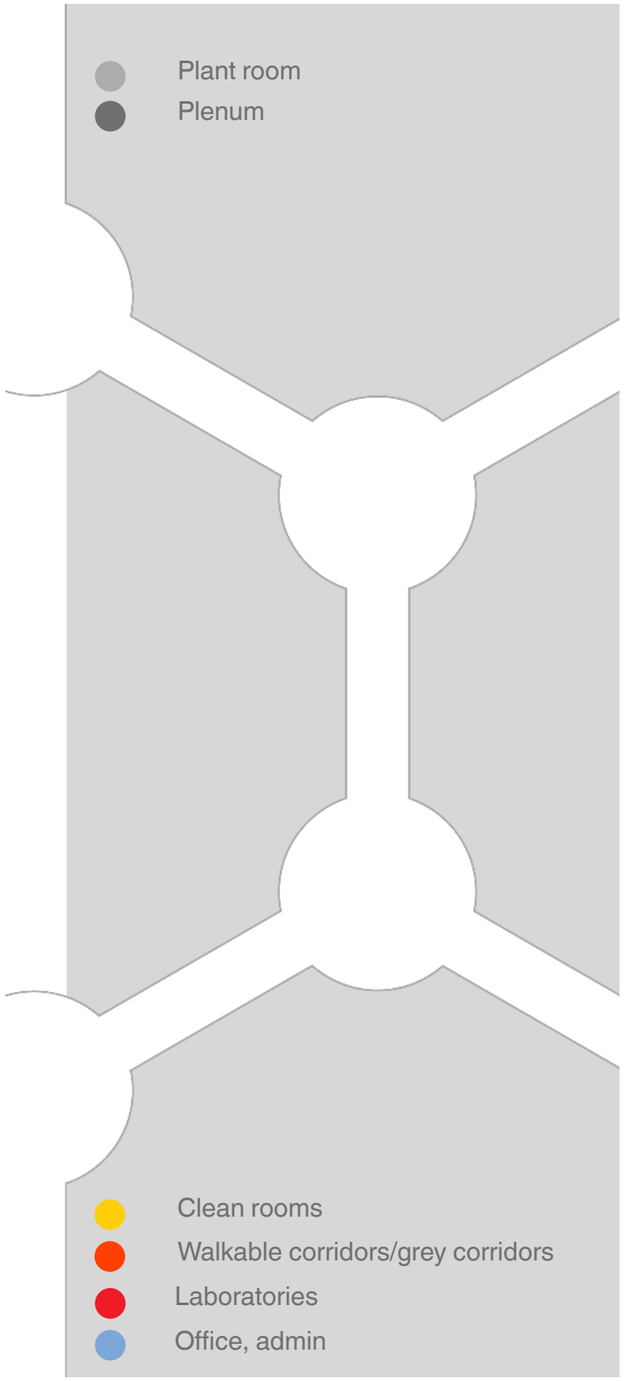
RE-MAP [A.A]

ALBENA ATANASSOVA

CASE STUDY

As a precedent ofr my research and design specification I looked at the scheme for the National Graphene Institute to be realised in Manchester. After contacting Jestico Whiles I had the opportunity to look into their proposal and technical requirement which them became the main source for the technical aspect of my building.





RE-MAP [A.A]

ALBENA ATANASSOVA

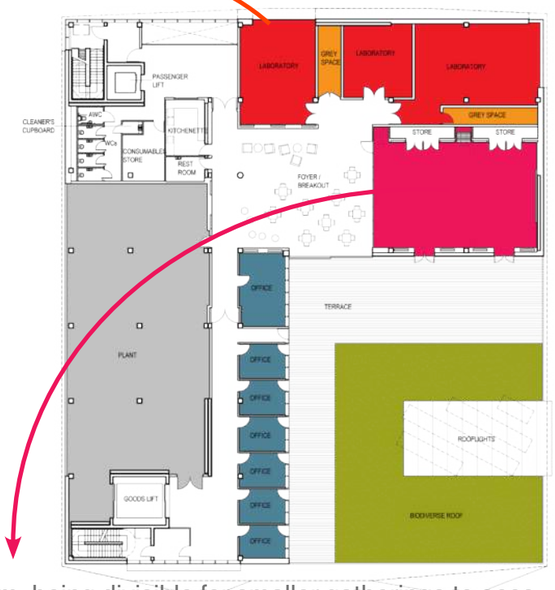
CASE STUDY

The cleanroom air system utilises a clean plenum approach, with fan filter units within the ceiling grid and sensible cooling coils located within the return-air path. This allows for flexibility and efficiency. The cleanroom tools require a precisely controlled internal environment to be maintained on a 24/7 basis. Makeup and pressurisation air to the cleanroom is provided via central air handling provision located adjacent to and distributing within plenum void space. The volume of makeup air provision exceeds that required for general occupancy for the space and is driven by the technical requirements of the exhaust provision. The full height of the cleanroom is thus over 7m and occupies in effect the lower ground and ground floor levels of the building.

1 SECOND FLOOR PLAN

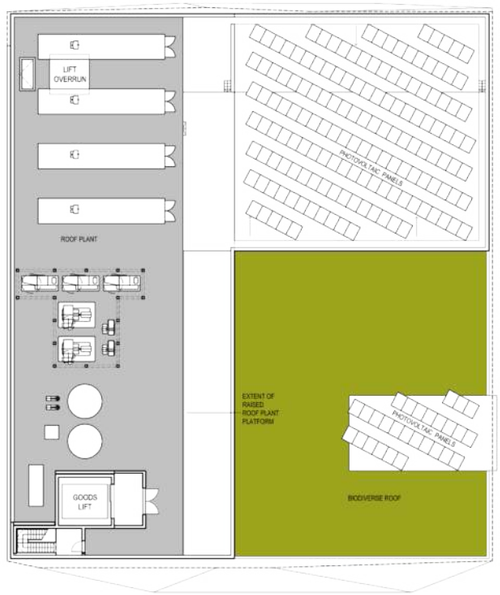
More demanding laboratories in terms of services requirements such as the Chemistry Laboratories are located on the Third floor of the building below the roof level, reducing the run of services and therefore cost.

The lab itself will measure approximately 6 x 7m and provide a clear floor to soffit height of minimum 4m



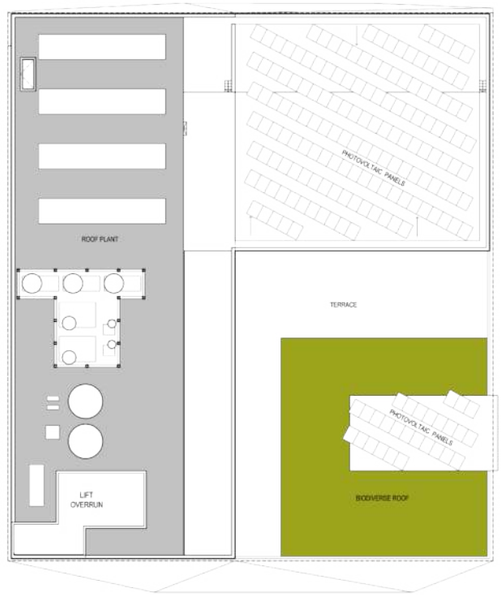
2 THIRD FLOOR PLAN

Multi purpose seminar room, being divisible for smaller gatherings.to accomodate up to 200 people. The public may be invited from time to time

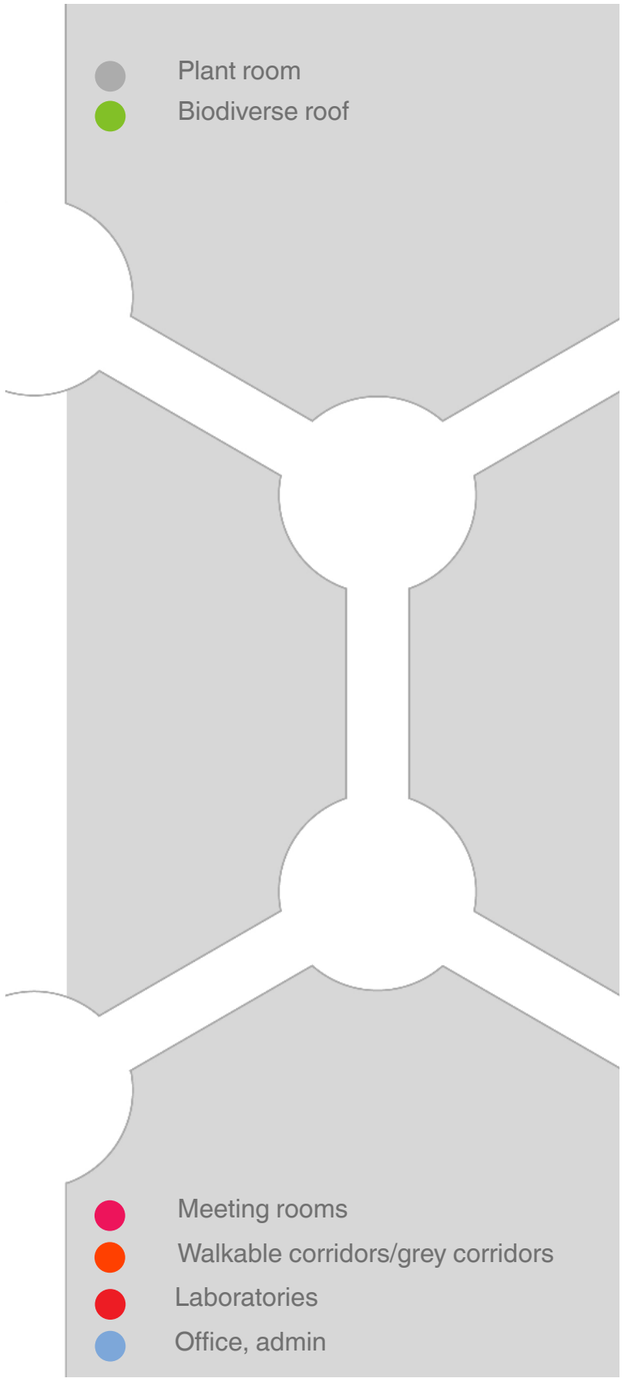


3 FOURTH FLOOR PLAN

The internal modular laboratories within each floor level are primarily located within the centre/ core of the building and are positioned back to back with a central shared grey space running the full vertical length. This allows increased flexibility for the services and pumps etc to be located within the grey space for the full length of each lab, reducing service runs and connection points.



4 ROOF PLAN

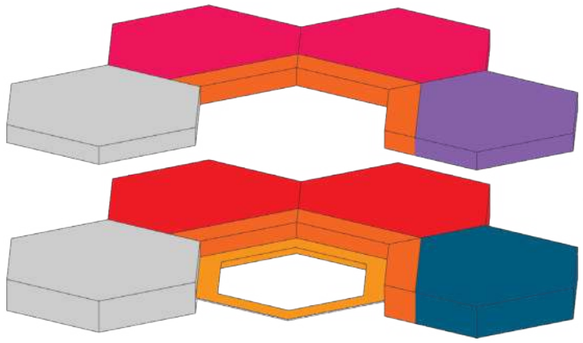


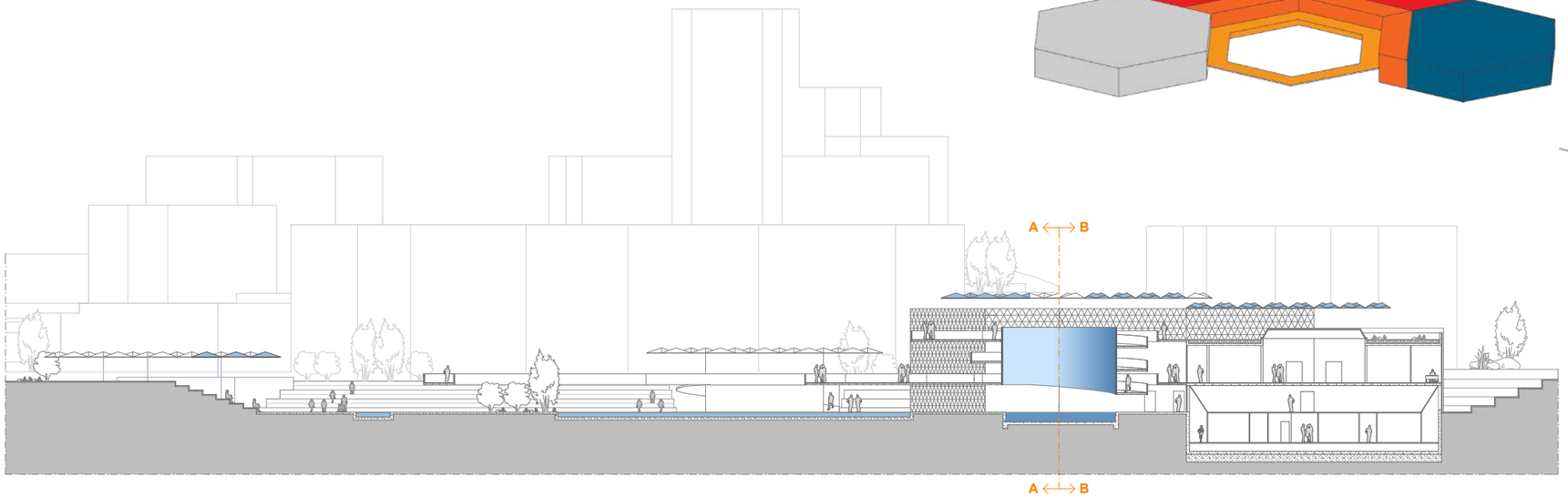
RE-MAP
[A.A]

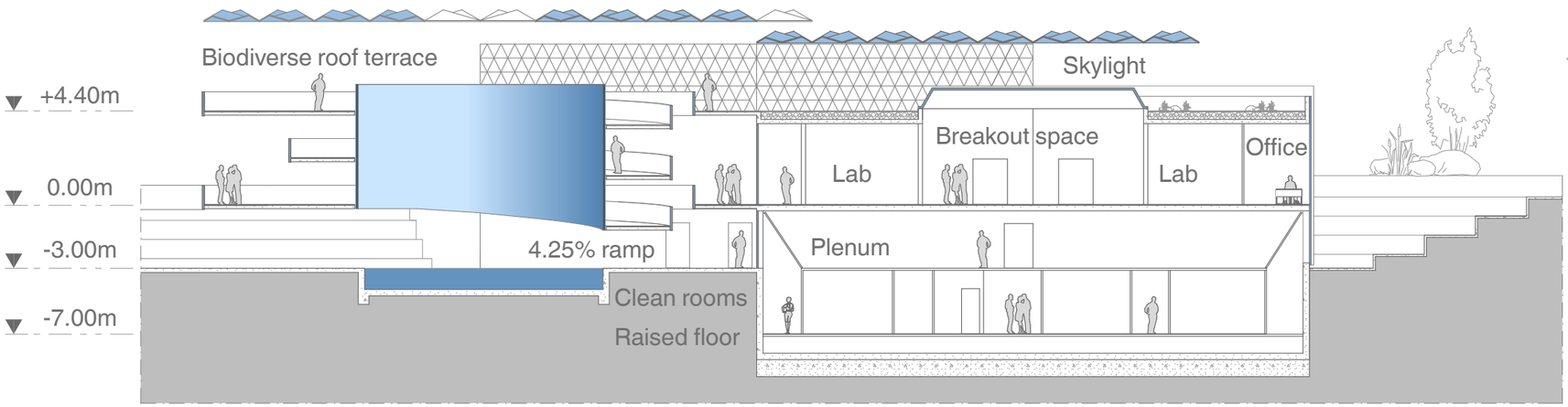
ALBENA ATANASSOVA

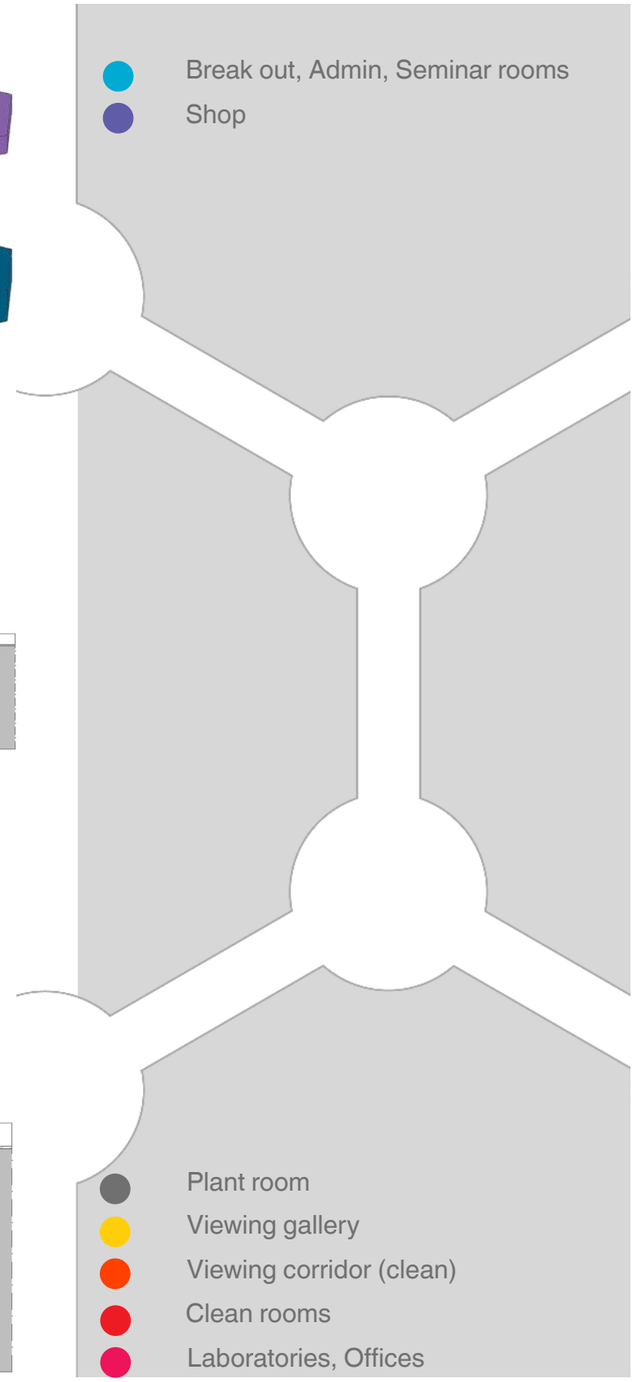
CASE STUDY

The gathered information was enough to lay out the main standards to comply with in my scheme so after I decided moving further into designing the graphene hub.









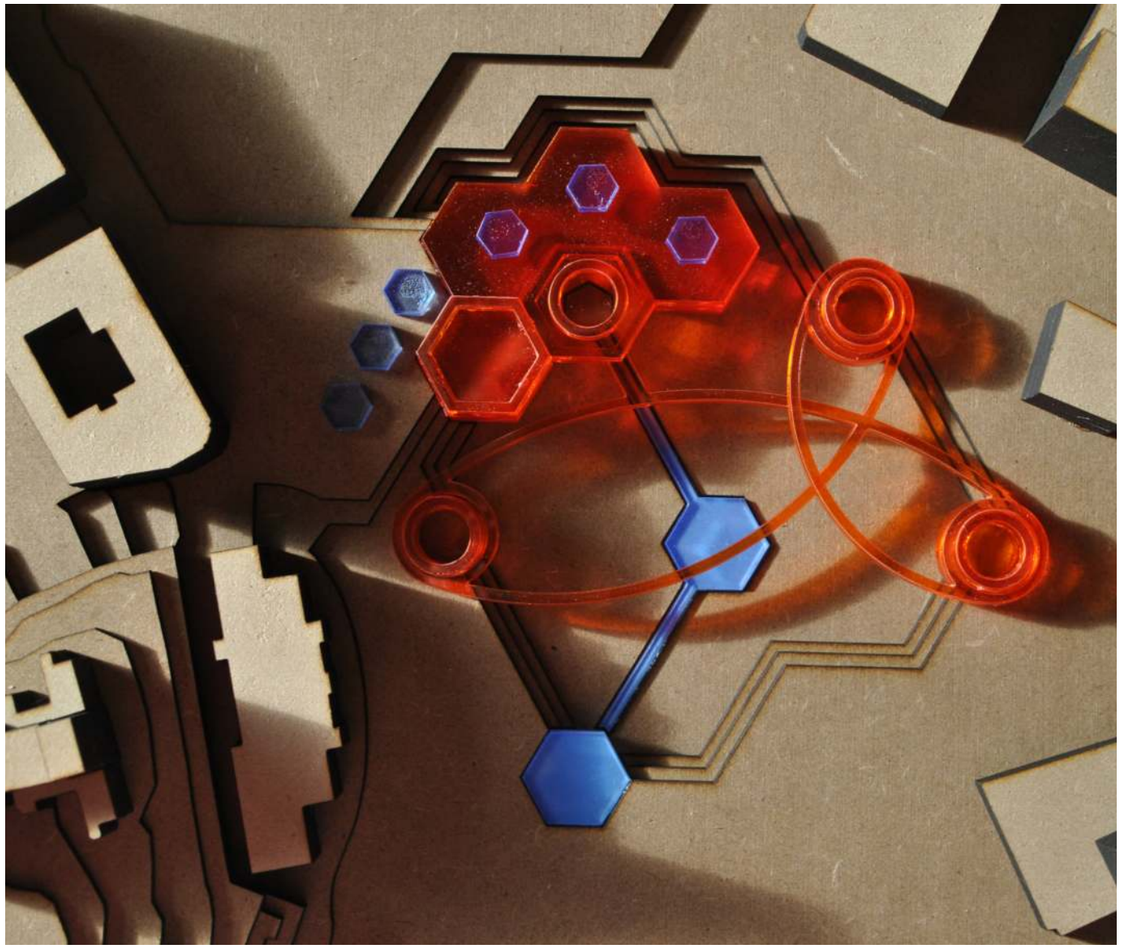
Scale: 1/200

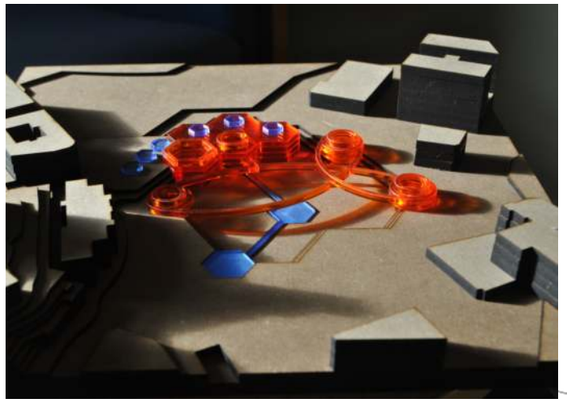
RE-MAP
[A.A]

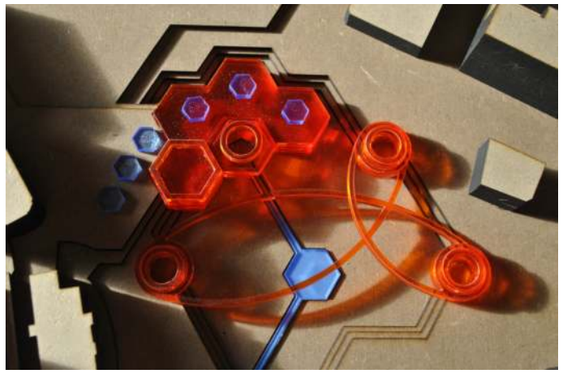
ALBENA ATANASSOVA

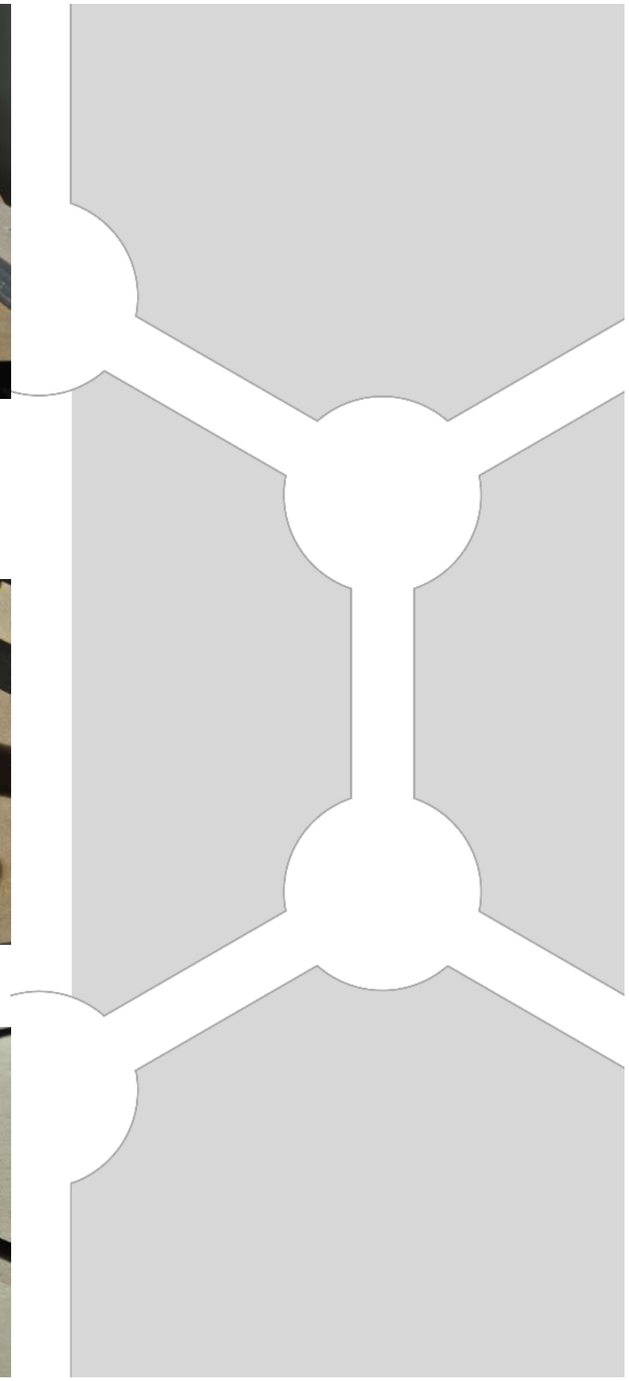
PROGRAM EVOLUTION

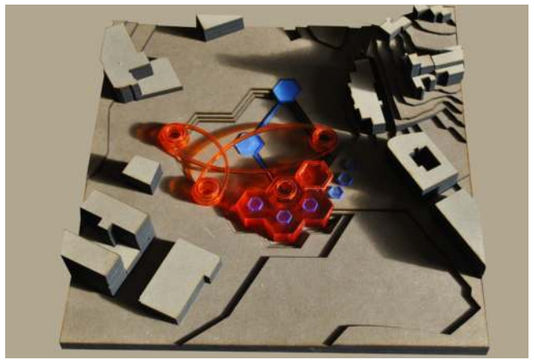
My start off point was to look at the distribution of levels in section as well as the functions that would be allocated at each level (refer to the axonometric diagram). The vibration Criteriod D that I had to comply with suggested a raised floor and lower level of the building to be completelly underground with a full height plenum located above. Lowering the building into the existent Westfield hole allowed for easy underground access for services and goods.

