

ESALA 2019

Master of Architecture

**THE STREAMLINES, VORTICES & PLUMES
OF THE BLUE LAGOON AND BATH**

Lisa Moffitt
Simone Ferracina

BLUE LAGOON | BATH



Field Instrument

October 2018 | Kirstin Forsyth, Fritz Holtgrewe, and Jamie Wilson



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**The Streamlines, Vortices and Plumes of the Blue
Lagoon/Bath.**

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Svartsengi Power Station

October 2018 | Laura Haylock, Calum Rennie, Katy Sidwell



MODEL CATALOGUE

WIND TUNNELS

01.1 / 01.2 JAMIE WILSON | KIRSTIN FORSYTH | FRITZ HOLTGREWE

02.1 / 03.1 / 04.1 BULAT GAFUROV | HENG ZHU (MAX) | CHRIS TOLMIE | JOSHUA SIU

02.2 BULAT GAFUROV

02.3 HENG ZHU (MAX)

05.1 / 05.2 FENGYI WANG | MAOYU MAO | JINGYI WANG

FILLING TANKS

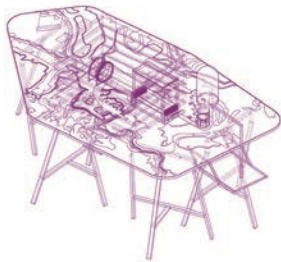
06.1 / 06.2 LAURA HAYLOCK | CALUM RENNIE | KATY SIDWELL

WATER TABLES

09.1 RACHEL BRIGLIO

09.2 RACHEL BRIGLIO | NAOMI WRIGHT

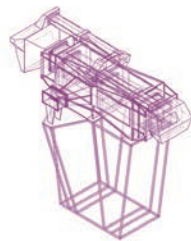
10.1 JAMES MA | STEVEN SHI | CHERIE WONG