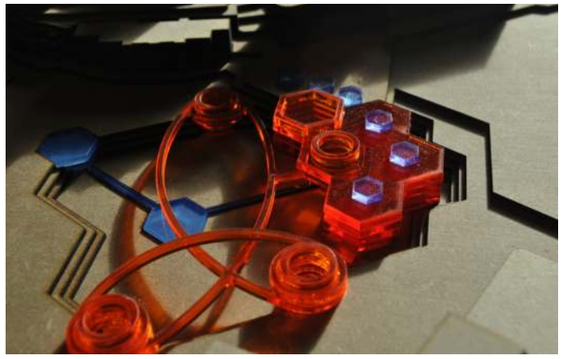












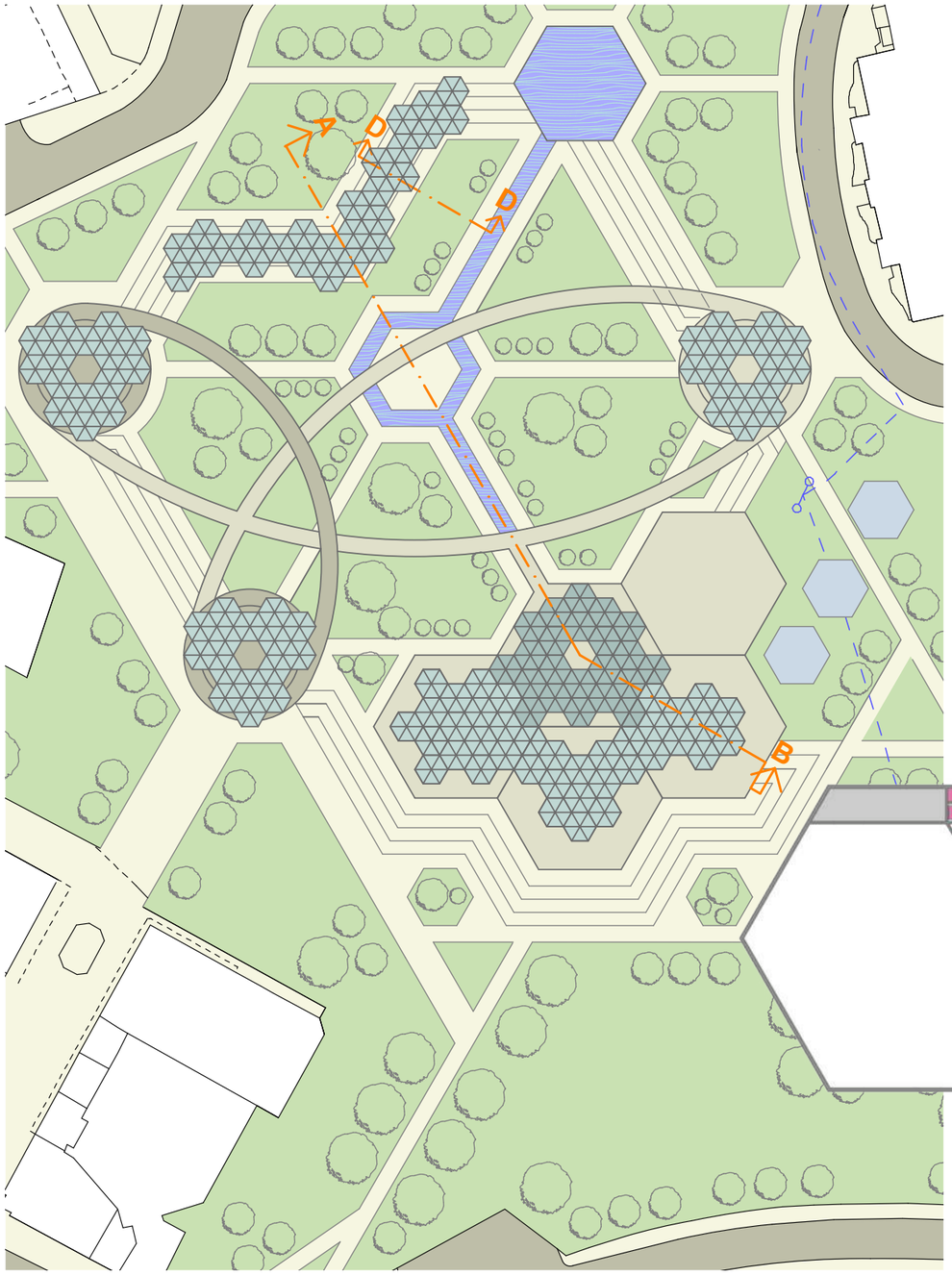
Scale: 1/1000

RE-MAP
[A.A]

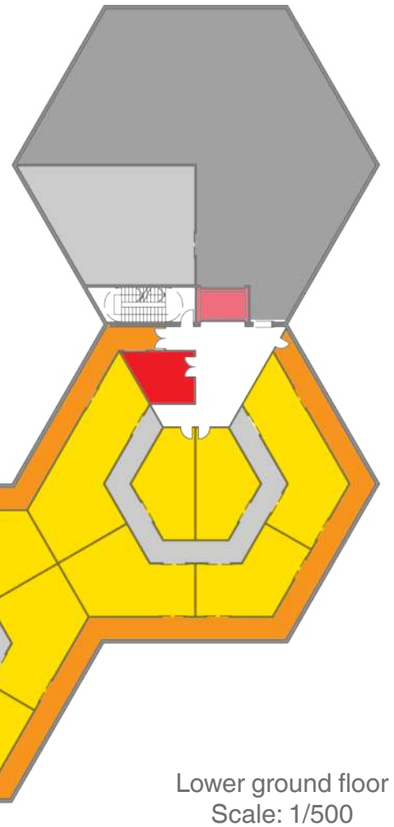
ALBENA ATANASSOVA

MODELS

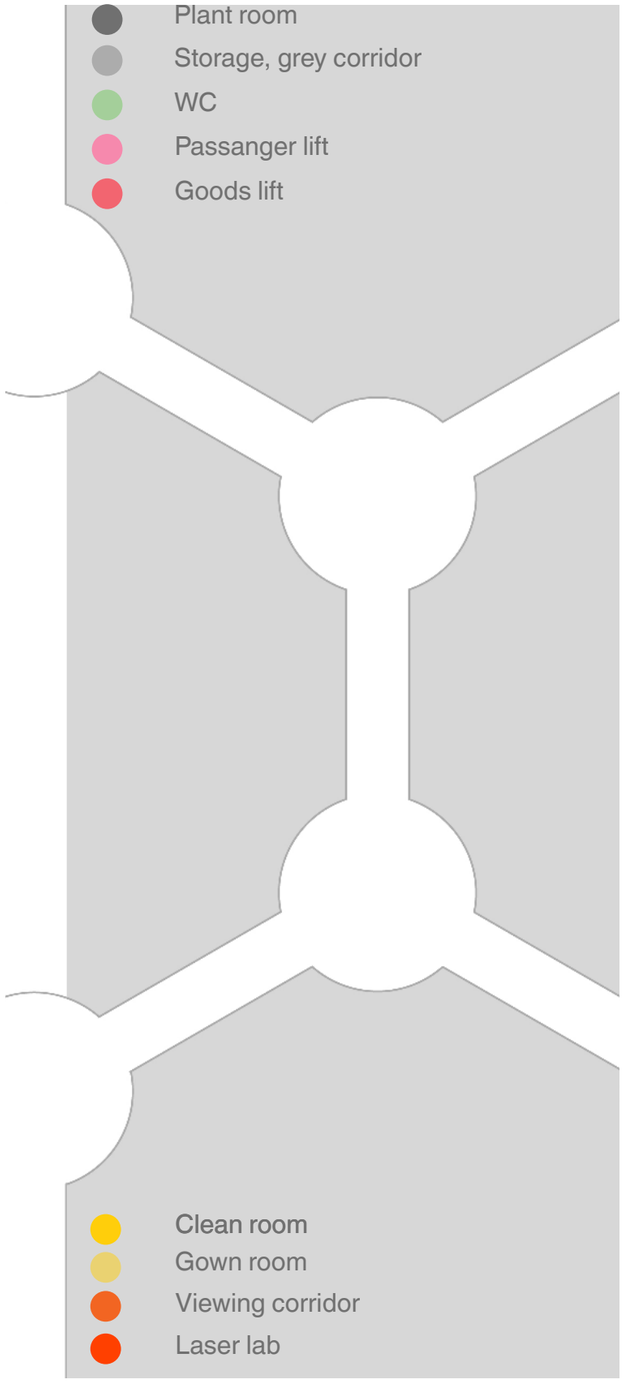
The model tests the overall massing of the proposed building within the Westfield site and surrounding context.



Scale: 1/1250



Lower ground floor
Scale: 1/500

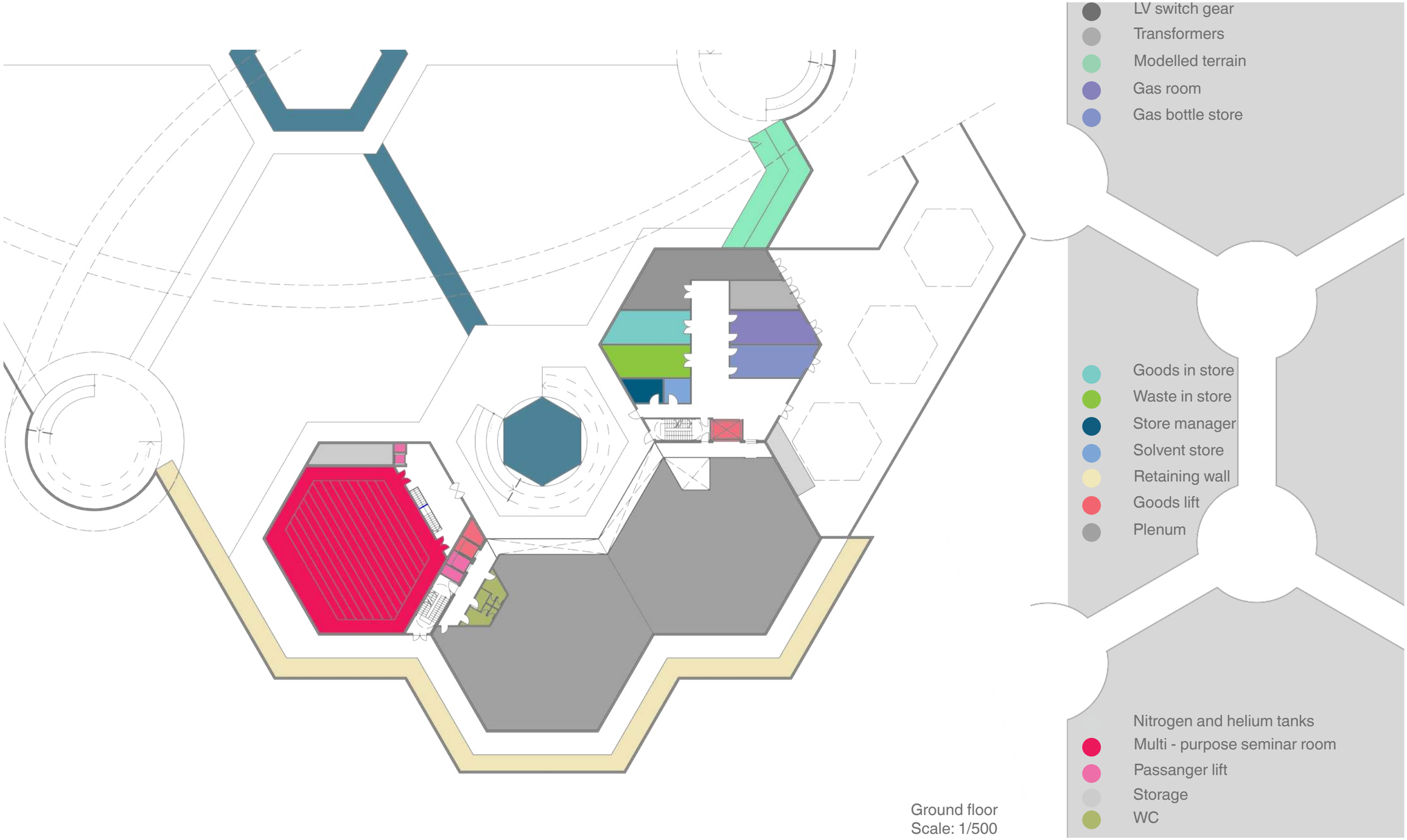


RE-MAP
[A.A]

ALBENA ATANASSOVA

PROGRAM EVOLUTION

As per my National Graphene Institute case study the lower ground of the building is position 3m into the ground. This floor plan hosts the main plant room, along with the necessary goods lift an clean rooms, located centrally with adjacent gown room and grey corridors for observation during experiments. The North -East side of the building is left for WCs, a public lift and a disable lift. The laser lab is also situated on this level due to vibration requirements.



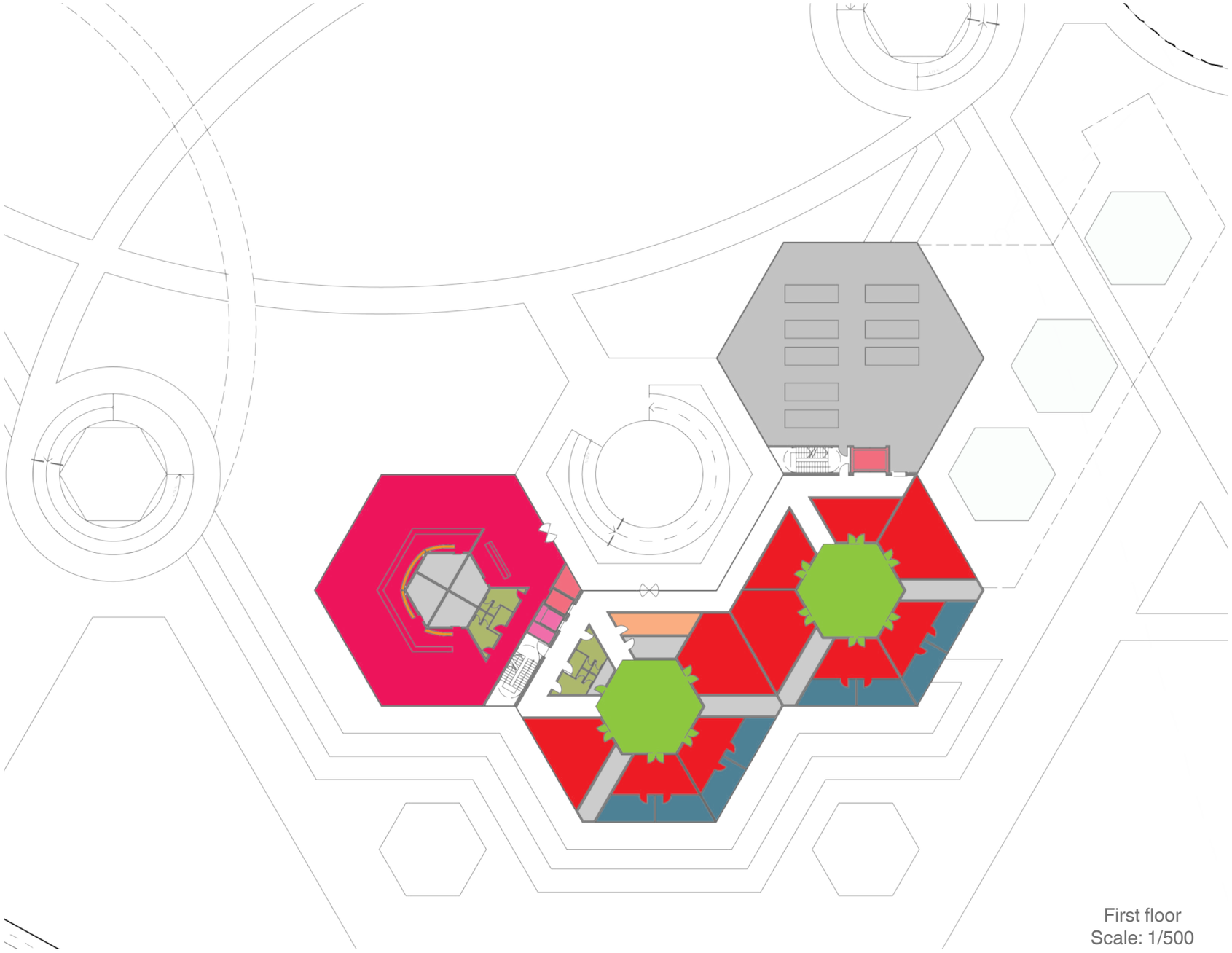
Ground floor
Scale: 1/500

RE-MAP
[A.A]

ALBENA ATANASSOVA

PROGRAM EVOLUTION

The ground floor accomodates a technical block on the west with Nitrogen and Helium tanks outside of the block and an underground access for goods delivery. The 2 central blocks are left for the plenum area above the cleanrooms, while the North -East block features a multifunctional seminar room open to the public.



First floor
Scale: 1/500

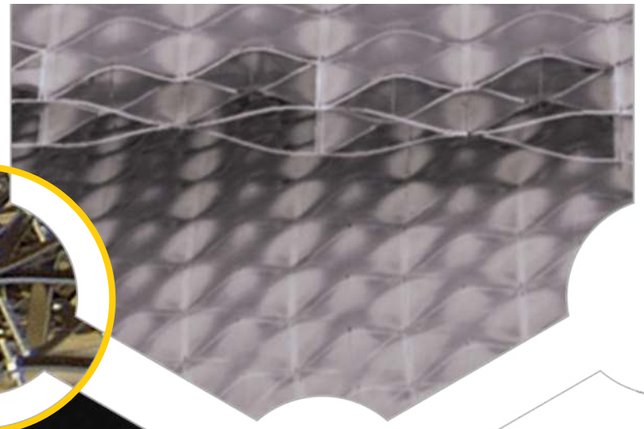
- Plant
- Skylighhts
- Grey corrindors, storage
- Goods lifts
- Passenger lifts
- Labs
- Break-out area
- Offices
- Interactive graphene wall
- Store with associated cafe
- Porters lodge
- WC

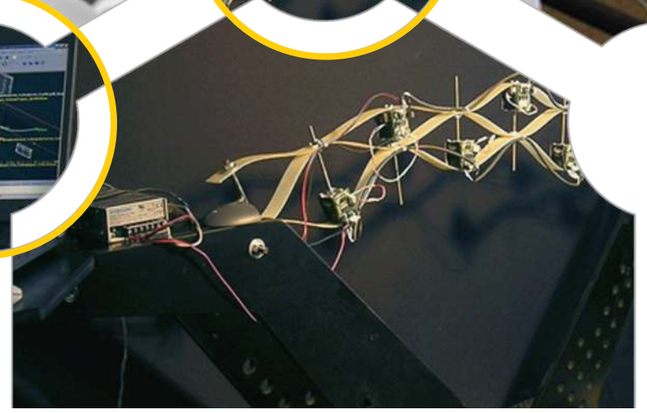
RE-MAP
[A.A]

ALBENA ATANASSOVA

PROGRAM EVOLUTION

The first floor provides natural northern light into the central block of the building where all laboratories and research offices are located. Break out areas are also provided. The space above the seminar room is transformed into a public cafe featuring an interactive graphene wall and a small shop, where the produced graphene paint would be distributed and sold.





HYBGRID_Adaptable architecture
http://hybrid-a.blogspot.co.uk/2008/07/hybgrid.html

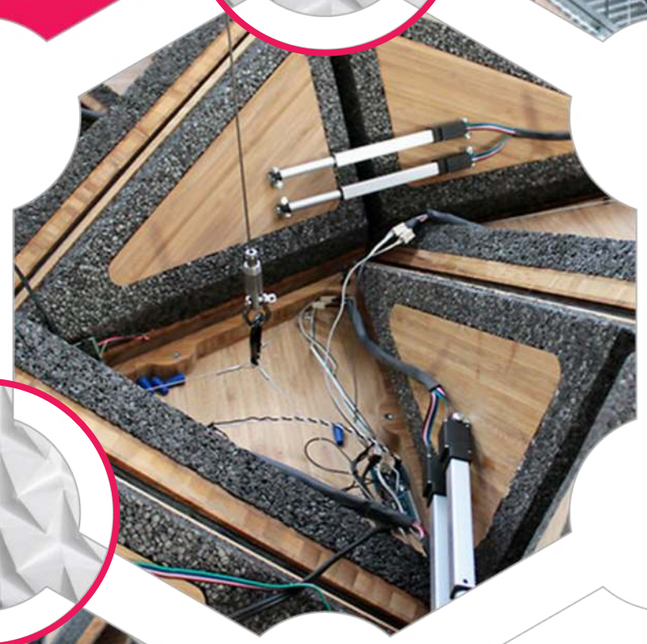
RE-MAP [A.A]

ALBENA ATANASSOVA

ADAPTABLE CANOPIES / RESEARCH

After establishing the plans for the graphene hub I then focused on the interactive graphene canopy that would cover the amphitheatre space. For inspiration and in order to better understand how my structure would move I looked at the following:

The HybGrid lightweight structural building system is able to automatically take different forms and is governed by a digital control system and an automated system activators. It consists of a physical structure and a digital system that controls and executes parametrically how changes in the physical structure occur. On a large scale it can be used as roofing panels and gateways fairgrounds, stadiums, warehouses, or as elements of avant-garde facade buildings (theGuggenheim in Bilbao is the most representative building). On a small scale it can be used as tents or pergolas.