01.1



01.2



02.1/03.1/04.1



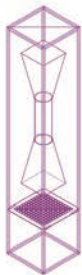
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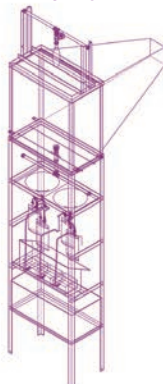
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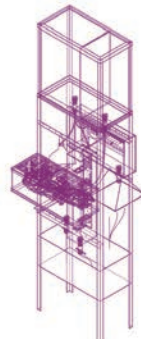
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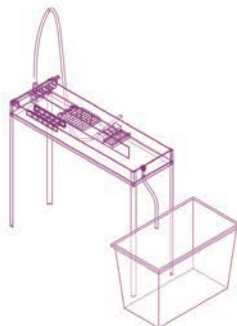
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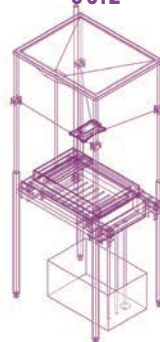
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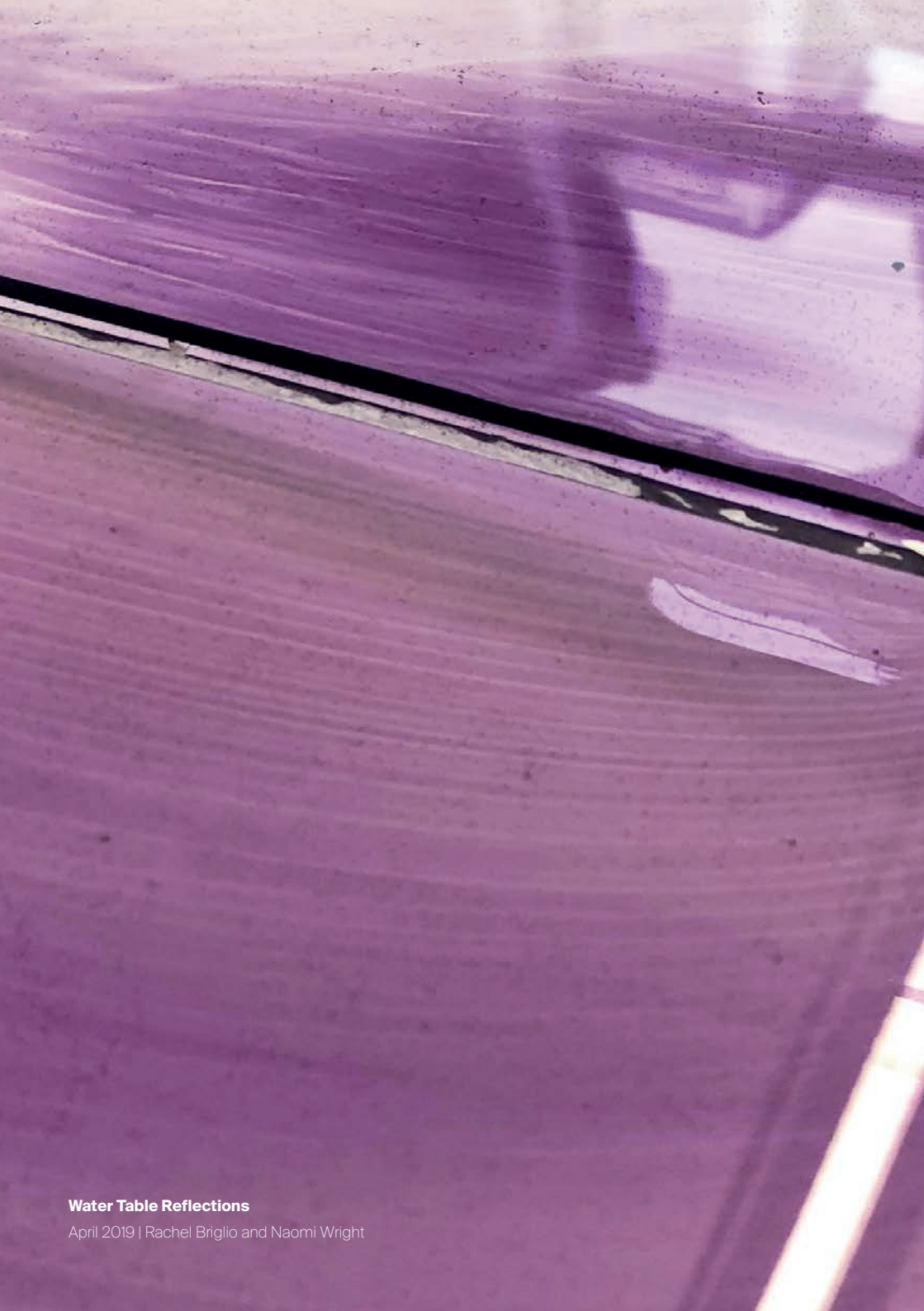
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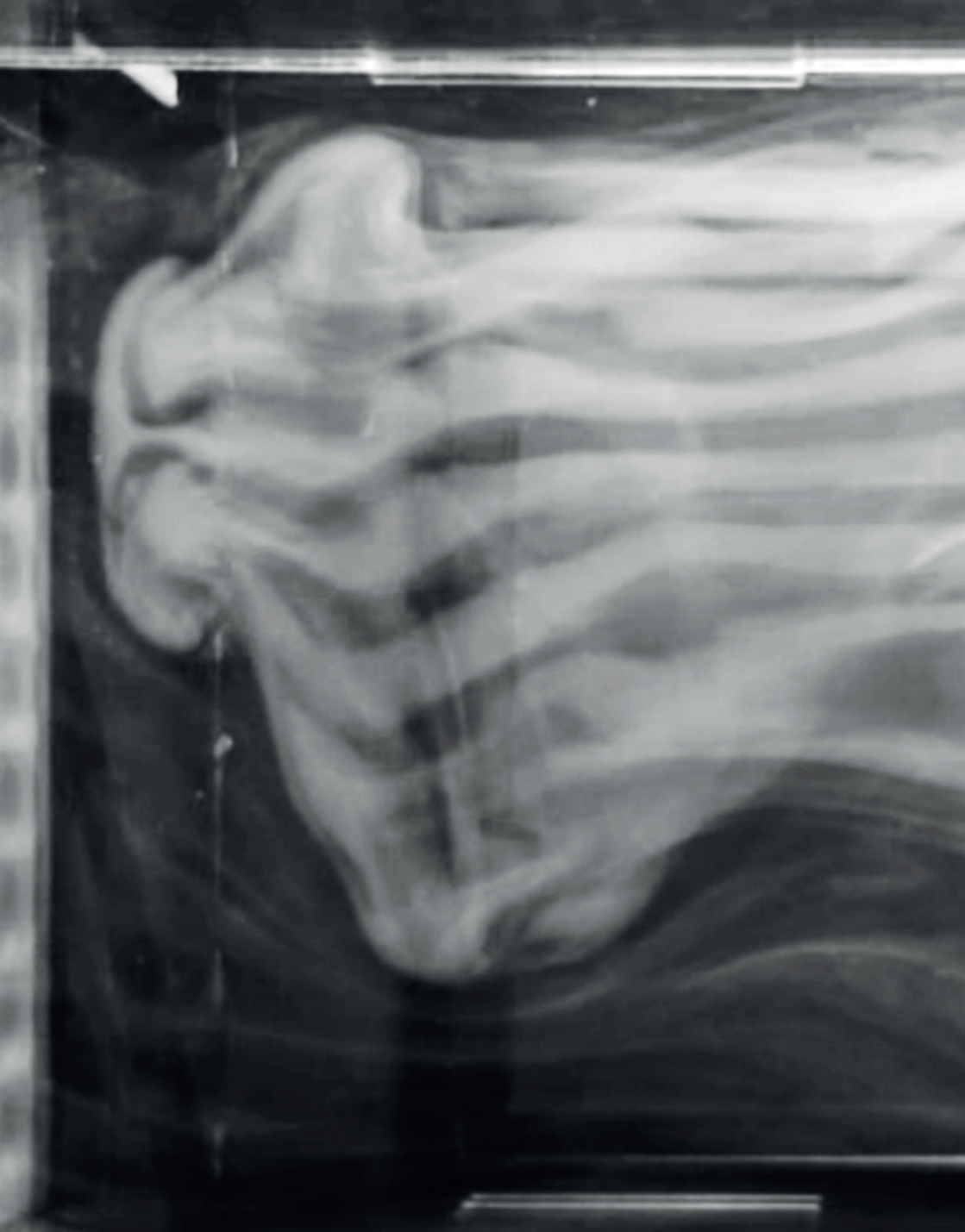
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Water Table Reflections