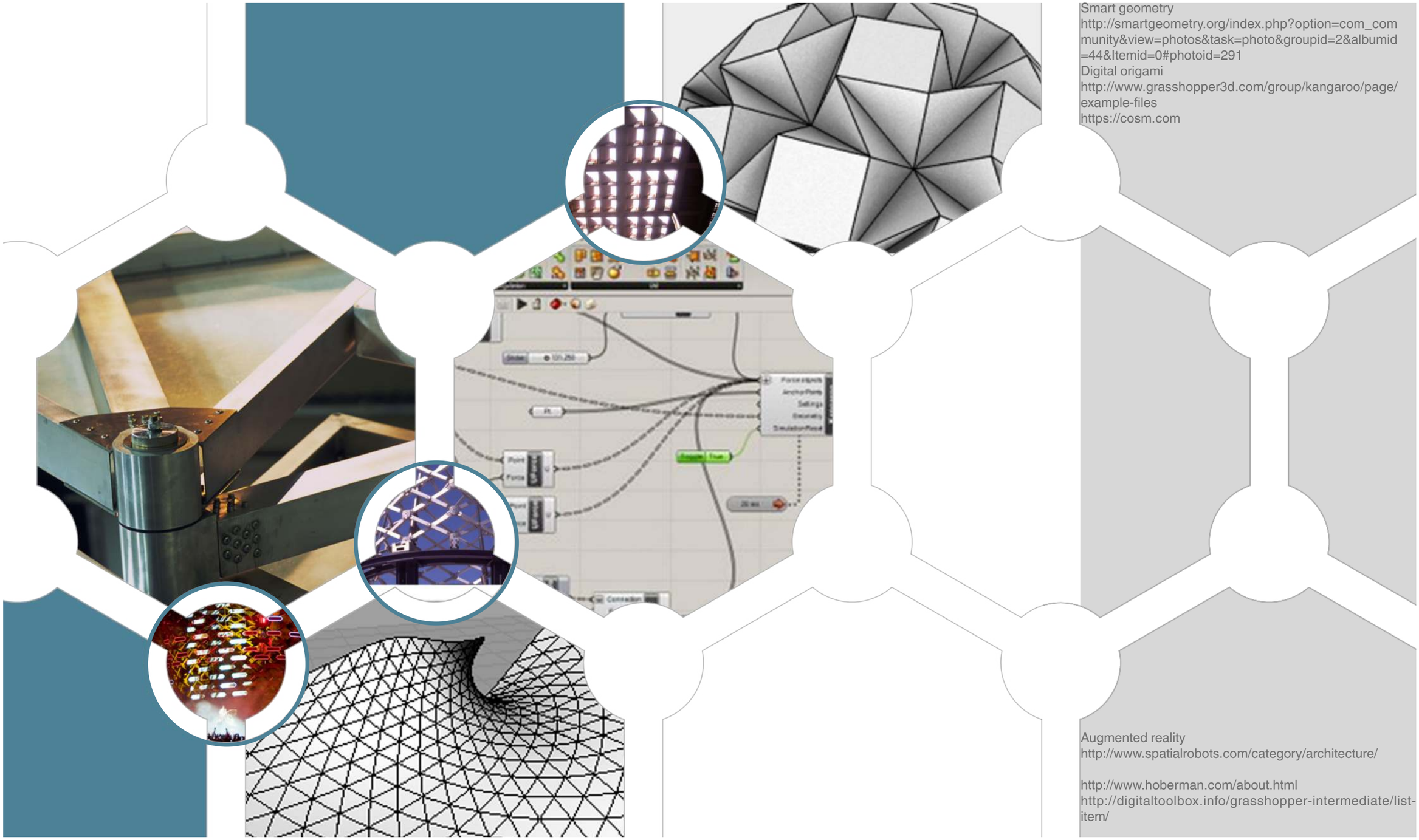
A Mechanical Roof Tweaks Concert Acoustics In Real Time
http://www.fastcodesign.com/1669640/a-mechanical-roof-tweaks-concert-acoustics-in-real-time#-5

RE-MAP [A.A]

ALBENA ATANASSOVA

ADAPTABLE CANOPIES / RESEARCH

The Resonant chamber system by RVTR engineers is described best as “rigid origami,” a collection of triangle panels that hang from a track, driven by motors to shift positions on command. The panels themselves come in three varieties: One is bamboo plywood, which reflects sound. Another is porous polypropylene, which absorbs it. And the third is actually a hollow panel that’s been filled with a speaker. With these three counterbalancing tools at its disposal, the Resonant Chamber can play chess with sound waves, creating a strategic structure to match any style of performance. Ultimately, with such a duplicable and adaptive system, RVTR could take over, not just the concert space, but any live environment in need of dynamic adjustment (busy restaurants come to mind).



Smart geometry
http://smartgeometry.org/index.php?option=com_community&view=photos&task=photo&groupid=2&albumid=44&Itemid=0#photoid=291
Digital origami
http://www.grasshopper3d.com/group/kangaroo/page/example-files
https://cosm.com

Augmented reality
http://www.spatialrobots.com/category/architecture/

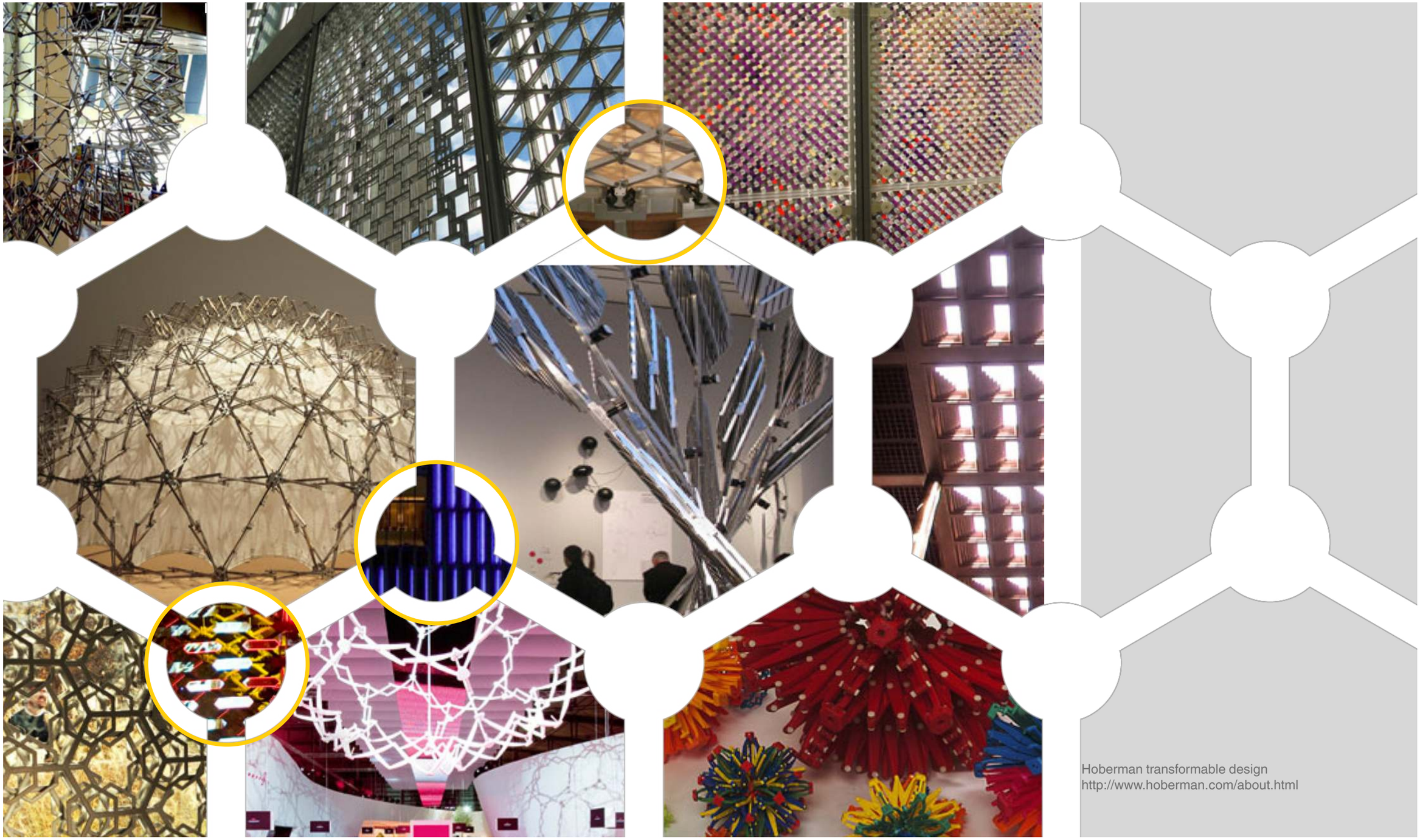
http://www.hoberman.com/about.html
http://digitaltoolbox.info/grasshopper-intermediate/list-item/

RE-MAP [A.A]

ALBENA ATANASSOVA

ADAPTABLE CANOPIES / RESEARCH

I further looked into design tools that I could utilise in order to create a canopy from a singular folded triangular module that could respond to live data streems. I looked into smart geometry designs and folded origami created with Grasshopper, gHowl and Kangaroo plug ins for Rhino.This project showcases a prototype of the AR environment devised at one to one scale to test the possibilities of augmented reality in the built environment. The project uses a simple architectural maze which people can navigate through in real-time. The prototype was developed for the iphone using Qualcomm Augmented Reality SDK and Xcode.



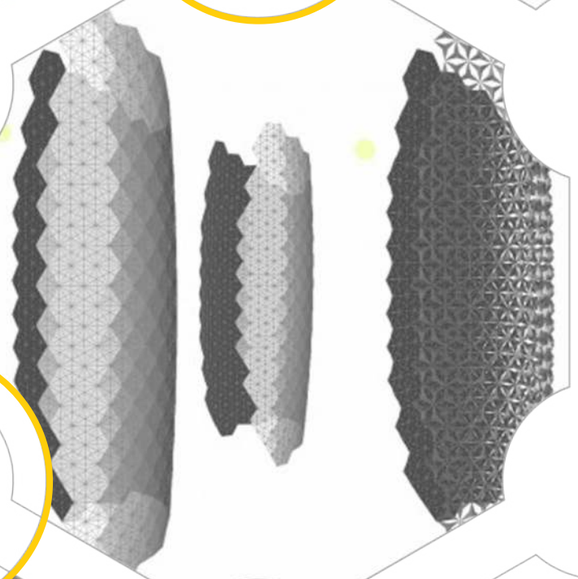
Hoberman transformable design
http://www.hoberman.com/about.html

RE-MAP
[A.A]

ALBENA ATANASSOVA

ADAPTABLE CANOPIES / RESEARCH

Finally I looked into Hobermans specification and structural requirements along with some detail drawings of simular “transformable structures “ in order to further improve my canopy design through built prototypes.

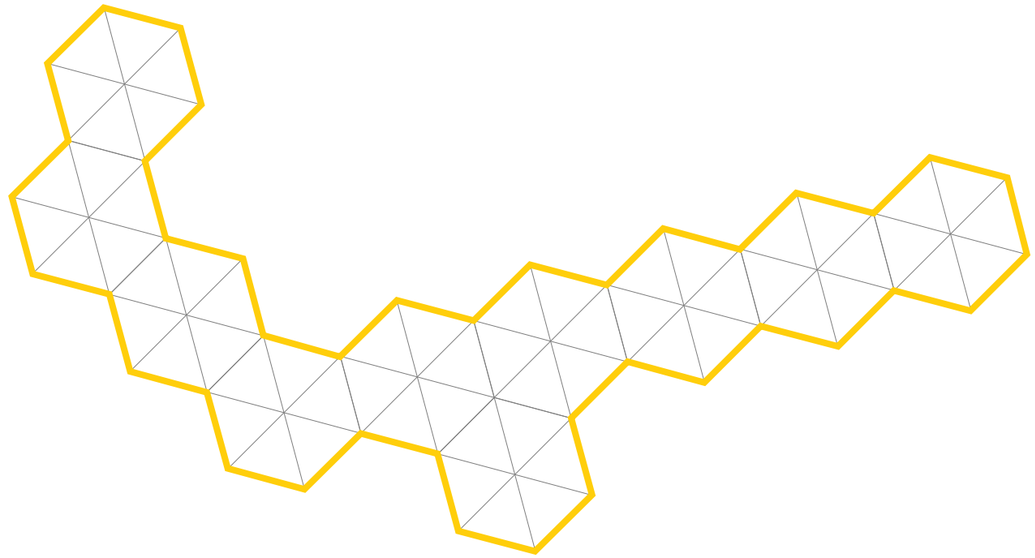


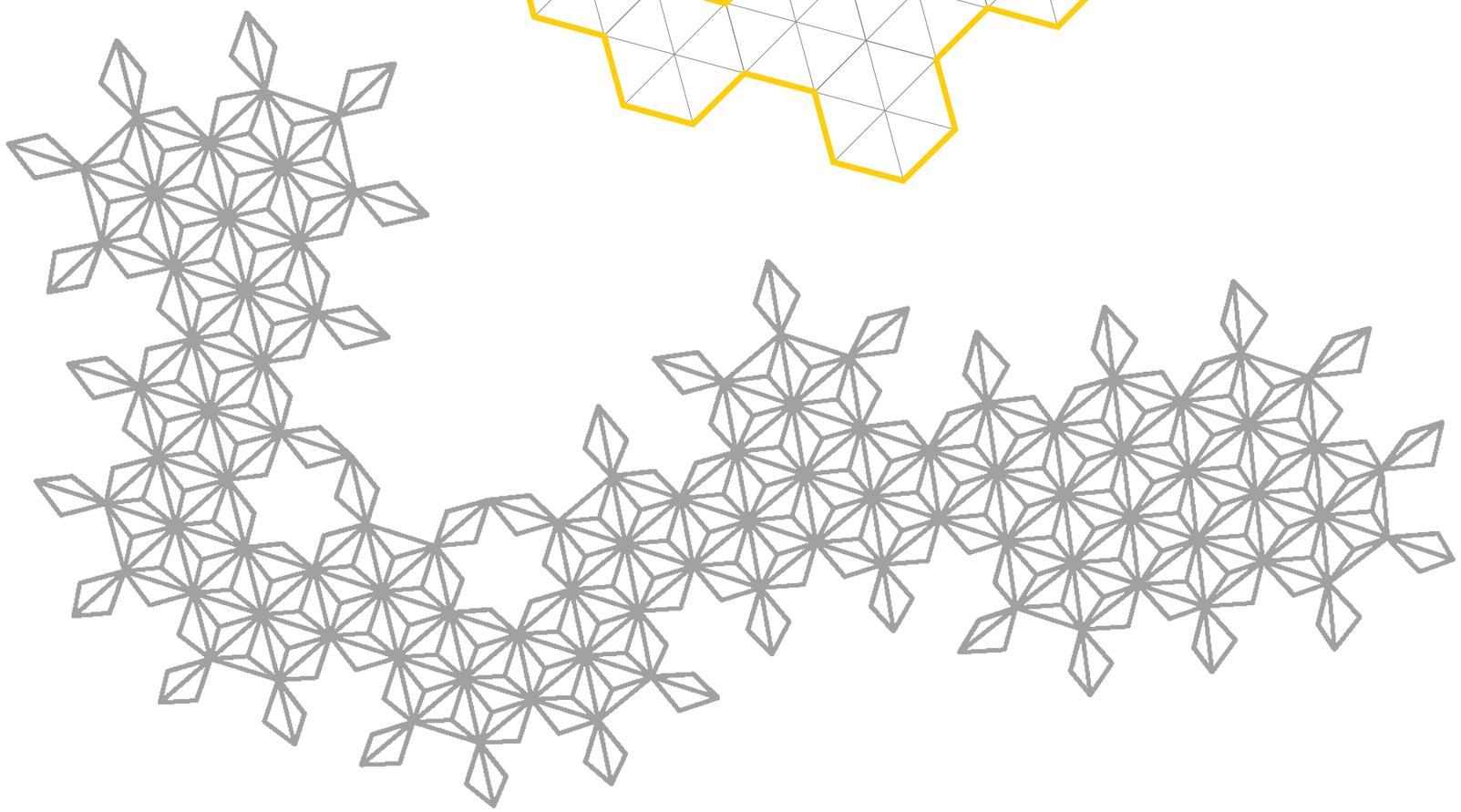
RE-MAP [A.A]

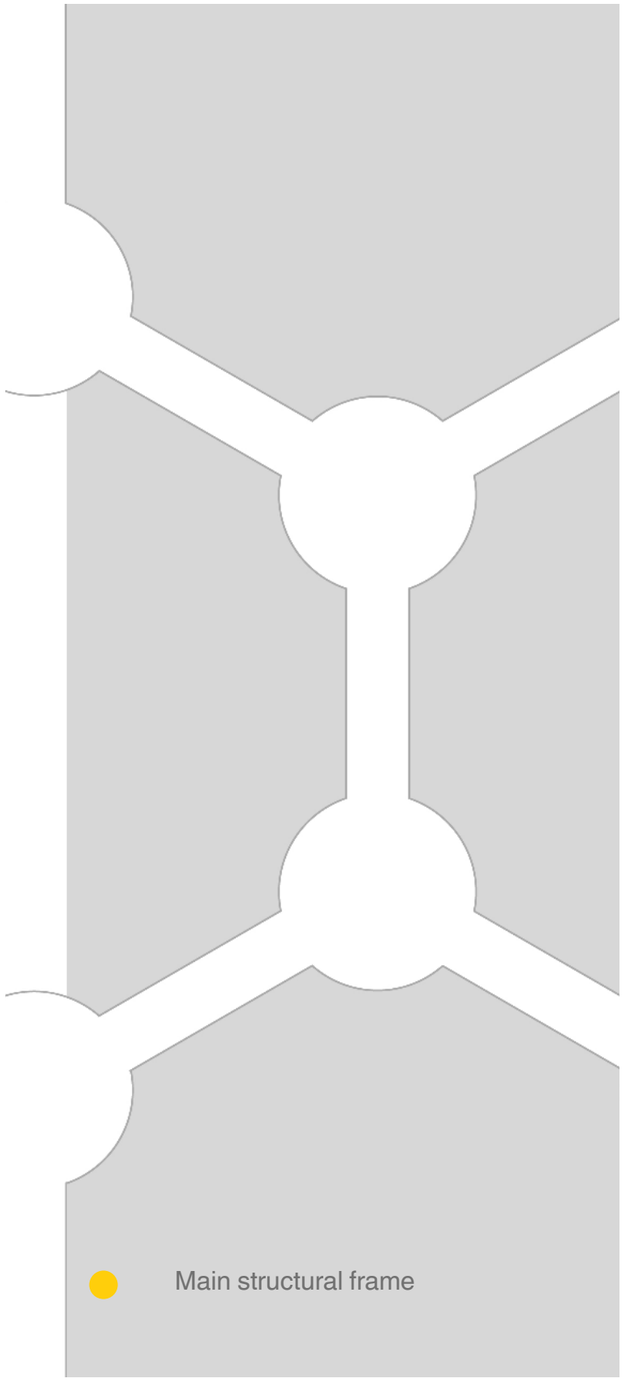
ALBENA ATANASSOVA

ADAPTABLE CANOPIES / AL BAHAR TOWERS, DUBAI

The screen opperates as a curtain wall, sitting two meters outside the buildings' exterior on an independent frame. Each triangle is coated with fiberglass and programmed to respond to the movement of the sun as a way to reduce solar gain and glare. In the evening, all the screens will close. "At night they will all fold, so they will all close, so you'll see more of the facade. As the sun rises in the morning in the east, the mashrabiya along the east of the building will all begin to close and as the sun moves round the building, then that whole vertical strip of mashrabiya will move with the sun," Such a screen will reducing solar gain by more than 50 percent, and reduce the building's need for energy-draining air conditioning. Plus, the shade's ability to filter the light has allowed the architects to be more selective in glass finished.







RE-MAP
[A.A]

ALBENA ATANASSOVA

SHAPE PROGRESSION

After looking at some precedents on different types of canopies, I decided to experiment with a struture derived from hexagons, split into equilateral triangels. The idea here is that the main structure is formed from a metal hexagon shaped frame that holds the canopy and all other triangular elements fold in and out of that frame.

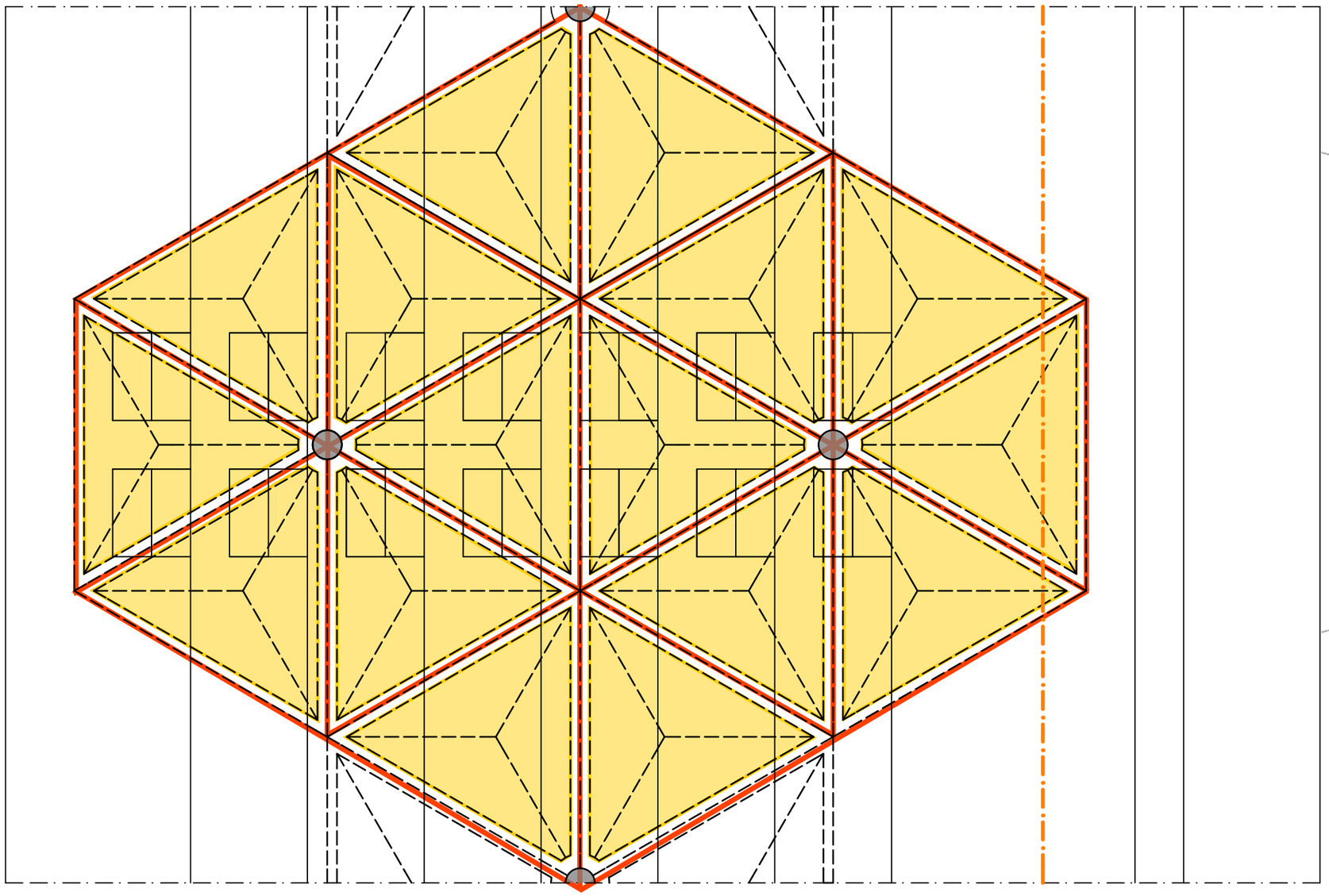
http://materiability.com/phototropia/

RE-MAP
[A . A]

ALBENA ATANASSOVA

SHAPE MOVEMENT / PRECEDENTS

In terms of movement I looked at simular structures that have been created/ experimented with before and how they would move/fold.



Scale: 1/50

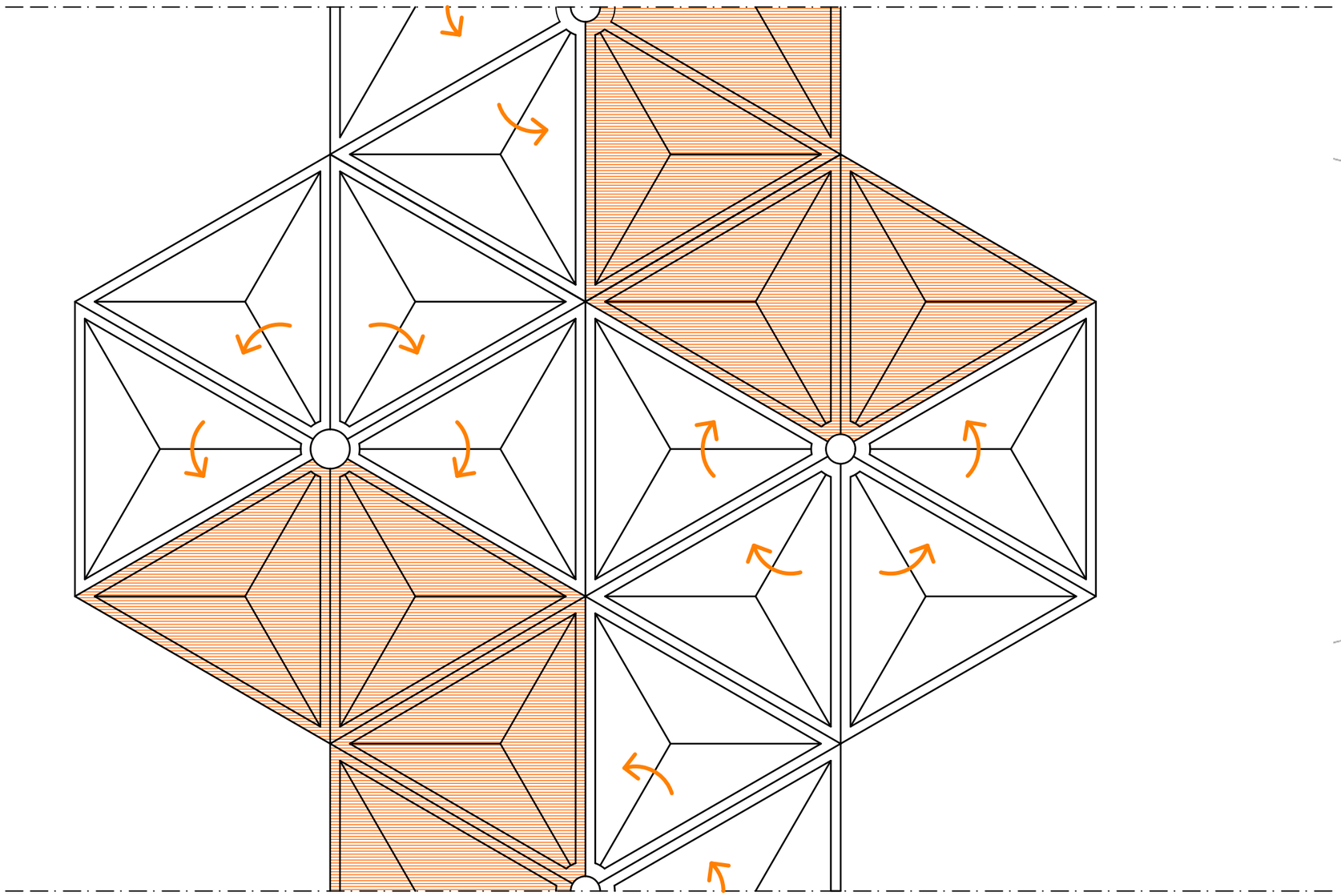
RE-MAP
[A.A]

ALBENA ATANASSOVA

SHAPE PROGRESSION

Here I elaborated on the previous idea in plan view in order to establish the weights and distribution of forces along the frame which lead to a slight modification of the initial idea. I also looked at potential materials I could use for the construction of the frame and my idea was to elaborate on the various properties of graphene, mainly strength in terms of the construction frame and columns and thin glass for the triangular panels with applied layers of graphene in order to transform the glass into a PV cell esentially.

The drawing is a plan view of the cross section through the amphitheatre.



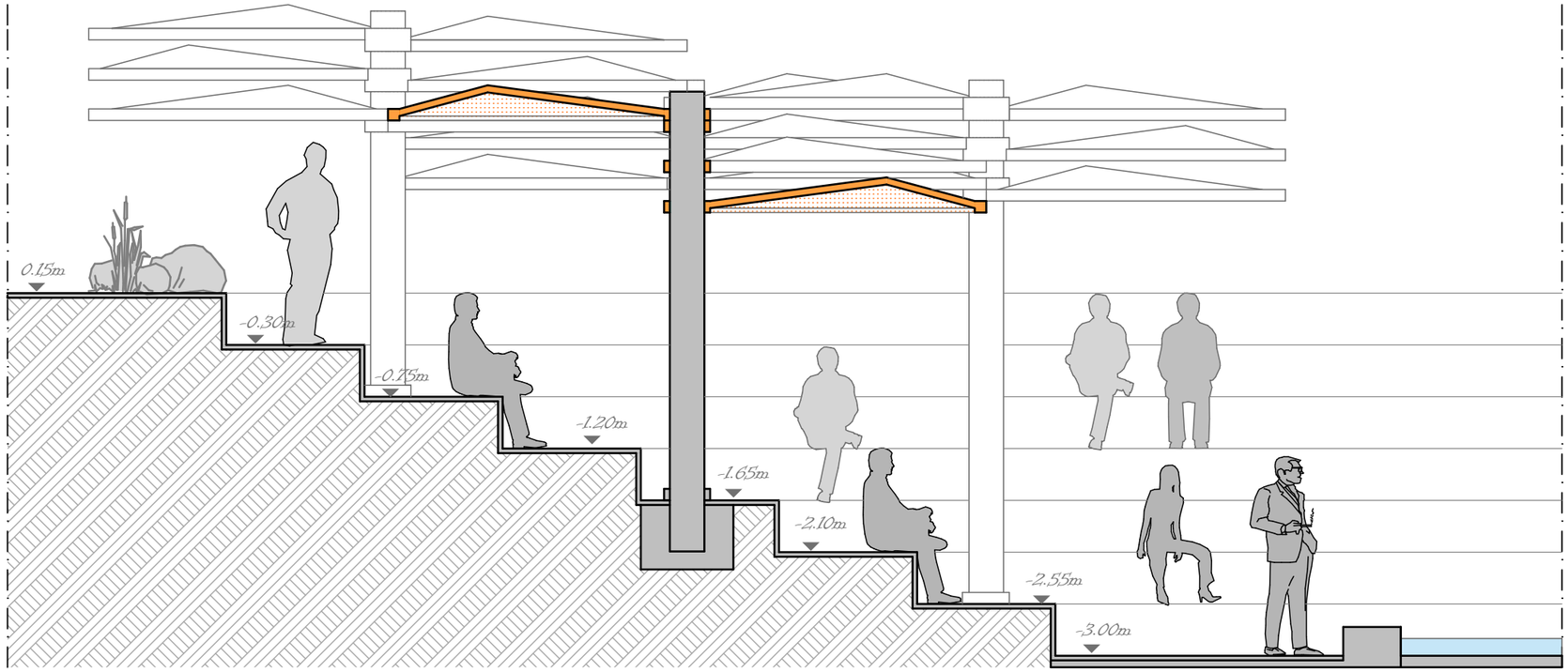
Scale: 1/50

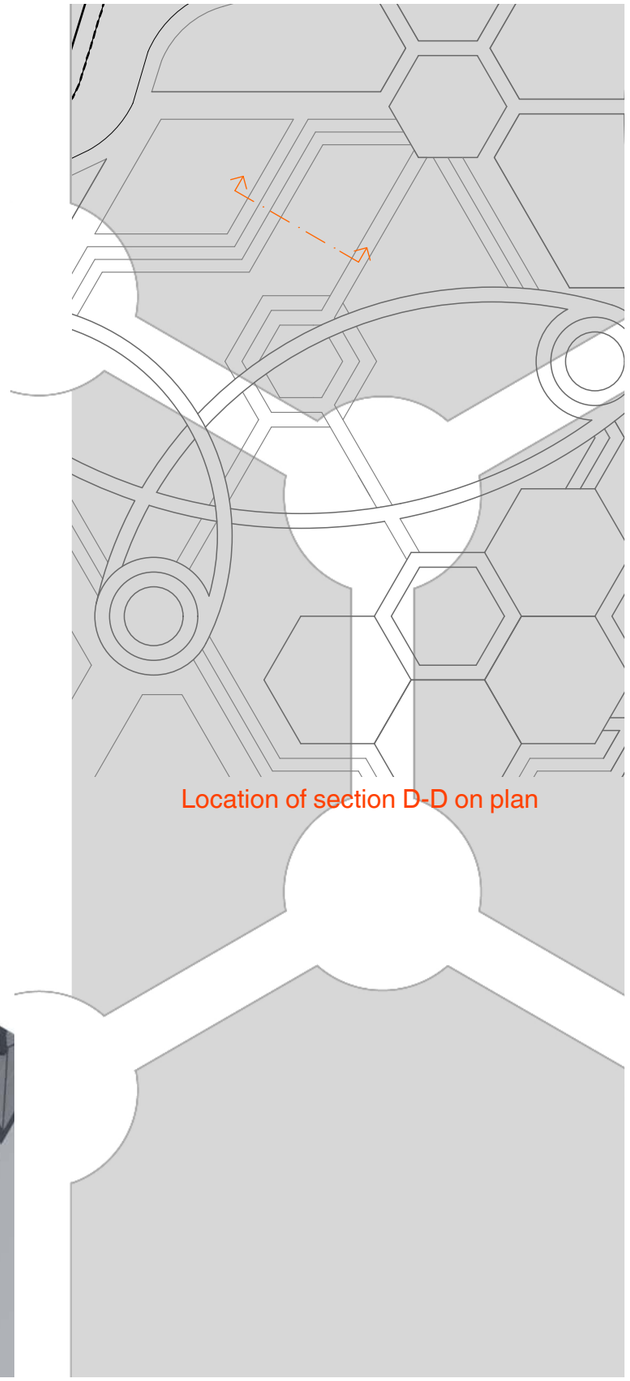
RE-MAP [A.A]

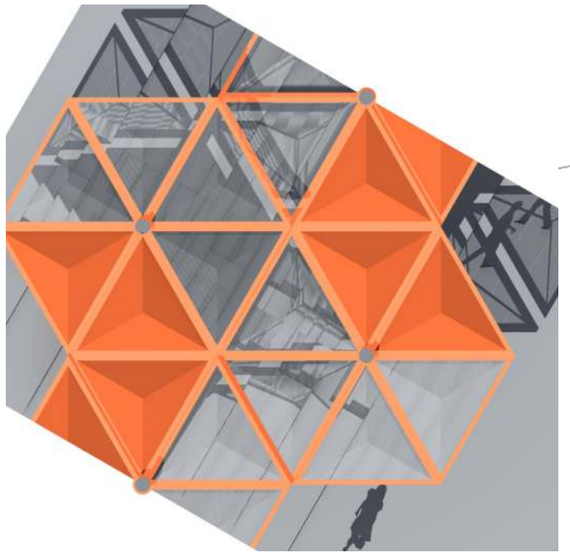
ALBENA ATANASSOVA

SHAPE PROGRESSION

My next task was to look at how the panels would actually move. For this bit I used a simulation in Grasshopper that enabled me to see how each traingular unit would react to the ones adjacent to it. Following this, I came up with a design where some of the panels would remain open and the rest woulf fold in and out of the latter. The canopy would respond to weather conditions in a way that when its sunny it would be folded, creating shaded spaces, whereas when its raining it would unfold, protecting the people underneath. At night it is envisioned that the energy generated during the day from the fixed panels would then be used as a heating system, allowing for an all day use of the amphitheatre.







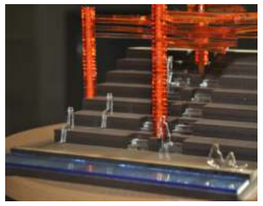
Scale: 1/50

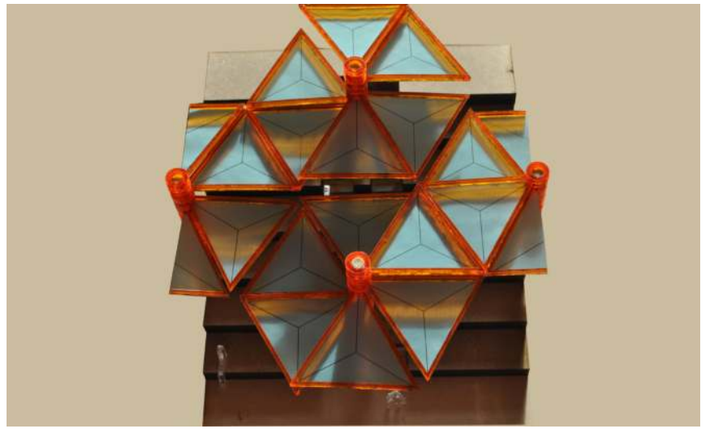
RE-MAP [A.A]

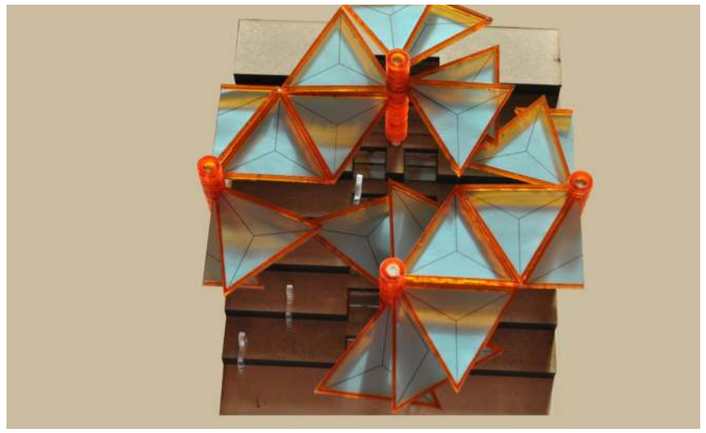
ALBENA ATANASSOVA

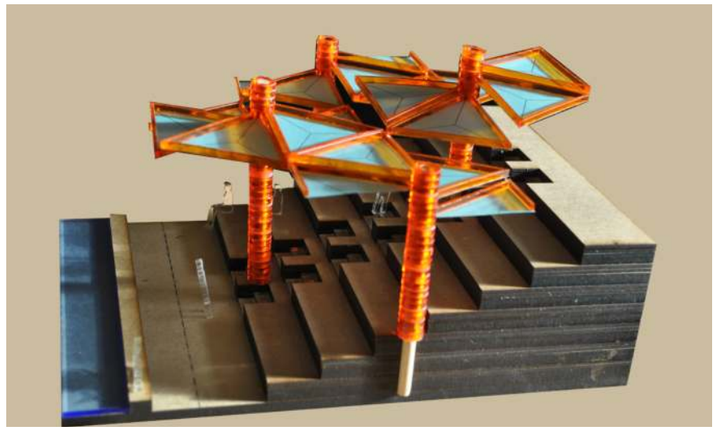
SHAPE PROGRESSION

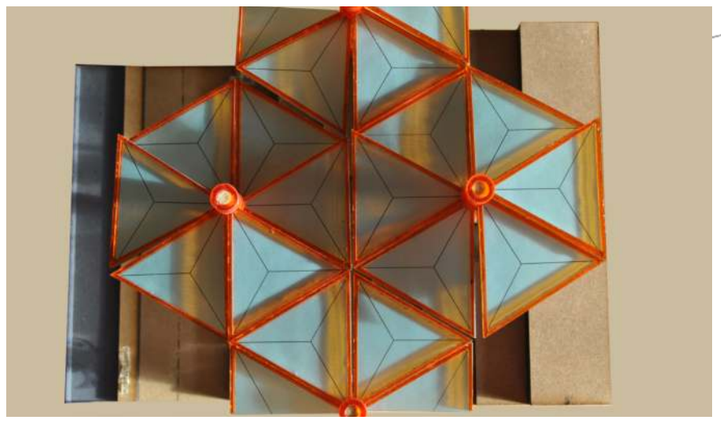
My final analysis of the canopy resulted in the construction of a sectional model, with folding elements that would allow me to test the folding strategy developed previously.

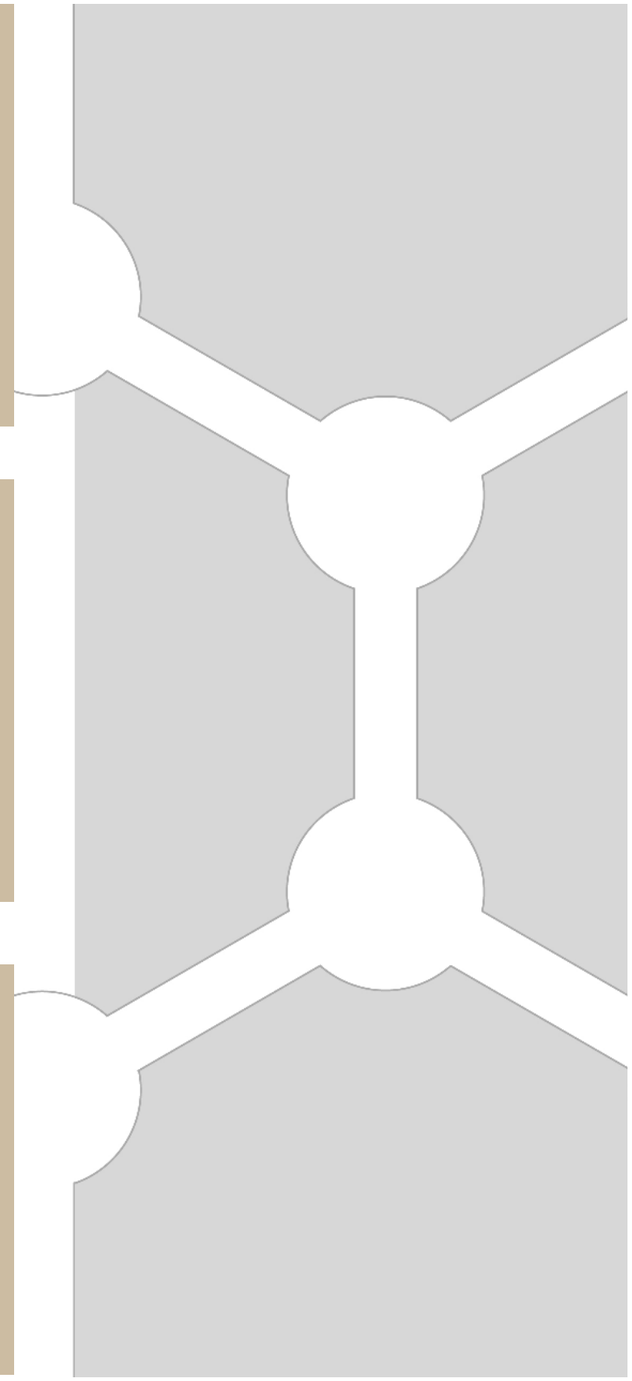












Scale: 1/50

RE-MAP
[A.A]

ALBENA ATANASSOVA

MODELS

The model tests the canopy at a 1:50 scale and demonstrates the mechanism according to which it could fold in and out in one single plane.

RE-MAP
[A . A]

ALBENA ATANASSOVA

DEMAKERSVAN FENCING / PRECEDENTS

After looking at some precedents on different types of canopies I decided to experiment with a struture derived from hexagons, split into equilateral triangels.