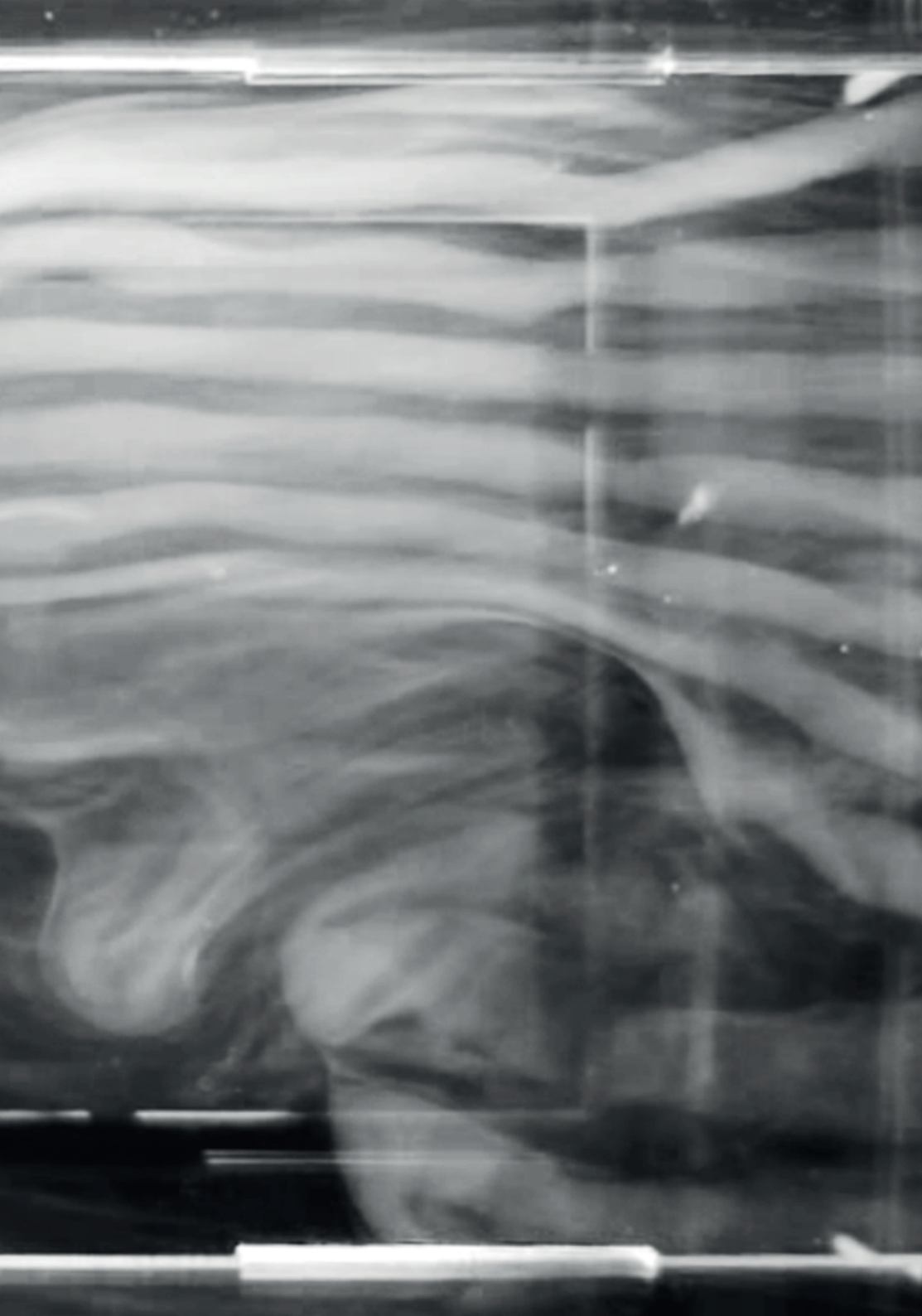
April 2019 | Rachel Briglio and Naomi Wright