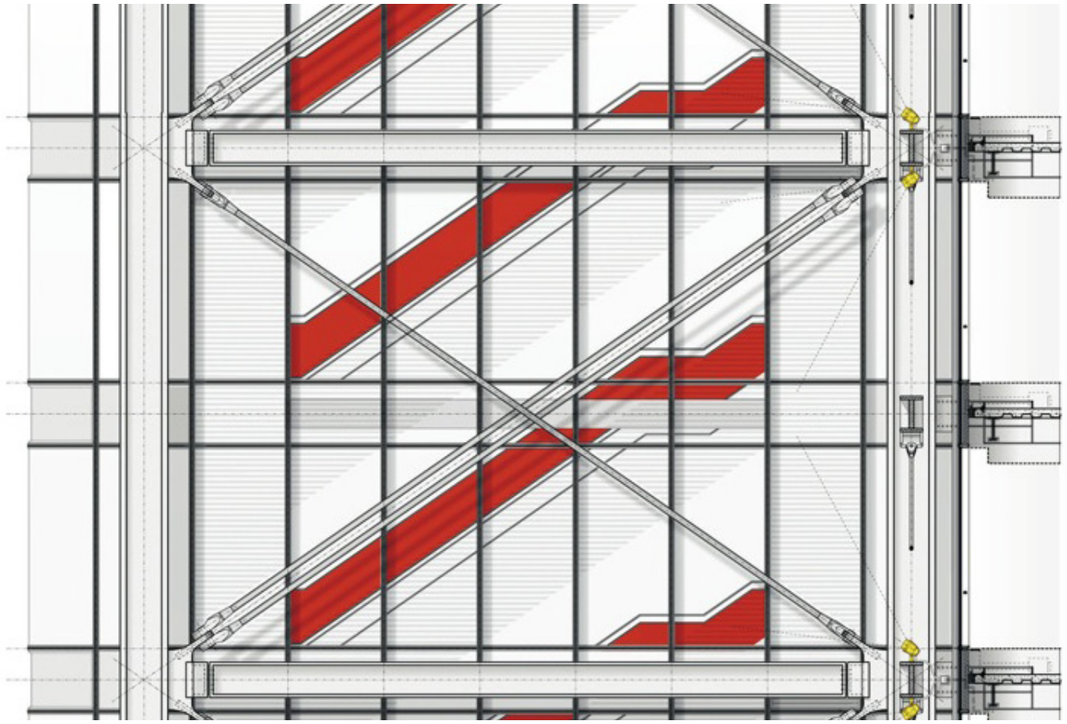
New York Times Building, RPBW

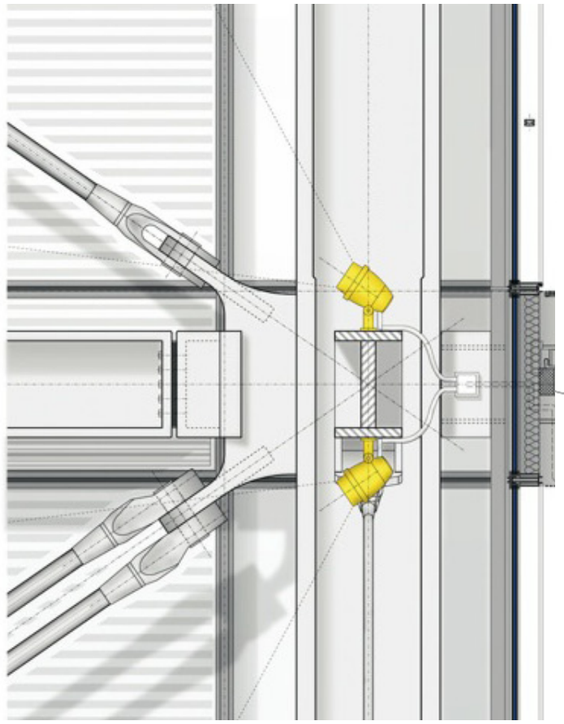
RE-MAP [A.A]

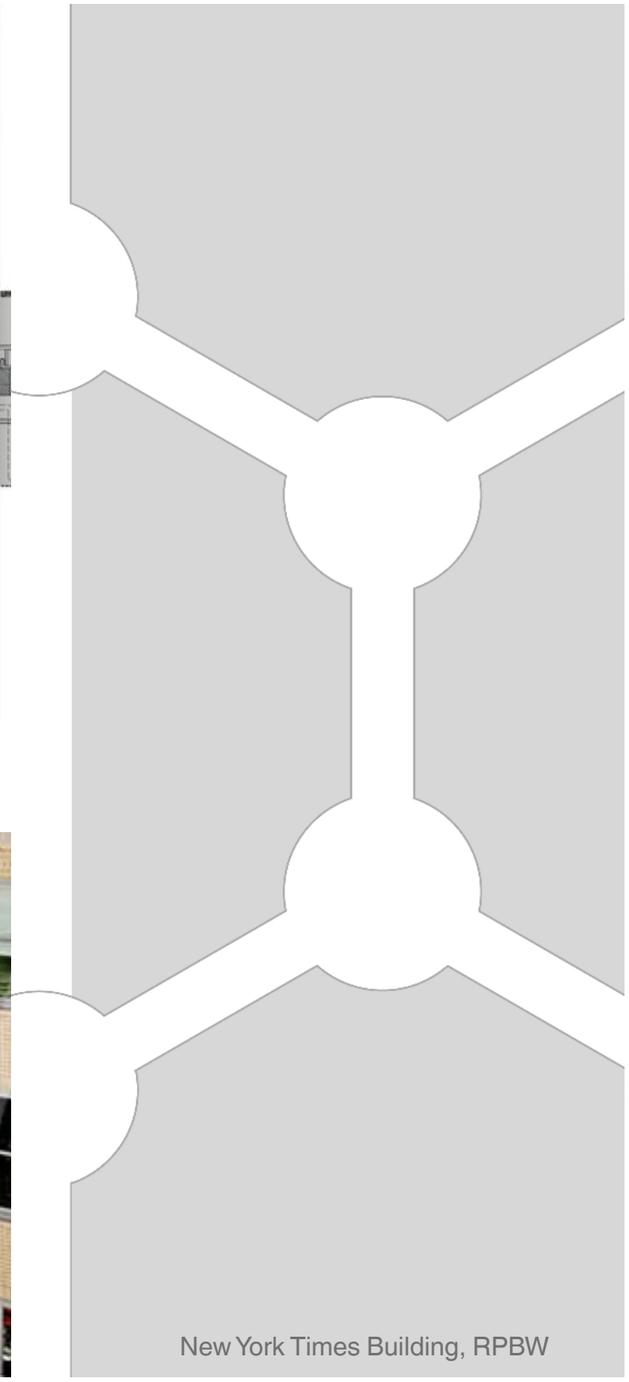
ALBENA ATANASSOVA

DOUBLE SKIN / PRECEDENTS

I then looked at buildings that use simular mesh structures as double skins and some of the detailing associated with them. This would help me establish a way to interpret the interactive canopy structure onto the fixed research hub of my scheme in order to bring more integrity of the overall design.







RE-MAP
[A . A]

ALBENA ATANASSOVA

DOUBLE / PRECEDENTS

The facades of the tower are a combination of glass curtain wall and a scrim of white ceramic tubes. This scrim, positioned 610mm from the structure, acts as an energy efficient sunscreen. In my project this could work quite well if the canopy was interpreted as a double skin/mesh on the research hub, which in itself would reduce unnnecessary glare and optimize north lighting for research offices and labs.

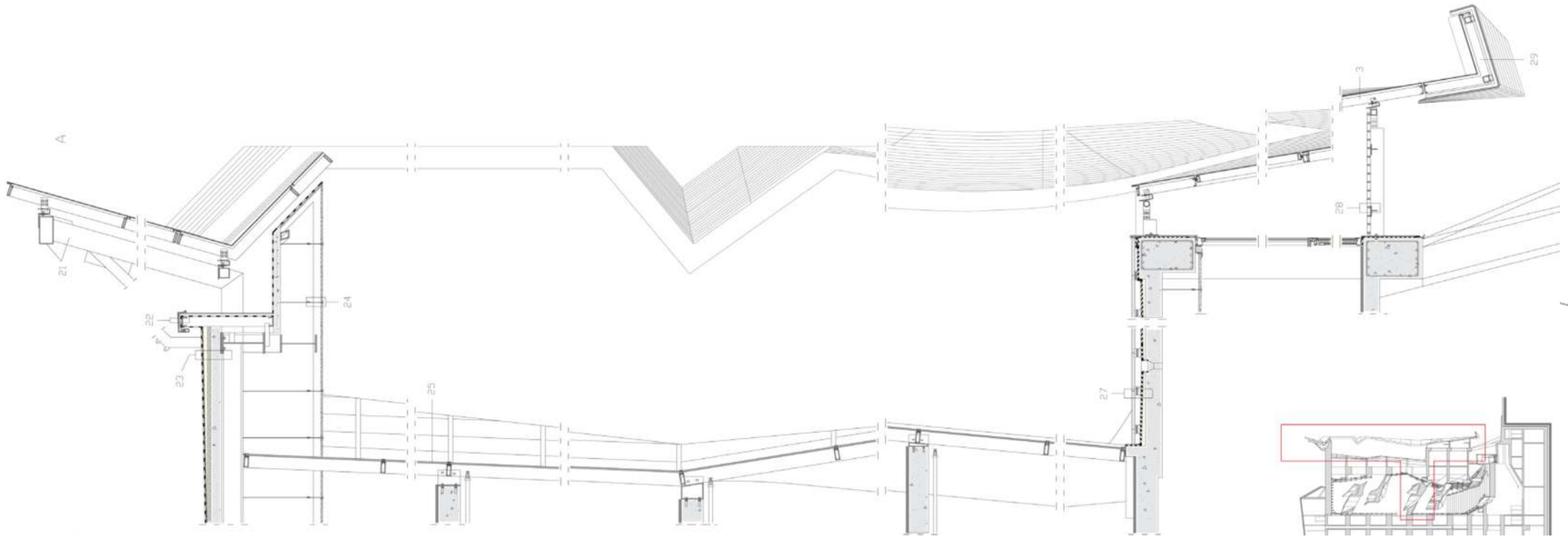
Cooper Union, Morphosis

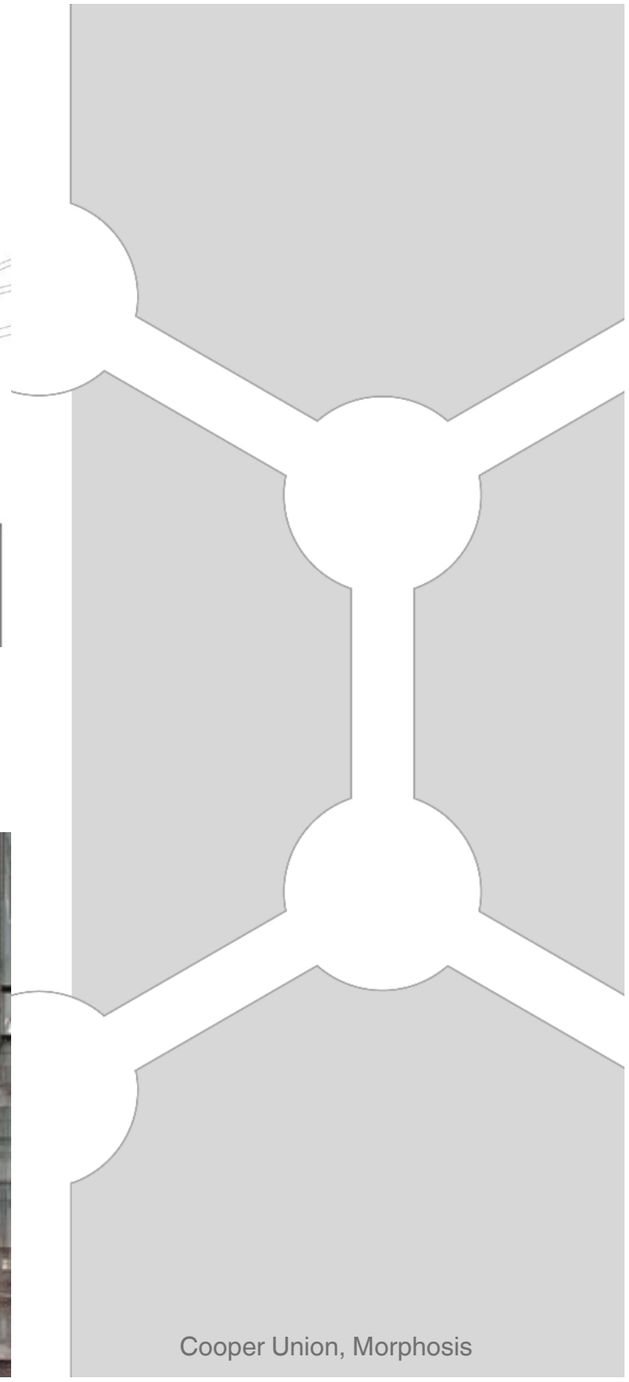
RE-MAP
[A.A]

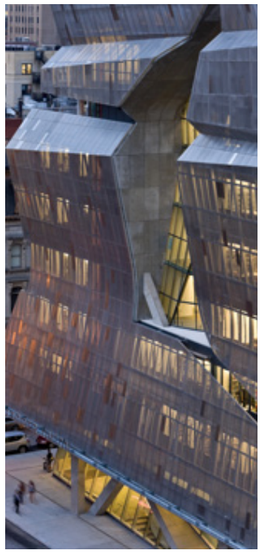
ALBENA ATANASSOVA

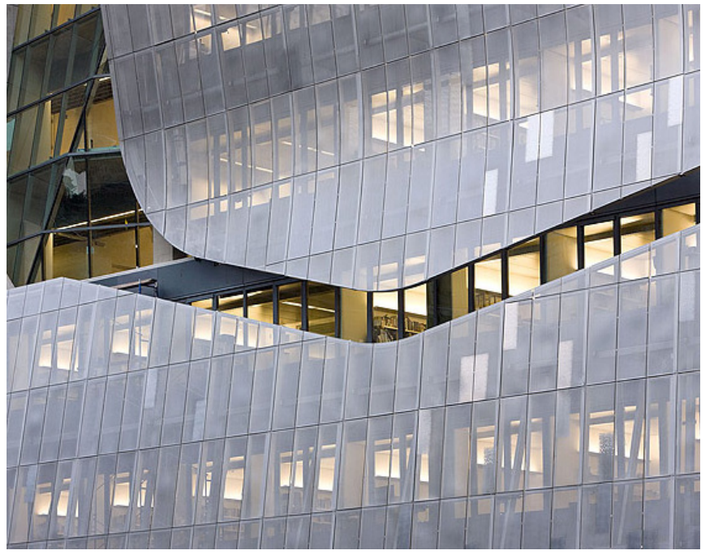
DOUBLE SKIN / PRECEDENTS

Another building I quite liked for my case study was the Cooper Union building in New York by Morphosis. It uses the same principle of a double skin structure.







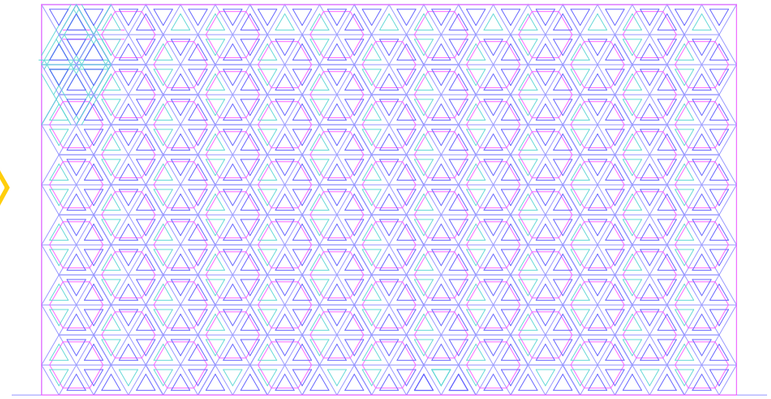


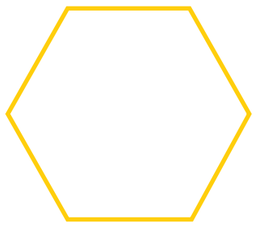
RE-MAP
[A . A]

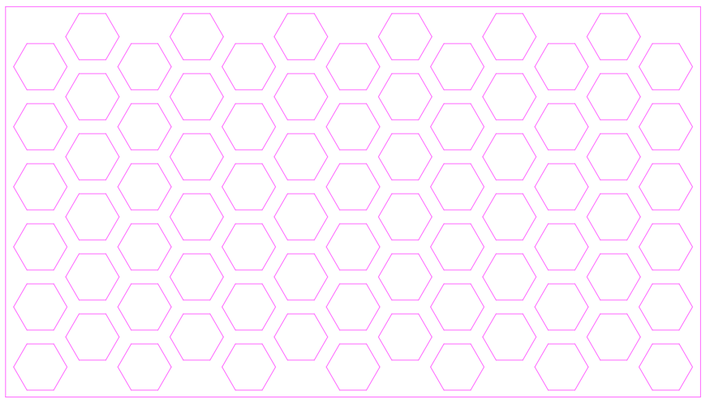
ALBENA ATANASSOVA

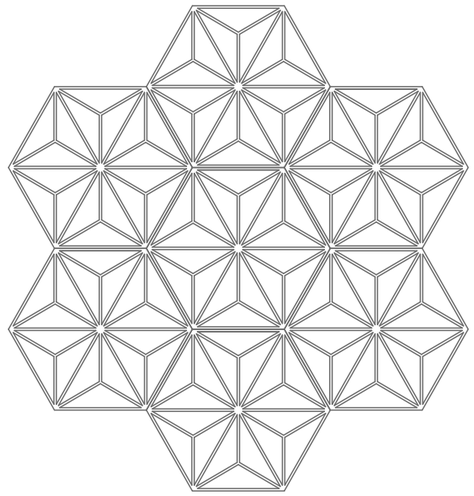
DOUBLE SKIN / PRECEDENTS

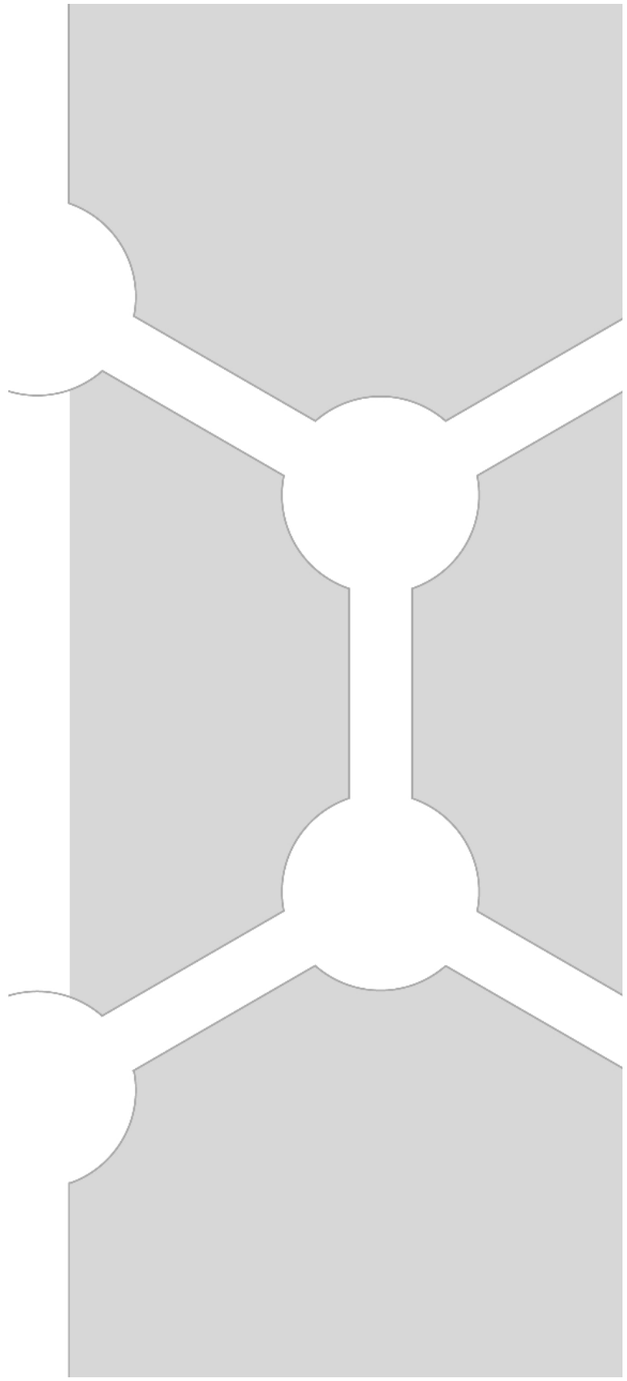
41 Cooper Square features second skin of perforated metal, a giant screen of shallow compound curves cut into by a central window that drops down from the parapet line and loops to the south as a kind of skybound loggia. The stainless steel is affected of course by sunlight and by the artificial light of the city.

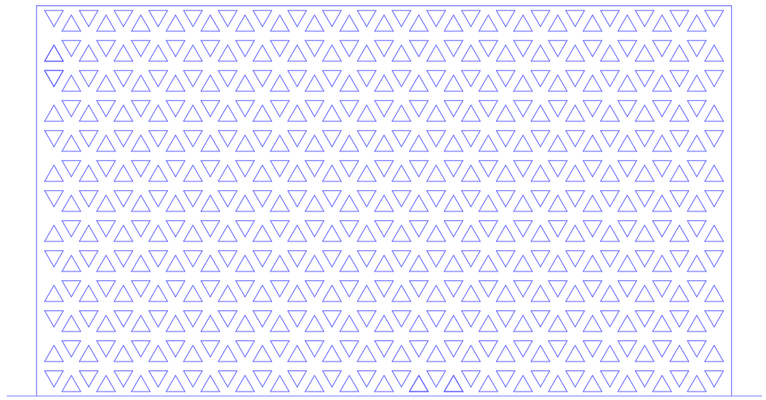










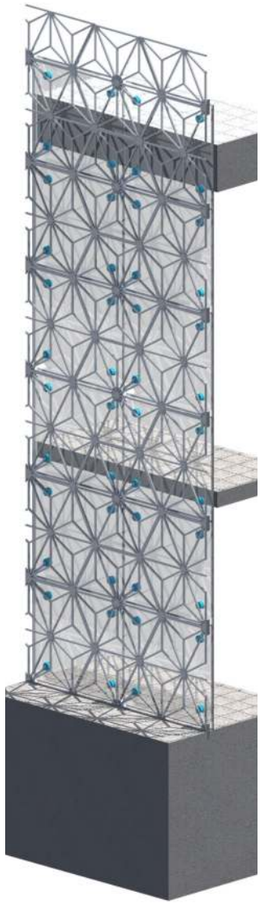


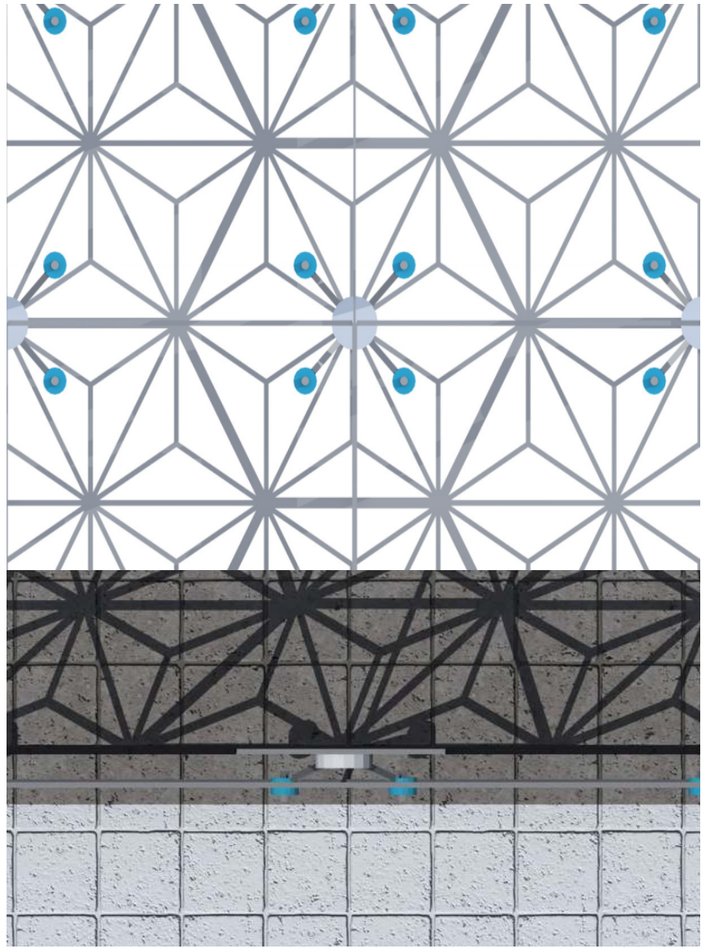
RE-MAP
[A.A]

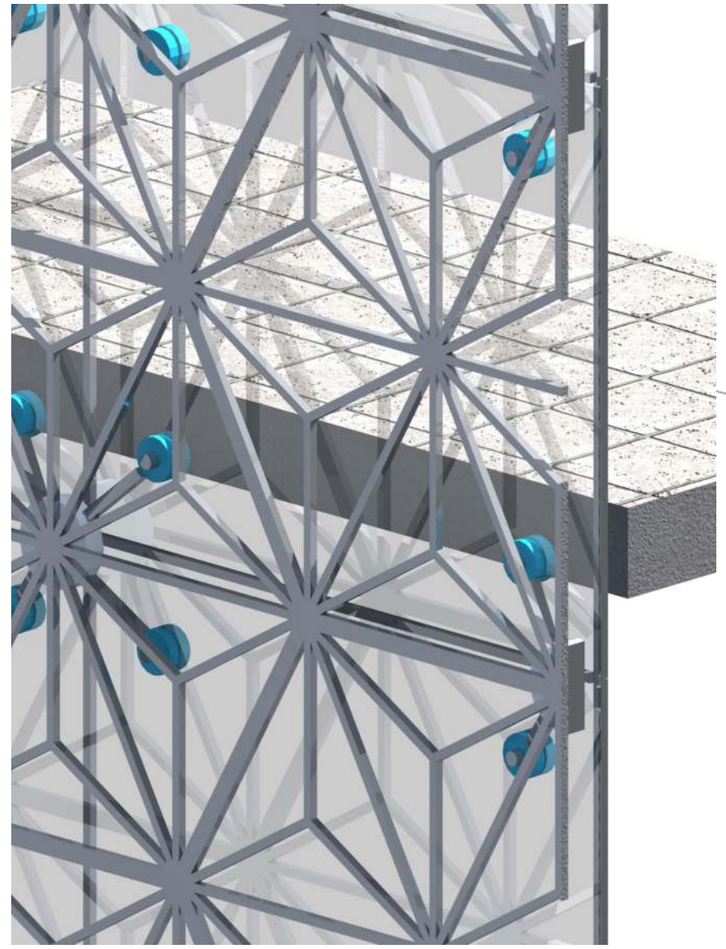
ALBENA ATANASSOVA

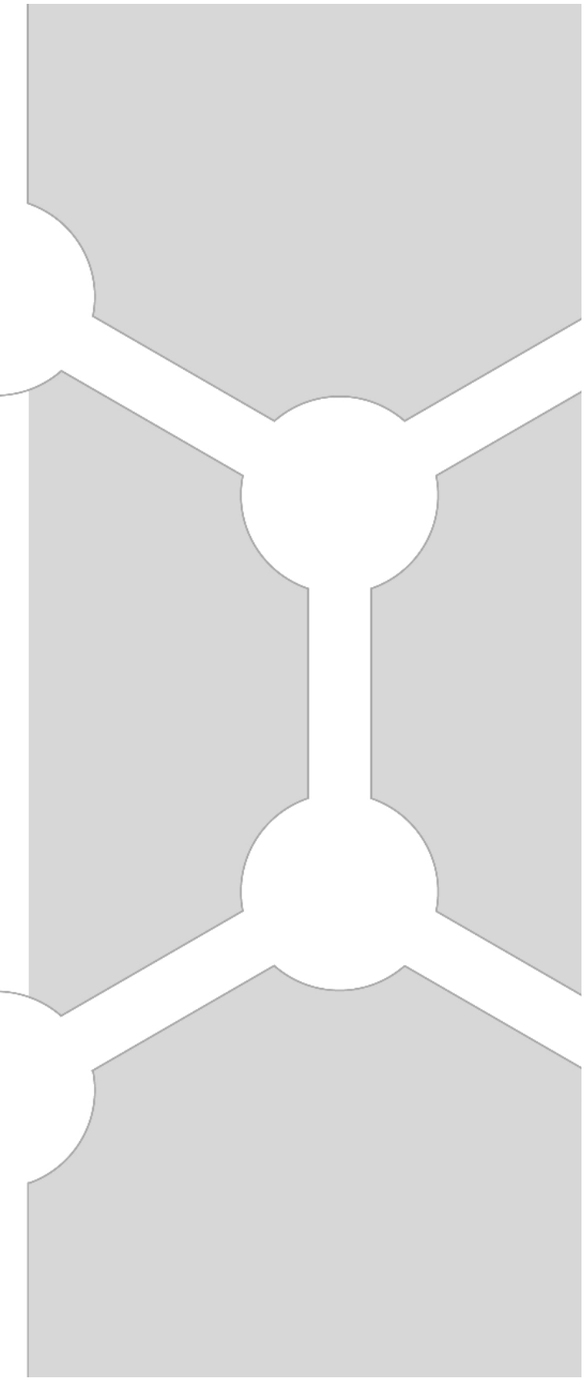
ELEVATIONAL STUDIES

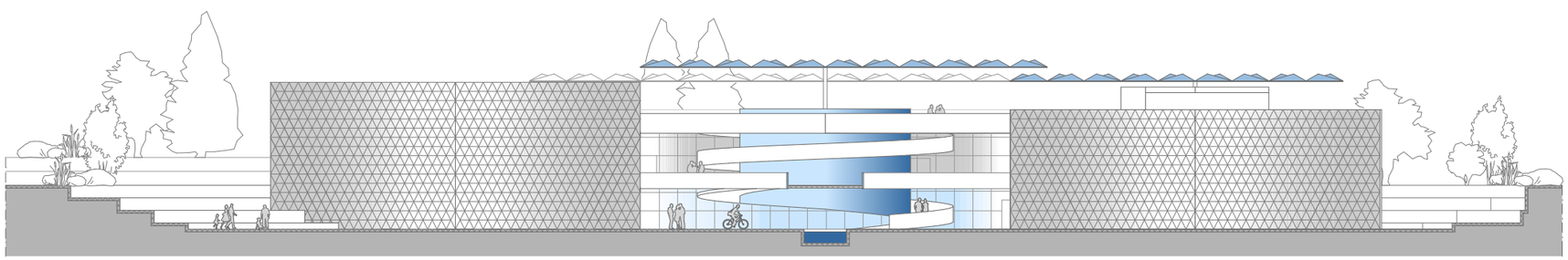
I then looked into different types of separating the elevation so that it corresponds and reads as the pattern of the canopy, although it remains still.









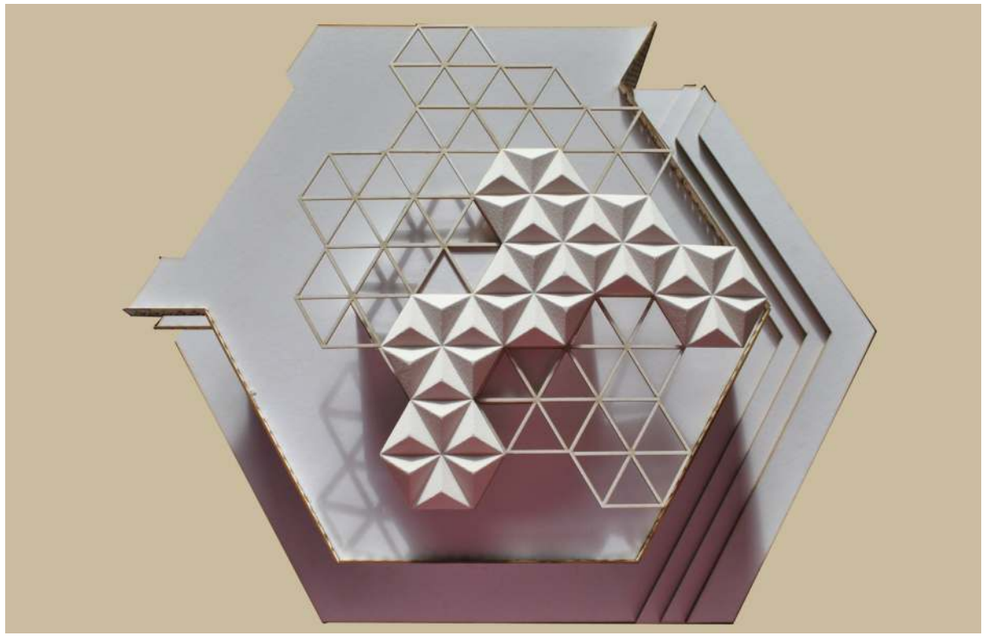


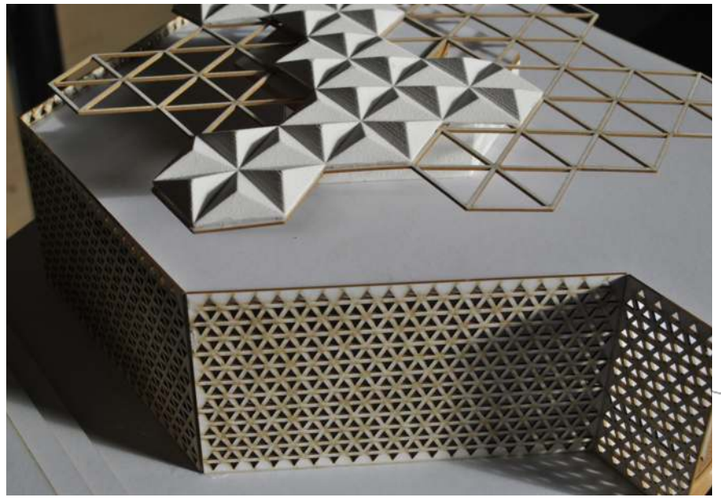
RE-MAP
[A.A]

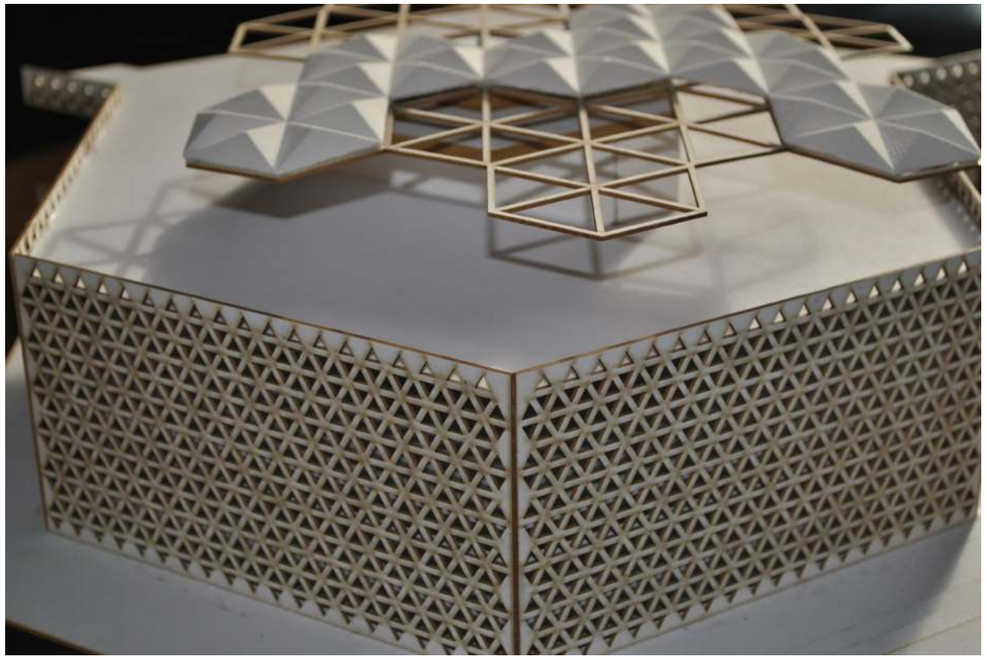
ALBENA ATANASSOVA

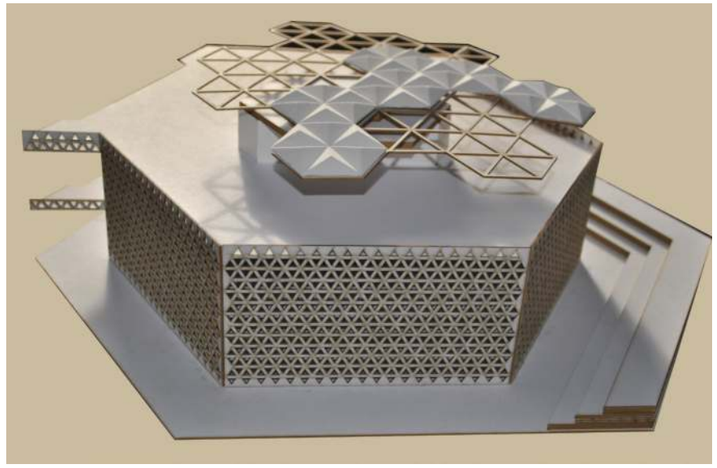
ELEVATIONAL STUDIES

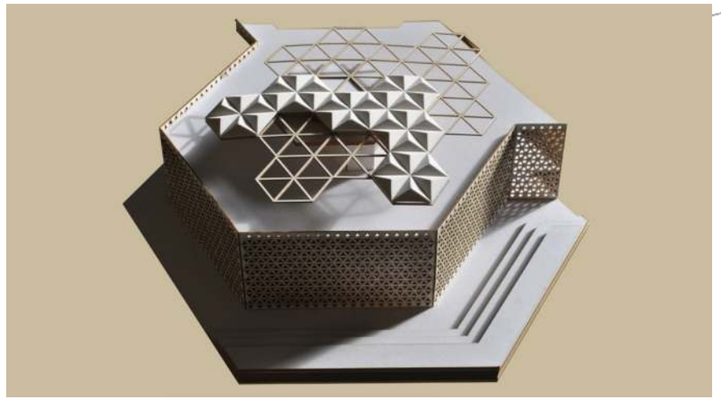
Here I tried to preserve the initial idea of hexagons and triangels but apply it as a double skin to the fasade of the re-search hub.

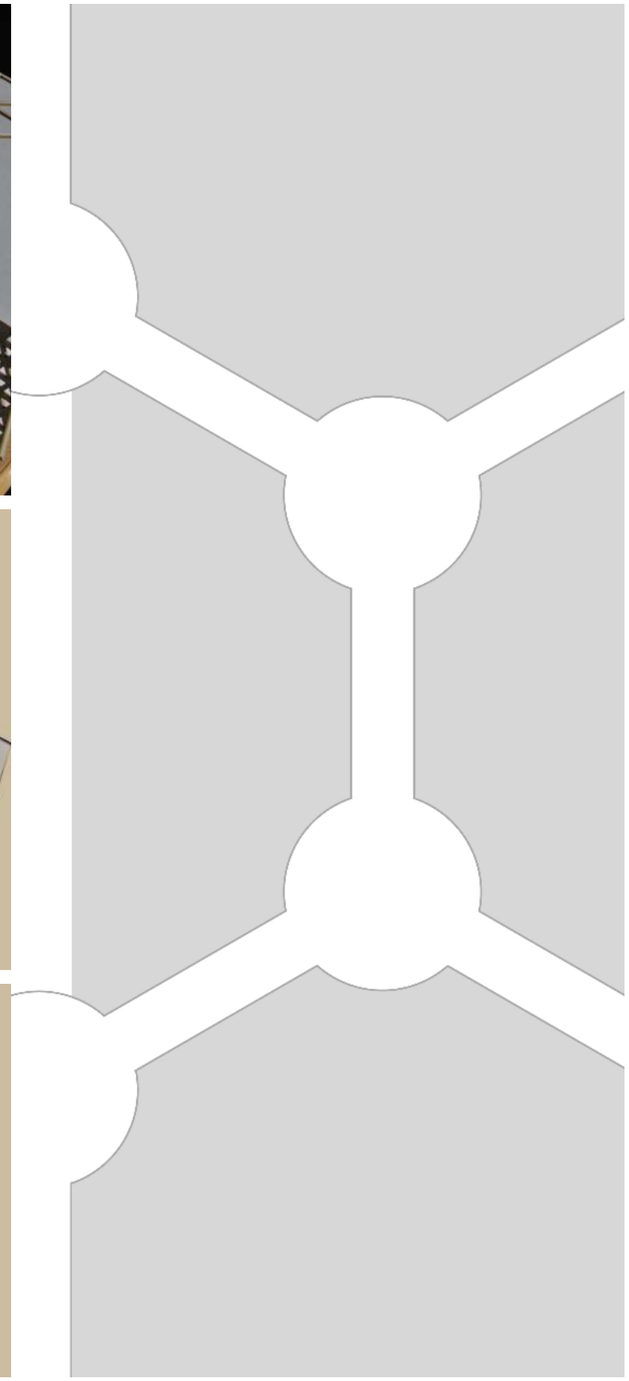












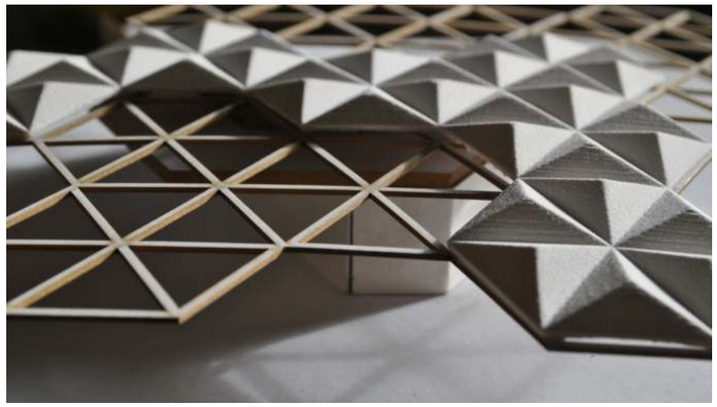
Scale: 1/100

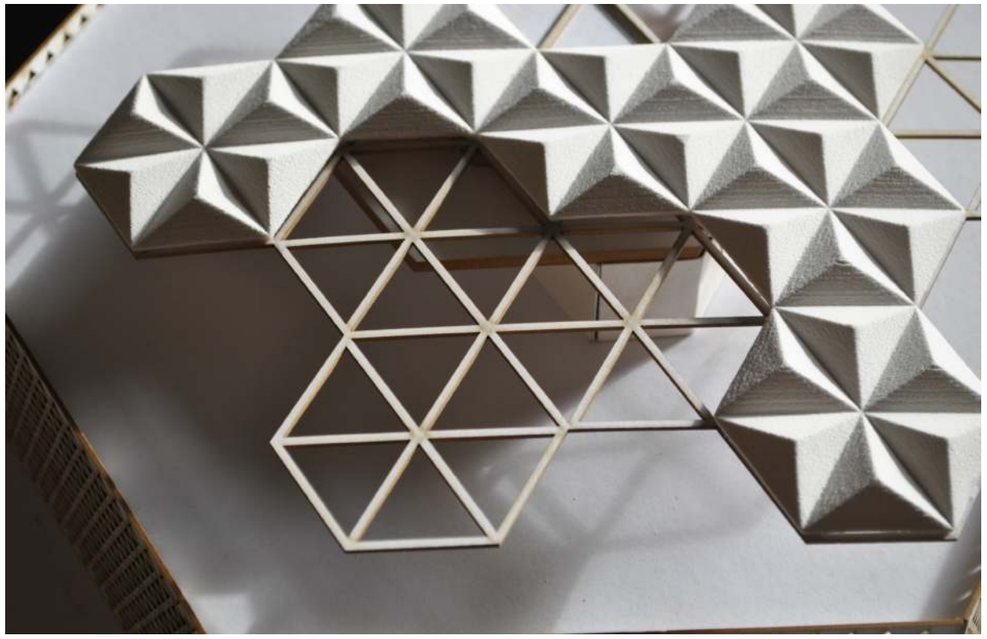
RE-MAP
[A.A]

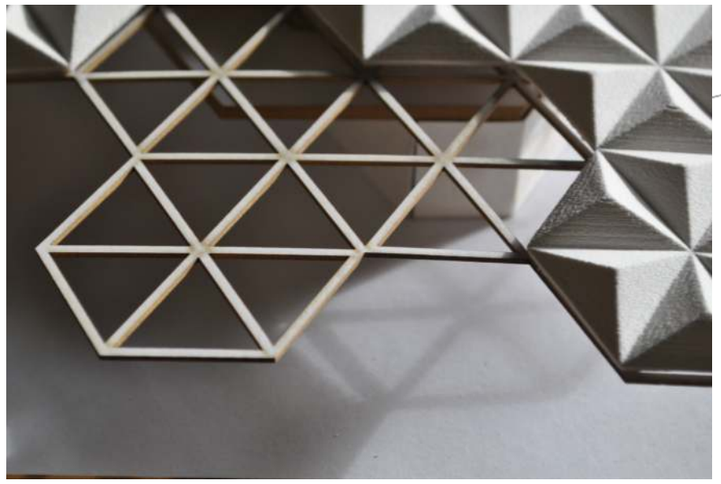
ALBENA ATANASSOVA

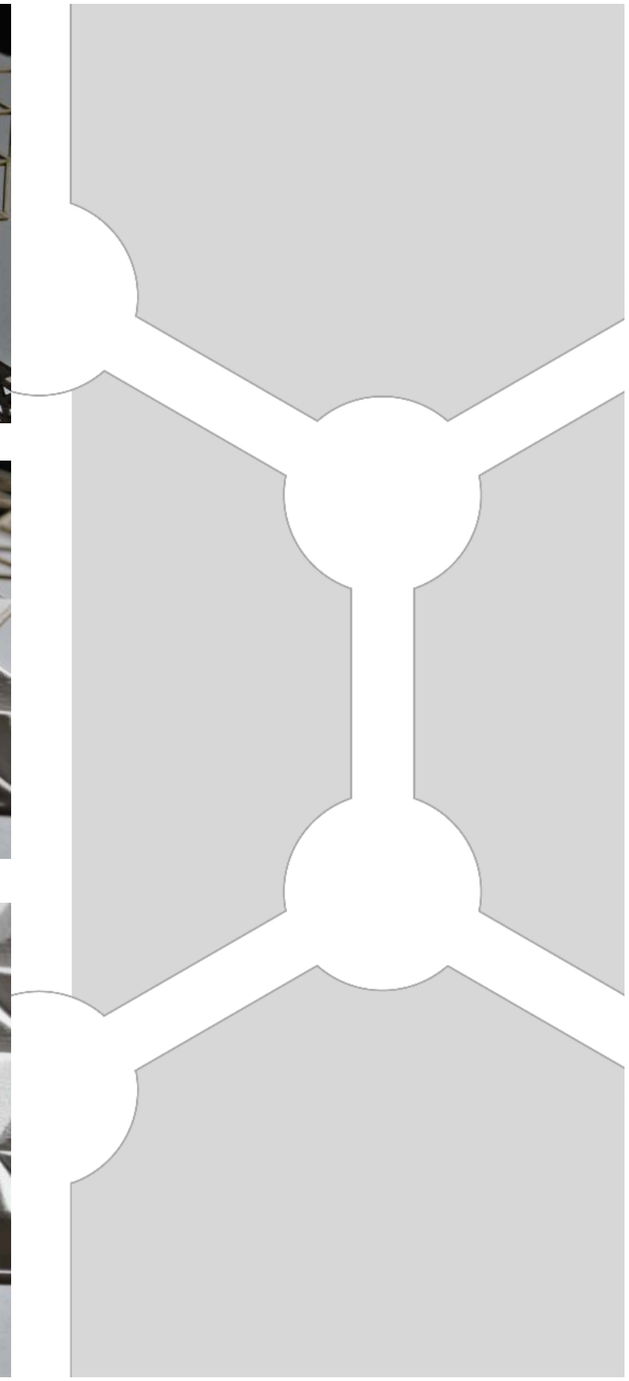
MODELS

The model demonstrates at a 1:100 scale the elevation in context with the roof biodiverse roof and the canopy on top. The cast model of the canopy aimed to demonstrate a thickness of 1.5mm simular to the thickness of a couple of graphene layers.