Wind Tunnel Smoke Visualisation

April 2019 | Bulat Gafurov





The Blue Lagoon

October 2018, Katy Sidwell

THE STREAMLINES, VORTICES & PLUMES OF THE BLUE LAGOON AND BATH

MODEL ENVIRONMENTS

LISA MOFFITT

Streamlines, vortices, and plumes are terms used in fluid dynamics to describe flow regimes. Continuous filaments of streamlines indicate steady, consistent flow; erratic curls of vortices reflect turbulent flow; cloud-like formations of plumes indicate one fluid flowing through another of a different composition. These fluid processes take place around us continuously, given that we live 'submerged at the bottom of an ocean of the element air'.¹ One of the primary tasks of the built environment is to shelter, buffer and mediate between the thermal conditions of given exterior and desired interior 'oceans'.

Streamlines, vortices and plumes are technical terms, yet to focus on these flow regimes solely in scientific or technological terms overlooks their strange materiality and physical presence. We are immersed within the atmospheric domain, which is active, shifting, often perceivable, and has spatial consequence. When made material and visible, streamlines, vortices, and plumes are beautiful and visually beguiling; they are complex material systems that operate in ways that raise questions beyond performance.

The studio speculates about designing and intervening knowingly within this rich and active material domain, testing the relationship between body, atmosphere, instrument and building in two environmentally charged sites—the Blue Lagoon, Iceland and Bath, England. Both the Blue Lagoon and Bath are sites of strange, fluid material presence. They are both contexts of 'thermal asymmetry'—places of unexpected, visceral climatic variability.² While the built landscape of the two sites have inverted figure-ground relationships, the Blue Lagoon is an analogical landscape to Bath's; it offers an extreme version of the curious climatic inversions possible when contrasting thermal conditions (and their associated programmes) meet.

1 Torricelli, 1644 cited in J.B. West, "Torricelli and the Ocean of Air: the First Measurement of Barometric Pressure," *Physiology* 28, no. 2(2013): 66-73.

2 Philippe Rahm, "Climatic Constructions: Thermal Asymmetry in Architecture," *Harvard Design Magazine* 30 (2009): 34.

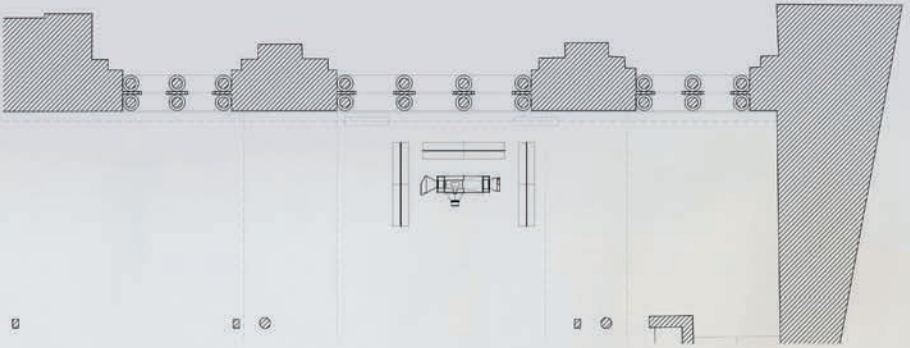
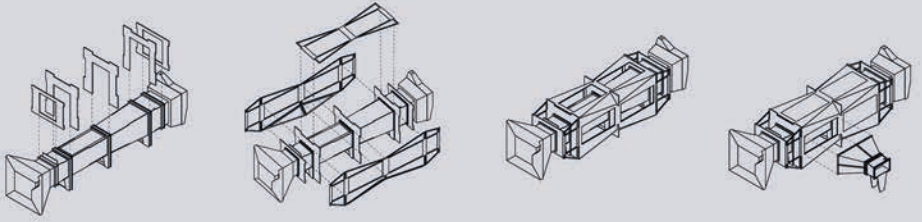
Environmental Models