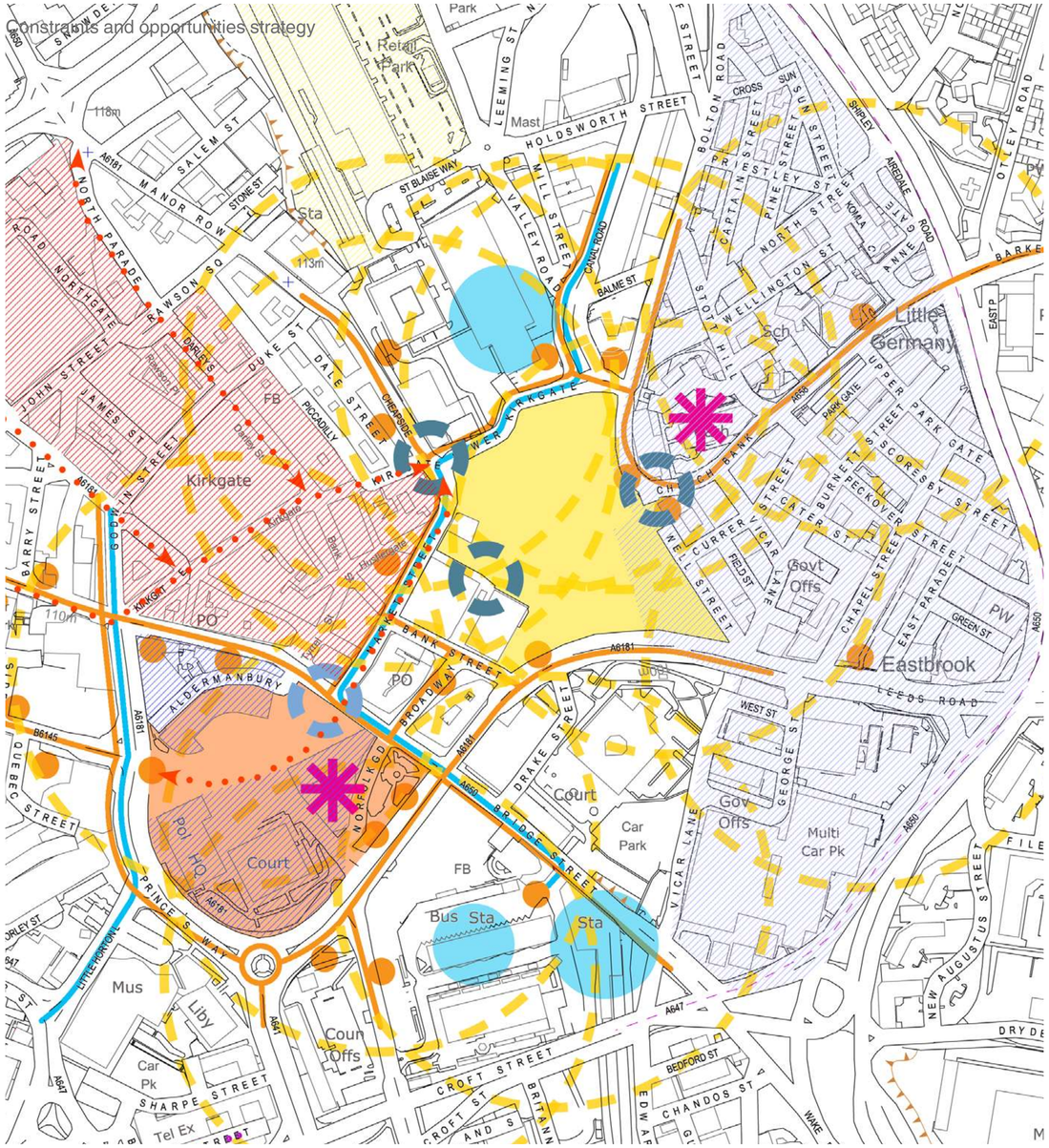
Scale: 1/100

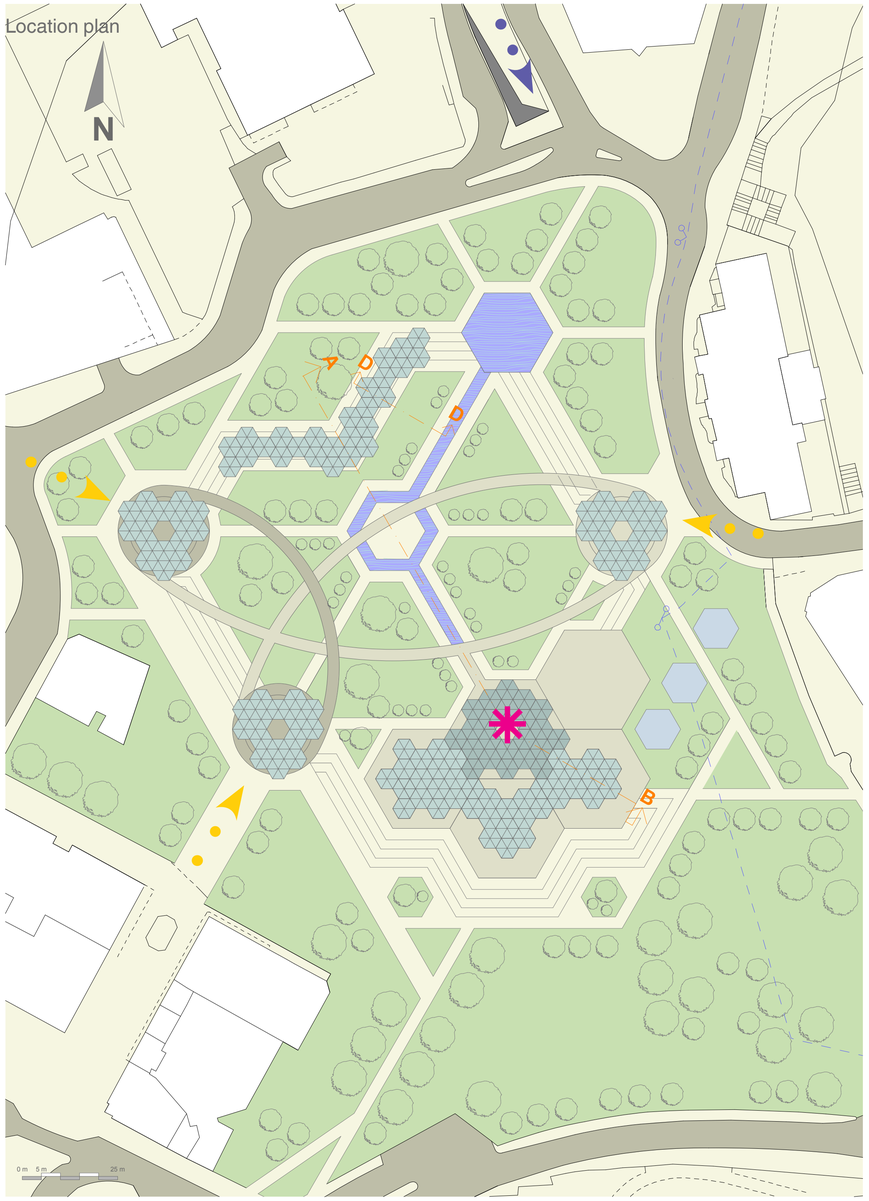
RE-MAP
[A . A]

ALBENA ATANASSOVA

MODELS

The model demonstrates at a 1:100 scale the elevation in context with the roof biodiverse roof and the canopy on top. The cast model of the canopy aimed to demonstrate a thickness of 1.5mm simular to the thickness of a couple of graphene layers.





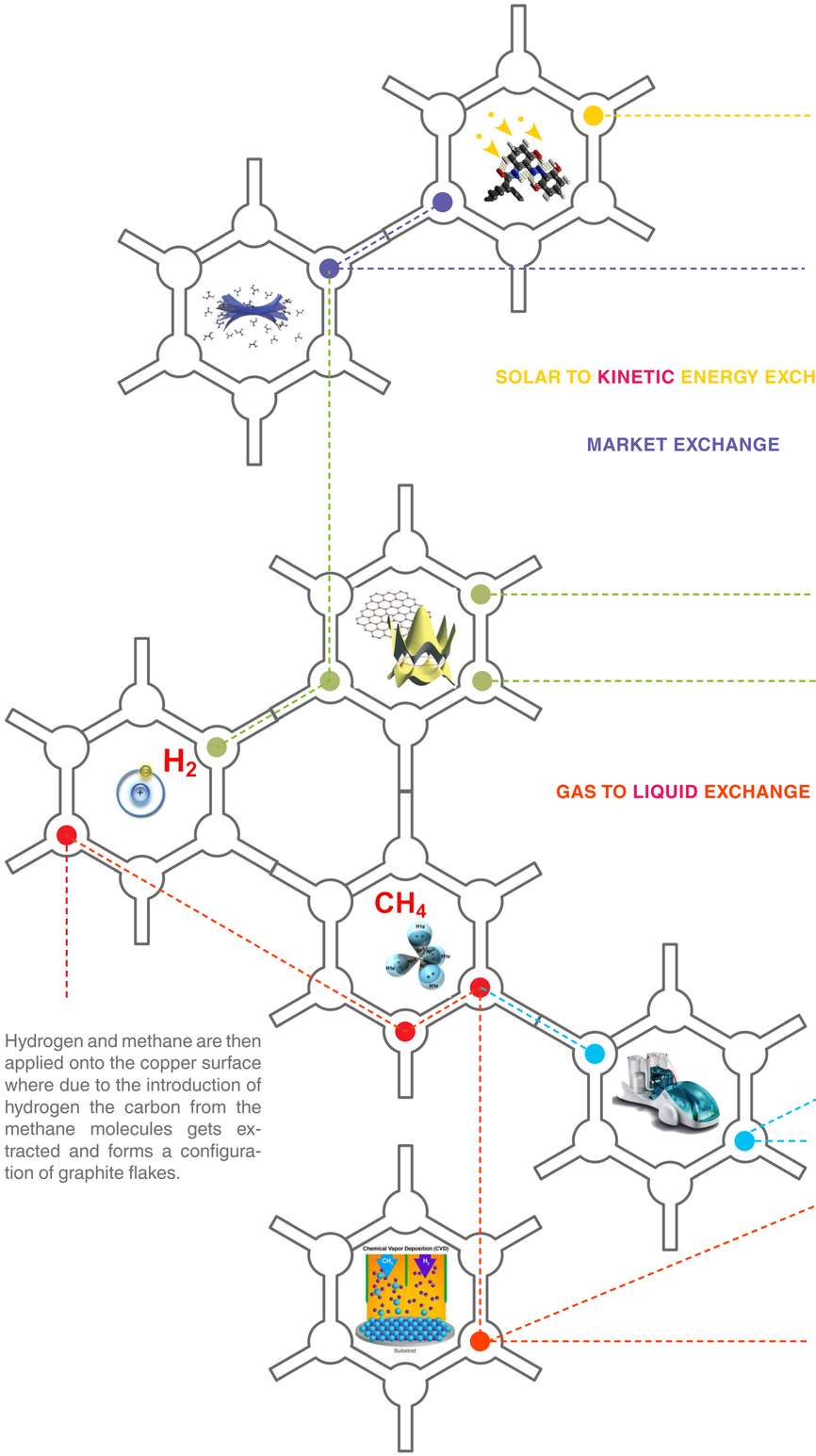
- Westfield site
- Bradford city centre
- Metro route
- Bus route
- Existing pedestrian movement
- Porposed pedestrian movement
- Underground access
- Bus stop
- 200m radius
- Existing node
- Proposed node
- Landmark
- Conservation area
- Retail / Shopping area
- Administration / Office area
- Graphene interactive canopy
- Graphene research institute
- Proposed public space
- Section D-D

The increased global connectivity and current financial instability raise the question of the future of contemporary urban centres. It is therefore interesting to explore the relashionship between Bradford's city centre and the Westfield site as a metaphor of such instability, towards establishing a new manufacturing technique that would render the city economically sustainable and profitable. After analysing the constraints and opportunities of the existing city centre area, I decided to propose a [re] vival of the Westfield site area to host an edifice, dedicated to the research and production of graphene along with part of the site given back to the community, where some of the features of the innovative material would be demonstrated through a series of interactive canopies (creatures). Graphene is extremelly profitable in terms of its various applications in electronics, PV cells, conductivity and production of electricty, water filtration, flexibility and strength (200x stronger than steel) and many more. Its production involves methane as a primary resource, which is one of the greenhouse gases, while its distribution and associated research is executed in "clean'' areas and laboratories underground, rendering the Westfield site ideal for the purpose. The proposal aims to reconnect the city centre through 3 bridges positioned at various levels: 0.00m (assuming the existent level of +98.00m at the crossing of Kirgate and Market Street as equivalent to ground zero for the purpose of the project) and 3.00m (providing a viewing gallery of the whole area). The building utilises the sites "hole'' and is thus sunk into the ground at -7.00m, to comply with Vibrations Criterion D for clean rooms and laser laboratories. The area above is allocated to the required full height plenum, thus bringing the main building to level 0.00m. The latter hosts the rest of the laboratories, break out areas and office spaces, along with a multifunctional public block to the east. The roof creates a biodiverse area with associated cafetiria and link to the bridges. The scheme also features a small shop at level 0.00m for the distribution of graphene paint. This innovative application of graphene allows for the development of a multilayered graphene paint suitable for all surfaces. The coating essentially substitutes PV cells and helps produce electricty in a solar - kinetic energy exchange.

RE-MAP
[A.A]

GRAPHENE CENTRE

ALBENA ATANASSOVA



Graphene coating working as substitute for PV panel. Transformation of solar energy into electricity and kinetic energy allowing for the interactive canopy elements to fold/unfold.

Graphene paint to be produced for commercial use allowing for multiple application on various surfaces, turning them into PV panells.

SOLAR TO KINETIC ENERGY EXCHANGE

MARKET EXCHANGE

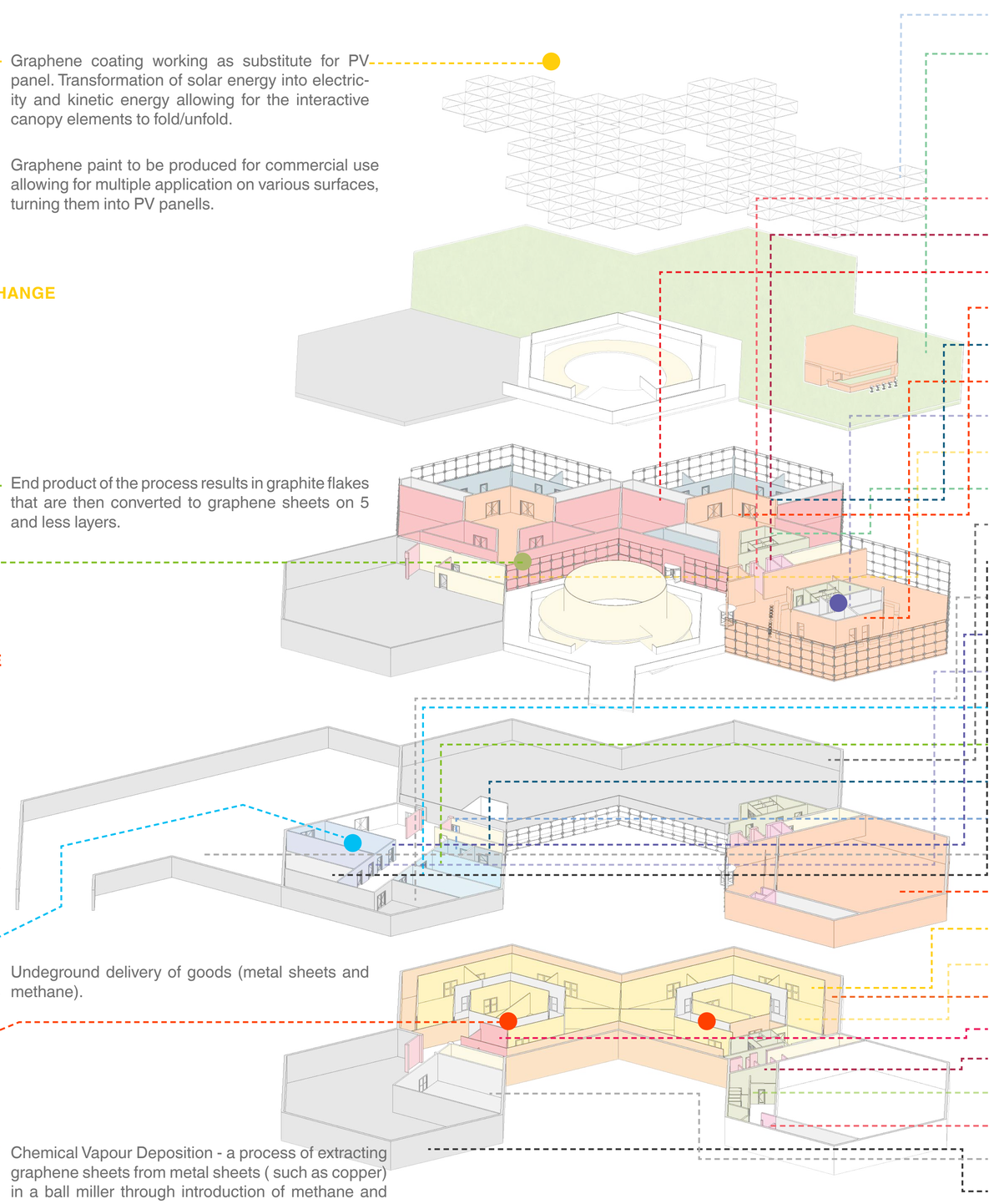
End product of the process results in graphite flakes that are then converted to graphene sheets on 5 and less layers.

GAS TO LIQUID EXCHANGE

Hydrogen and methane are then applied onto the copper surface where due to the introduction of hydrogen the carbon from the methane molecules gets extracted and forms a configuration of graphite flakes.

Undeground delivery of goods (metal sheets and methane).

Chemical Vapour Deposition - a process of extracting graphene sheets from metal sheets (such as copper) in a ball miller through introduction of methane and hydrogen.



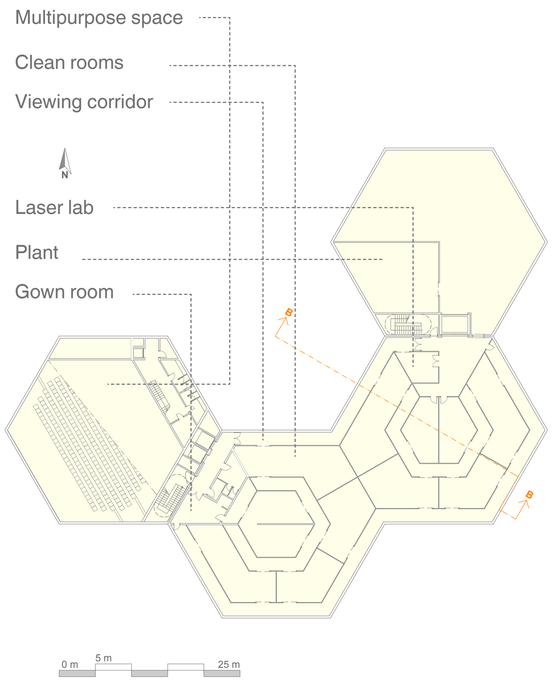
- Solar canopy
- Biodiverse roof
- Plant
- Roof cafeteria
- Grey corrindors, storage
- Goods lifts
- Passenger lifts
- Labs
- Break-out area
- Offices
- Interactive graphene wall
- Store with associated cafe
- Porters lodge
- WC
- Plenum
- LV switch gear
- Transformers
- Gas room
- Gas bottle store
- Goods in store
- Waste in store
- Store manager
- Solvent store
- Nitrogen and helium tanks
- Multi - purpose seminar room
- Clean room
- Gown room
- Viewing corridor
- Laser lab
- Goods lift
- WC
- Passanger lift
- Storage, grey corridor
- Plant room

RE-MAP [A.A]

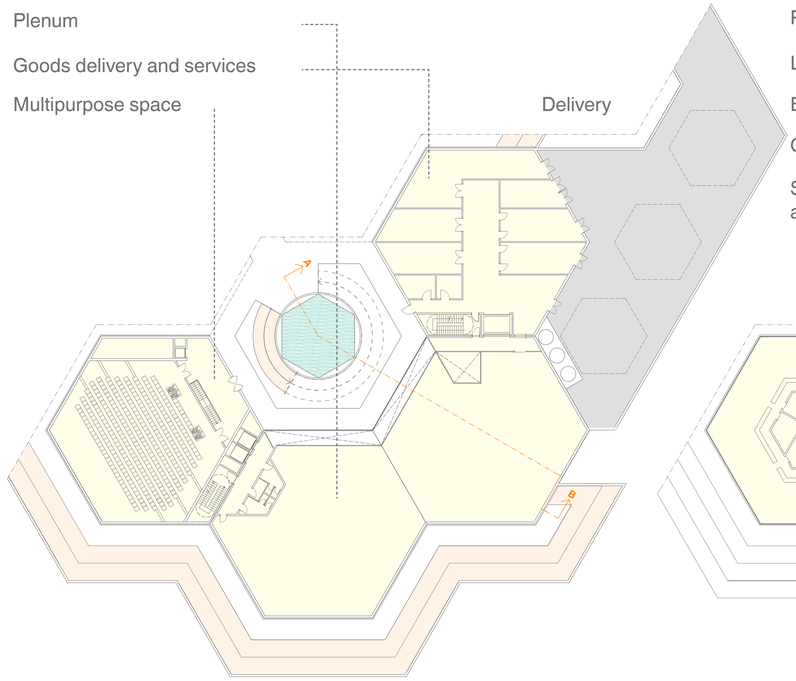
GRAPHENE CENTRE

ALBENA ATANASSOVA

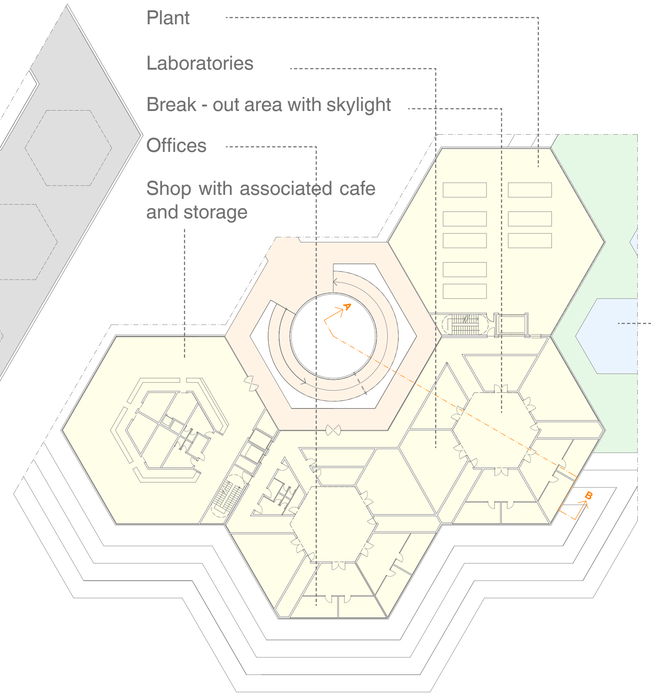
Basement -7.00 m



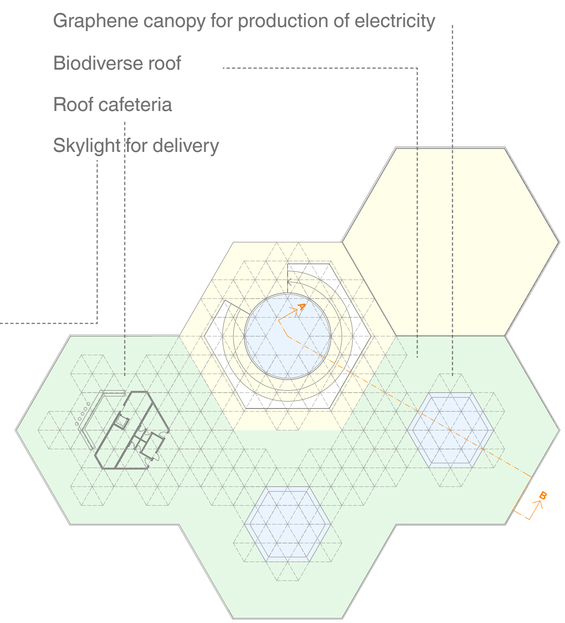
Lower ground floor -3.00 m



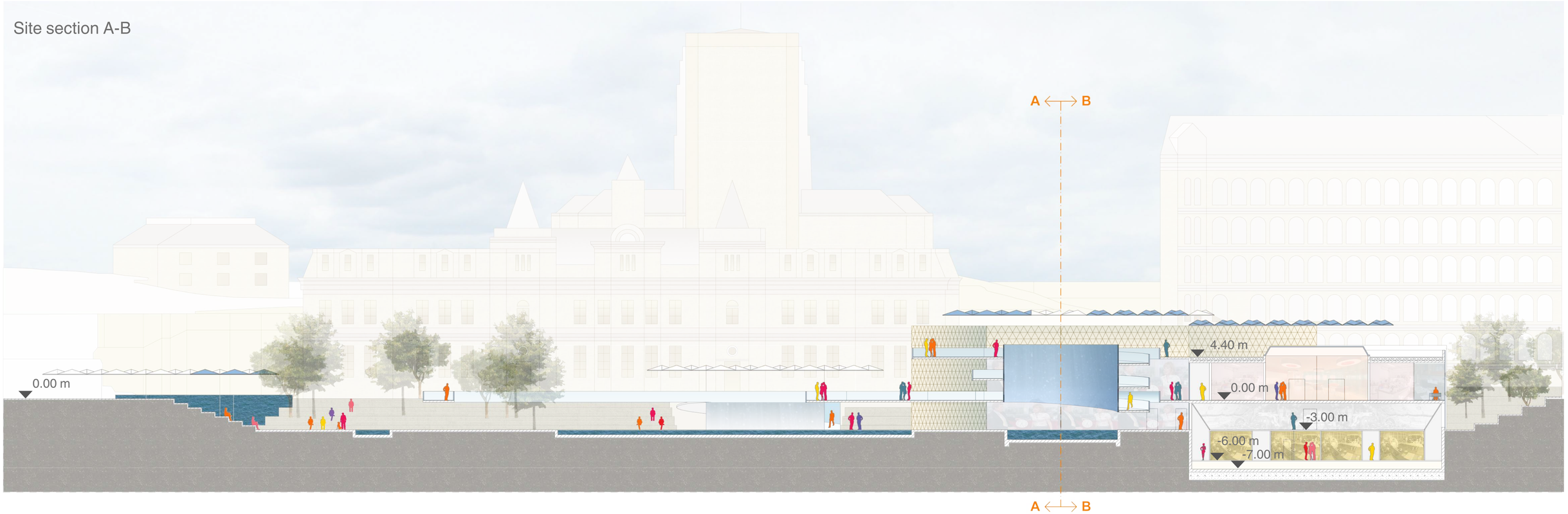
Ground floor 0.00 m



Roof plan 4.40 m



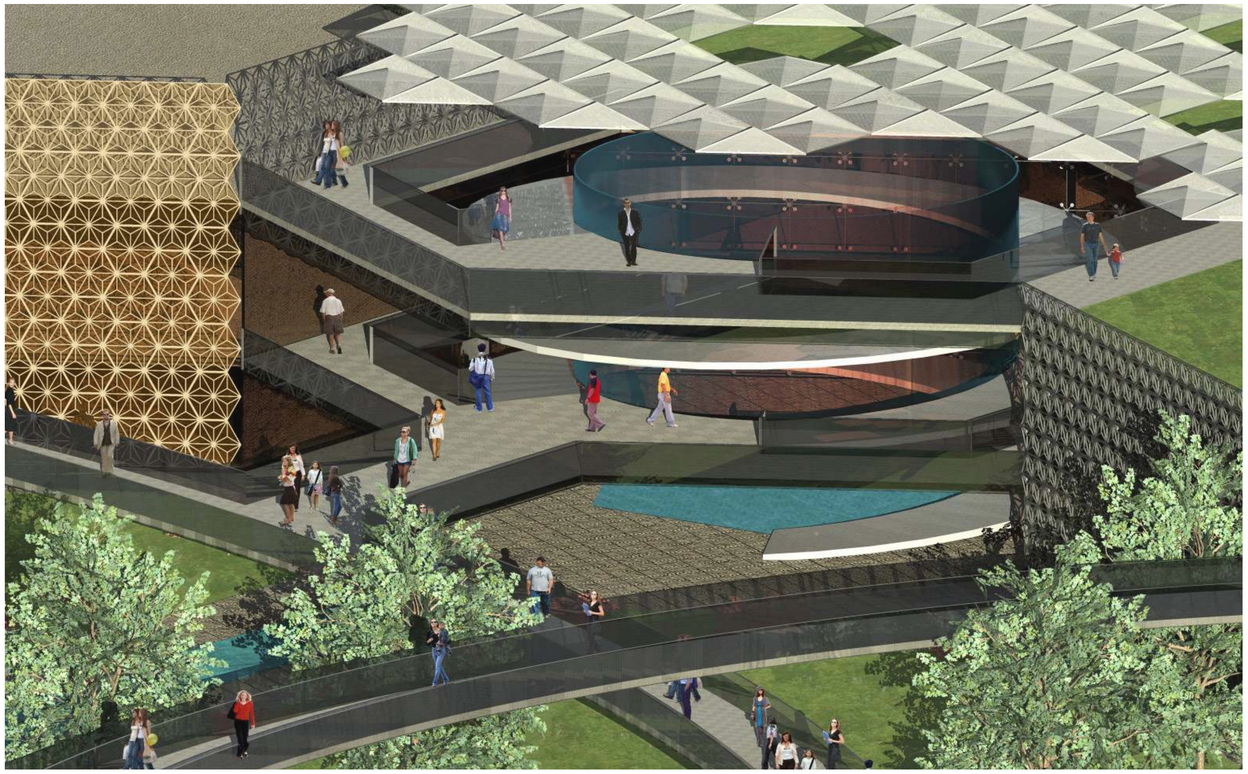
Site section A-B



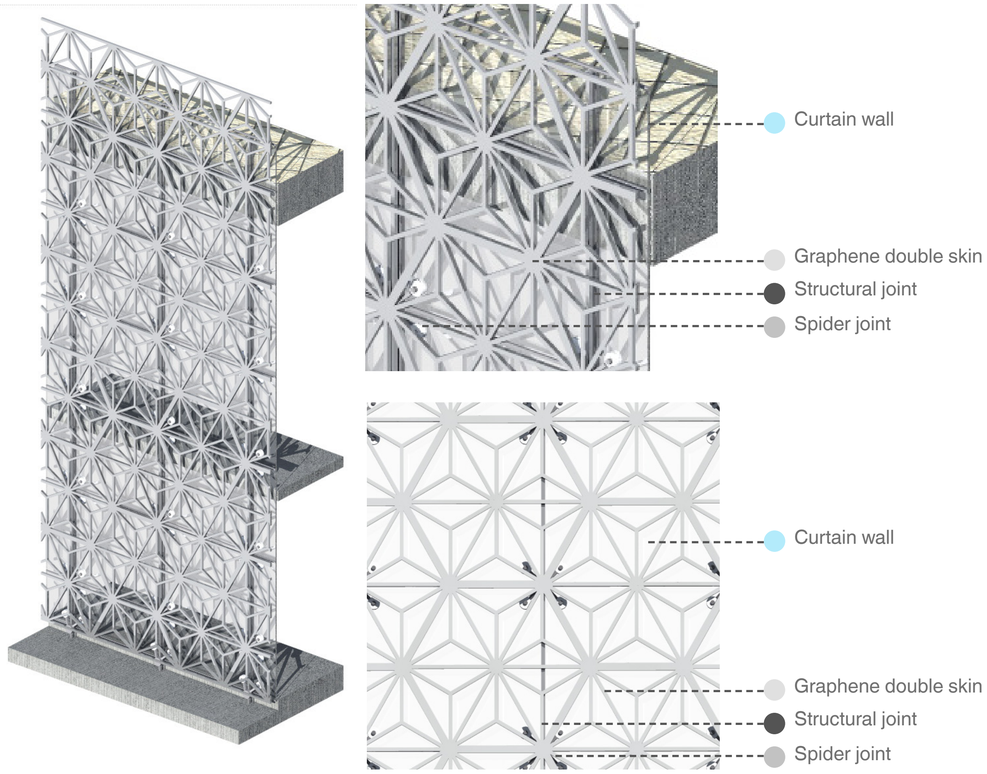
RE-MAP
[A.A]

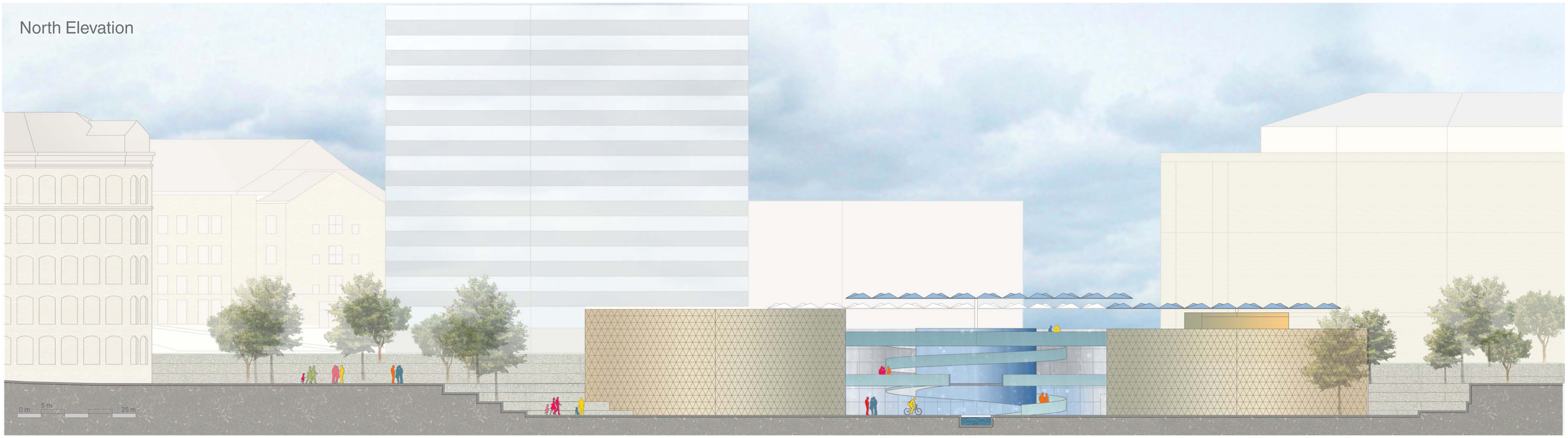
RAPHENE CENTRE

ALBENA ATANASSOVA



Detail section through elevation:



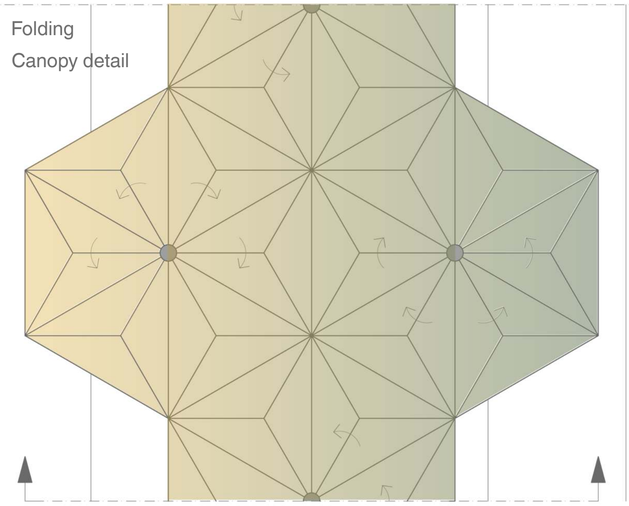


RE-MAP
[A.A]

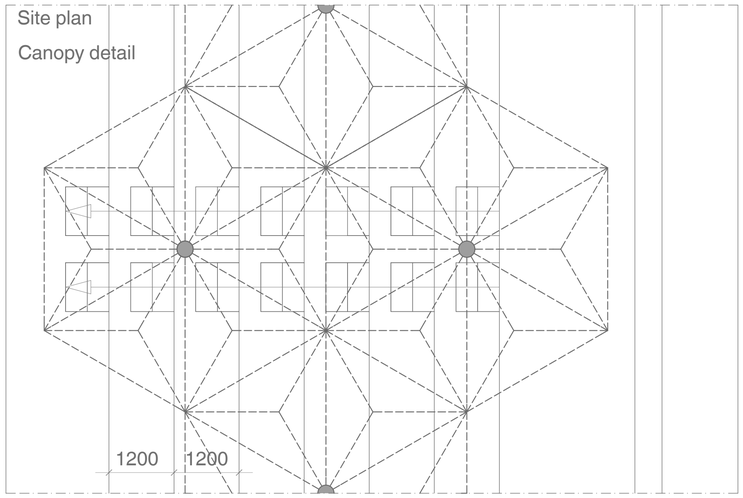
GRAPHENE CENTRE

ALBENA ATANASSOVA

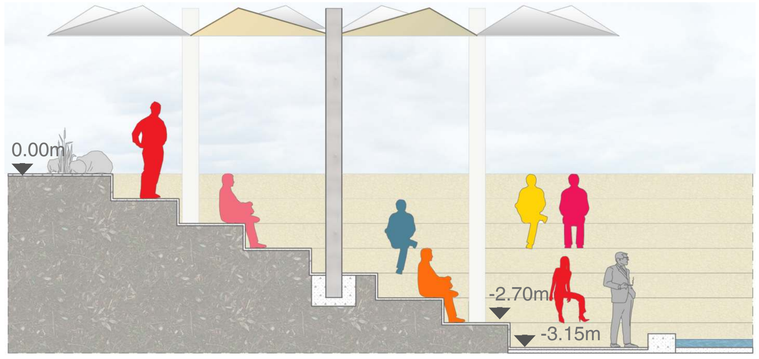
Folding
Canopy detail

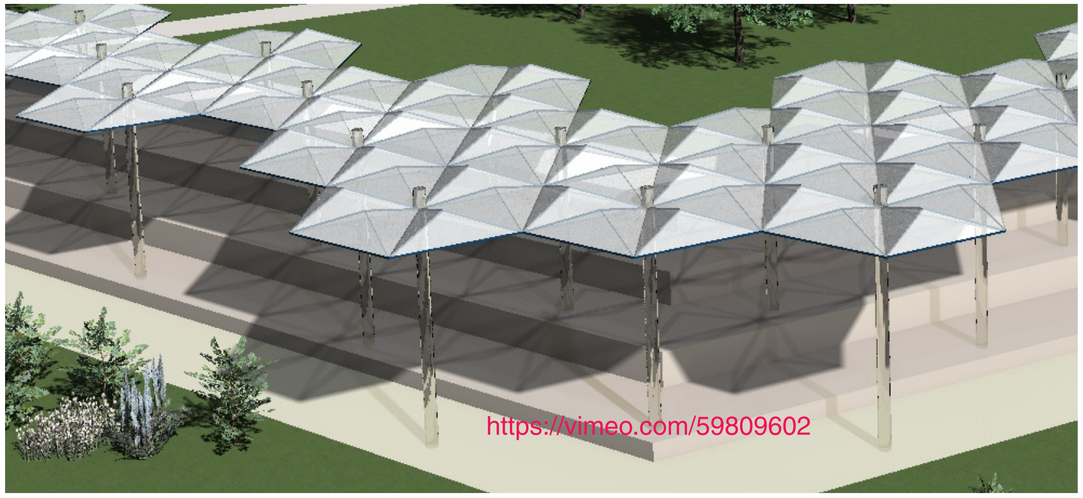


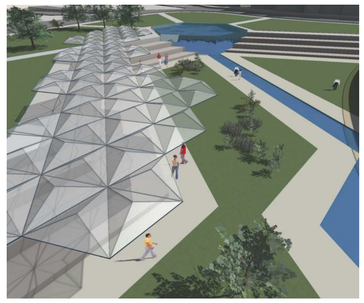
Site plan
Canopy detail

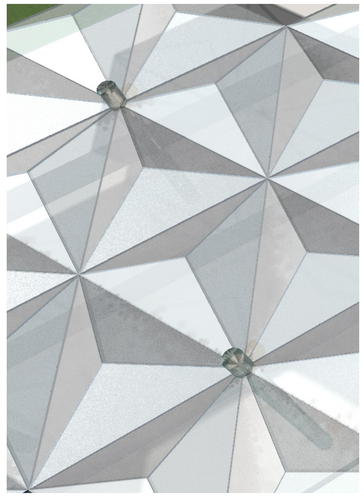


Section D-D
Canopy detail





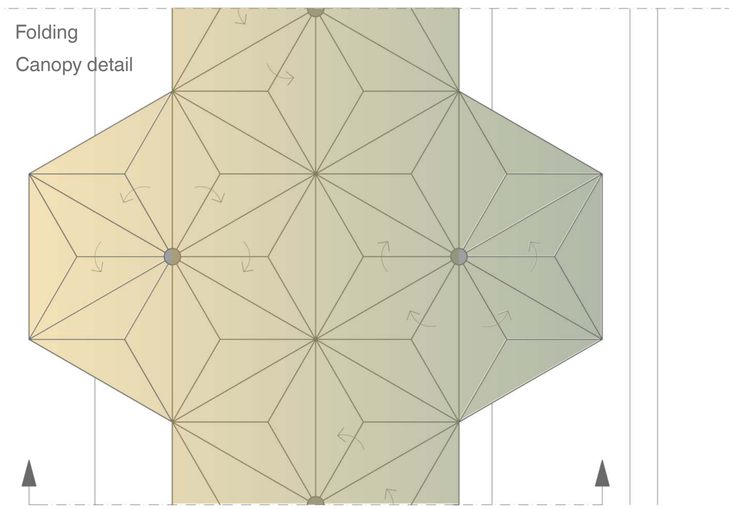




RE-MAP
[A.A]

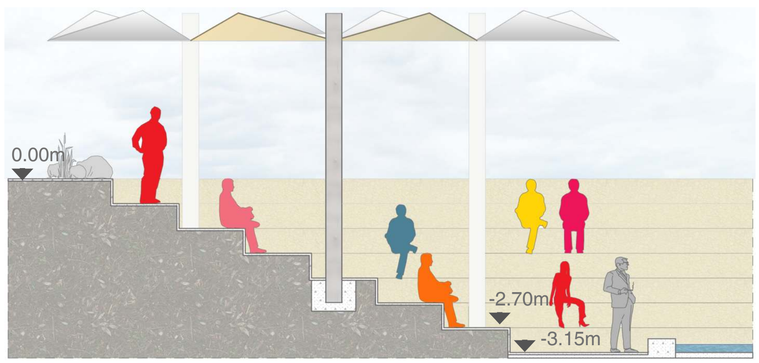
RAPHENE CENTRE

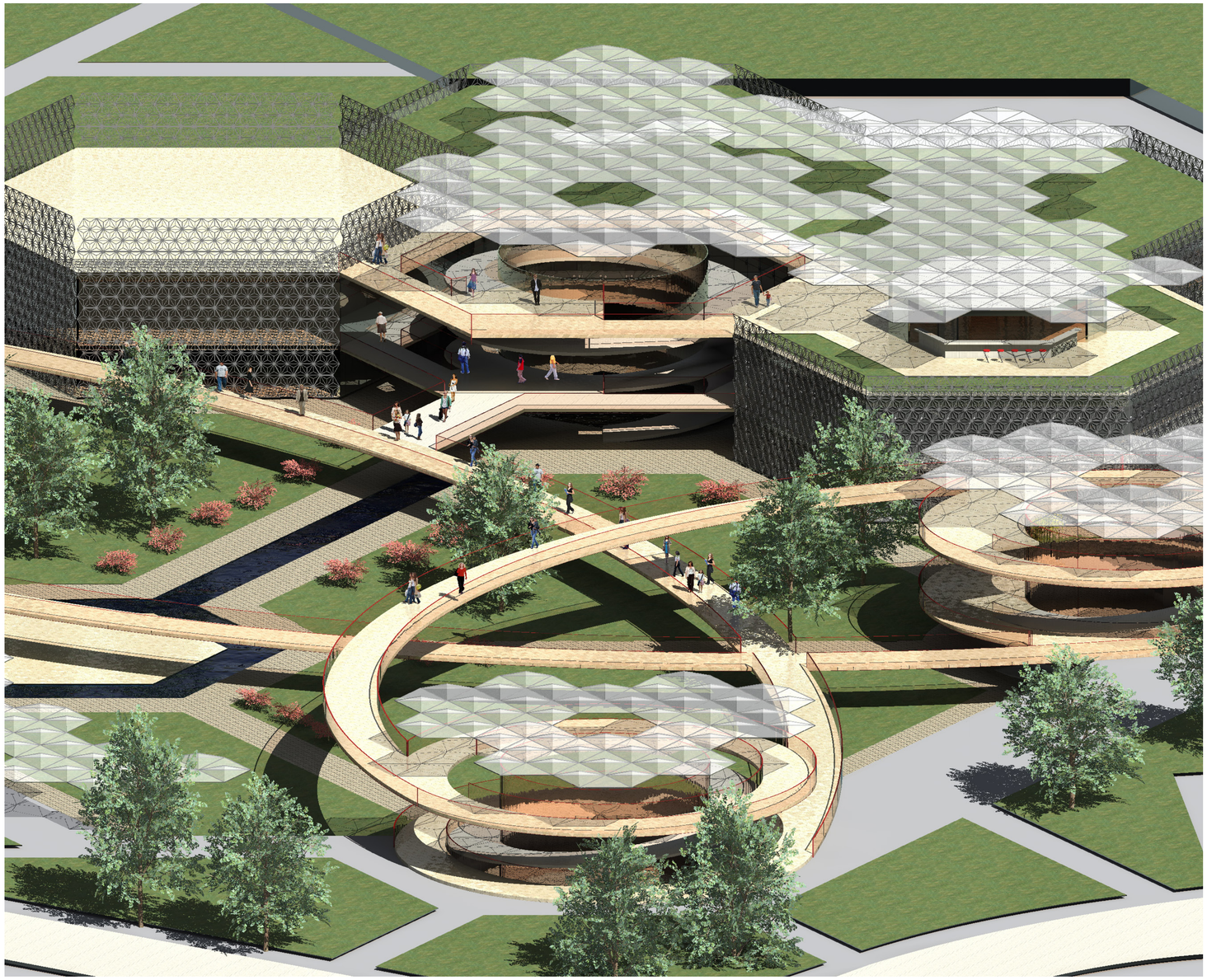
ALBENA ATANASSOVA

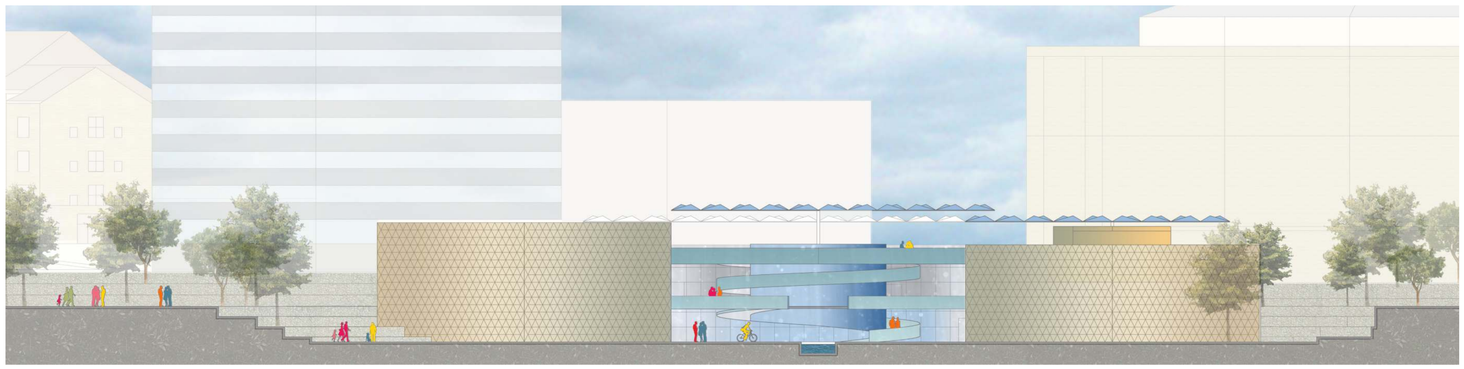


Section D-D
Canopy detail

0 m 1 m 5 m







RE-MAP
[A.A]

RAPHENE CENTRE

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