Students began by designing one of three types of physical environmental models: wind tunnels, water tables and filling tanks. All three are instruments that materialise airflow within a controlled environment and in relation to a scale architectural model. Environmental models are architectural models, but they are architectural models with the added demand of creating a controlled, steady-state environment that materialises airflow. This materialisation focuses attention on the relationship between buildings, instruments, environmental phenomena and their idealisations, operating at full scale in the 'real' world. Thus, environmental models operate as potent lenses for reconciling the scales and problematics of working with consequential environmental processes that extend beyond the conventional scales of architectural investigation.

Environmental models are thinking tools. Historian of Science D. Graham Burnett's distinction between analogical and ontological models presses the significance of the environmental model. In a 2008 interview published in *Models: 306090*, Burnett reflects on the historical use of physical scientific models within the context of contemporary architectural design, making a distinction between analogical and ontological models. Analogical models, he suggests, are models whose central attributes apply by analogy to the physical traits or attributes of the scaled thing that is being modeled. In other words, the model is understood as distinct from but analogous to aspects of the world, or the target system, it represents. Ontological models, on the other hand, cause the physical traits of the world being modeled "to be made manifest—and hence allow[s] for the revealing, touching, tweaking, or accessing of... the actual forces and stuff at issue."³ Burnett suggests that it is not so much the distinction between the two, but in the indeterminacy or translation between the "as" and the "is", between the analogical and the ontological, where models are most potent. He suggests that often a productive shift occurs when models yield insights to the workings of the world that one wouldn't have access to otherwise.

Environmental models provide intellectual access to the workings of the natural world by enabling the 'seeing, touching, and tweaking' of the 'actual stuff' at work in the model. Moreover, models enable those moments in the design process in which a reading or misreading of the artefact and of its environment enables productive reconceptualizations of and new insights about both that model and its target system.

3 Burnett, D. and Solomon, D. 2008. "Masters of the Universe," in Solomon, J.D., ed. 2008 306090 *Models*. Princeton Architectural Press, 44-51.



LISA MOFFITT | THE STREAMLINES, VORTICES & PLUMES OF THE BLUE LAGOON AND BATH

In the studio, models become instruments; instruments become buildings. Controlled environments fail. Air and water are capricious, prone to disturbance. Delicate exchanges are made evident through visual saturation, vibrant synthetic coloration, and high contrast. Orientations matter in terms of material weight and environmental prevalence. Architectural devices buffer and baffle; they contain, resist, fill, filter, and dissipate. Boundaries are unclear; gradients and intensities organise space. Curls and swirls are probable; lines impossible. Models leak; seams fail; water falls; air presses; smoke sputters.

The Blue Lagoon: Real Environment

We visited Iceland, moving from the controlled environment of the studio to a ‘real’ environment of visceral thermal variability, a landscape of stark contrasts. Iceland’s once fluid volcanic foundations meet its arctic atmosphere at the earth’s surface, resulting in natural and manmade ethereal blue hot springs, geysers, and thermal pools set amidst black volcanic rock and green moss. Iceland’s horizon is punctuated by streams of steam where hot and cold fronts meet.

Set amidst a lava field, the Blue Lagoon is a natural wonder, its mineral-rich hot spring is known for its therapeutic benefits. The horizon of the Blue Lagoon is interrupted by the exhaust stacks of the neighbouring Svartsengi geothermal power plant, the first geothermal and district hot water heating plant in the world. Svartsengi looms



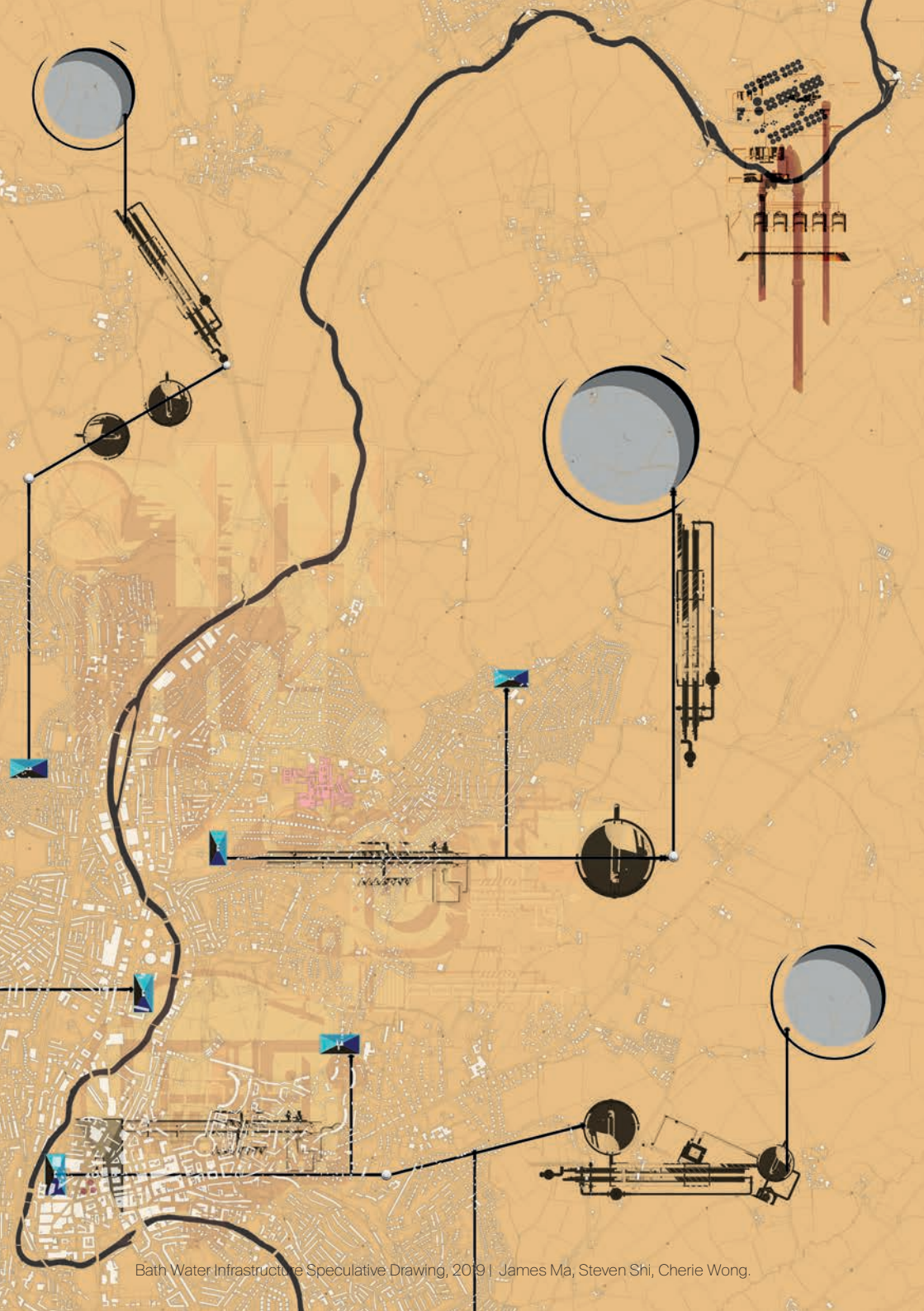
as a mechanical assemblage that draws heat from its geological substrate, using it to generate electricity and heating for district-wide distribution. Views to Svartsengi are architecturally obstructed in the Blue Lagoon—an attempt to conceal the complex entanglements between the two.

It is tempting to view the industrial architecture of Svartsengi as a stark counterpoint to the sublime landscape in which it sits—an assembly of mechanical components disrupting a pristine environment. But the two systems are in fact deeply intertwined. The pools of the Blue Lagoon are pools of wastewater from Svartsengi—expelled from the power plant after being stripped of their useful offerings. Despite engineering attempts to inject the wastewater below ground, the lava rock resisted, releasing silica and forming mineral-rich mud that sealed the ground, creating enormous contained tanks. These tanks of waste water are now the Blue Lagoon, an elite tourist destination. The Blue Lagoon is a very profitable waste-escape and a feat of geological civil engineering. The power plant can be viewed as a complex water cycle, an accelerated landscape analogous to that of the very geology of Iceland itself—a mutable, shifting set of thermal exchanges and state changes—but of water rather than of lava. Thus, we have new counter models for reading both conditions: the power station as a water cycle; the power station as a tectonic shift; the thermal baths as a mechanical system; the thermal baths as civil engineering.

Both the Blue lagoon and Svartsengi are most productively viewed as intertwined systems—as heat sources and heat sinks; as alternating between open loop and closed loop processes; as complex collusions with not only their atmospheric and hydrological surroundings, but with much broader systems of energy generation, environmental alteration, resource consumption, and consumerism. Students grappled with these entanglements by designing small interventions either within the Blue Lagoon or the Svartsengi plant. Modest in scope, a basic programme of food cultivation and consumption focused their investigation on what it means to construct particular kinds of controlled and contingent environments, thus contributing to the dialogue between the Blue Lagoon and the Svartsengi power station.

Bath, England: Speculative Environment

Students displaced their Blue Lagoon proposals, transposing the curious inversions, the striking contrasts, the unexpected cultural and programmatic collusions of Iceland, to Bath, using Iceland as a point of departure to show that what often seem like architectural fictions or fantasies are in fact real. This studio honed a concept of architecture as an environmental instrument. Instruments require careful calibration,



Bath Water Infrastructure Speculative Drawing, 2019 | James Ma, Steven Shi, Cherie Wong.

exquisite componentry; they require a defined substrate, and a measurable datum. While Iceland offers productive intellectual frameworks and tangible possibilities, Bath offers a complex urban substrate for nuanced intervention.

Bath is a UNESCO World heritage-designated city. The naturally occurring hot springs of Bath are the only occurring ‘hot’ (>30° C) springs, geologically speaking, in the British Isles. Given their thermal properties and purported therapeutic benefits, these springs have long acted as an epicenter of social activity in the city. The springs were the subject of Celtic legends; they were directed into elaborate naturally-heated thermal baths during Roman occupation; they acted as a destination of Royal patronage and a popular excursion for the social elite during the Renaissance; most recently, the Roman ruins have been excavated and preserved, and a new thermal bath constructed as part of Bath’s broader UNESCO world heritage status. The exact geological condition that results in the springing of warm water at the bend in the river Avon has been the subject of geological debate, but the resultant spring yields water at 46.5C at a flow rate of 60m³/hr.⁴ It’s not an exaggeration to suggest that the hot springs of Bath, a curious geological anomaly, have formed both the geophysical and social foundations of the town for over two thousand years.

Whereas the Blue Lagoon operates largely as a constructed landscape, a territorial intervention dominated by its natural surroundings, Bath offers urbanity, a historic stratigraphy of ruins and buildings as constructed layers. Bath offers a particular environmental agenda, given its unique status in the UK as the only site of such low-grade (and yet ‘hot’) geothermal activity. For thousands of years, the hot springs of Bath have underpinned the urban, social, and environmental structuring of the city. The future Bath, however, as with all cities, is unclear given the known depletion of global carbon-based fuel sources, economic/resource inequities due to mass consumerism and globalisation, climate change and its associated meteorological and ecological impacts. What makes Bath distinct in the UK is the existence of a particular resource—heat.

The studio concluded by speculating about a Bath of the future, a post-carbon city in which carbon-based fuel sources are so depleted that they are no longer viable. This future balances austerity with surplus. Students speculated about what this post-carbon stratigraphy of the city might add to the Roman, Medieval, and Renaissance layers still present today. Students intervened within the historic urban fabric of the bend in the River Avon proximate to the city’s historic Roman baths. They were tasked with

4 Gallois, R. W. 2006. “The Geology of the Hot Springs at Bath Spa, Somerset” in *Geoscience in Southwest England*, 11(3), 168-173.

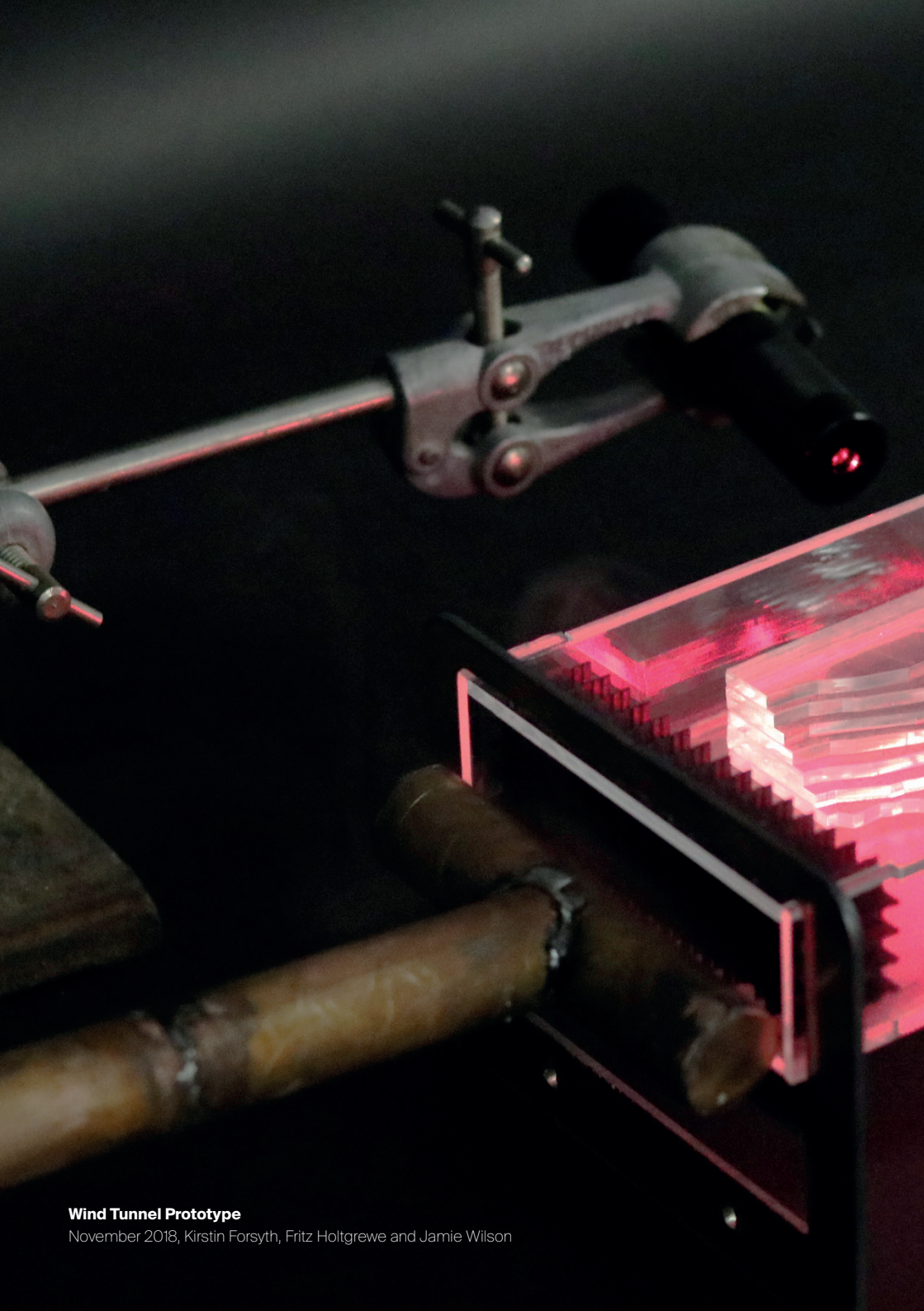
developing resolved, experientially rich, and performatively charged projects that draw directly from the thermal conditions on both sites and that respond to the question of how architecture operates as an environmental instrument. Given its mannered, well-preserved present, Bath is an unlikely context for radical speculation. Yet, the projects that follow do just that.

In the studio, Bath becomes a thermal hub where public bathing is re-democratised. Bath becomes a food emporium, a city of greenhouses of constructed biomes where Mediterranean and Tropical gardens infiltrate the city. The River Avon is alternately controlled and flooded to support agricultural production and to increase carbon sequestration. The Great Drain outlets into the River Avon, creating an altered and thriving warm-water ecosystem. Bath's roads become ecological corridors; its gasworks reconfigured to biofuel production. Bath's history as a therapeutic hub is reinvented. Here bathers swim in tanks of algae; bath water is infused with herbs cultivated and dried on site; steam is trapped and directed into baths contained in urban ruins. Bath lies fallow and is re-wilded; it falls to ruin. Bath's quarries and mines house mechanised food production. Land and water-based dwelling is densified and thermally re-zoned, inaugurating a new social order in the city. Environmental instruments infiltrate its buildings, attuning them to particular luminous and thermal conditions. Bath's subterranean vaults are recalibrated; its skyline is activated with a new, light aerial stratigraphy added above. Future Bath hisses and sputters; it steams and dissipates; it bustles and works; it shifts and negotiates; it floods and dries; it inhales and exhales; it works hard, yet it thrives.

This studio was structured as a conversation between two places, the Blue Lagoon and Bath. The bookends to these conversations were models. The first one was a physical artefact, a working model that simulates environmental processes, and a thinking tool. The final model is an experiment, a speculation about a radical future for an improbable place. The first model initiated a conceptual trajectory; the final one suspended that trajectory. The questions that were tested will be returned to for the right questions are tenacious and persistent. Models broker these questions, offering invitations, enabling speculations, and revealing insights not possible otherwise.

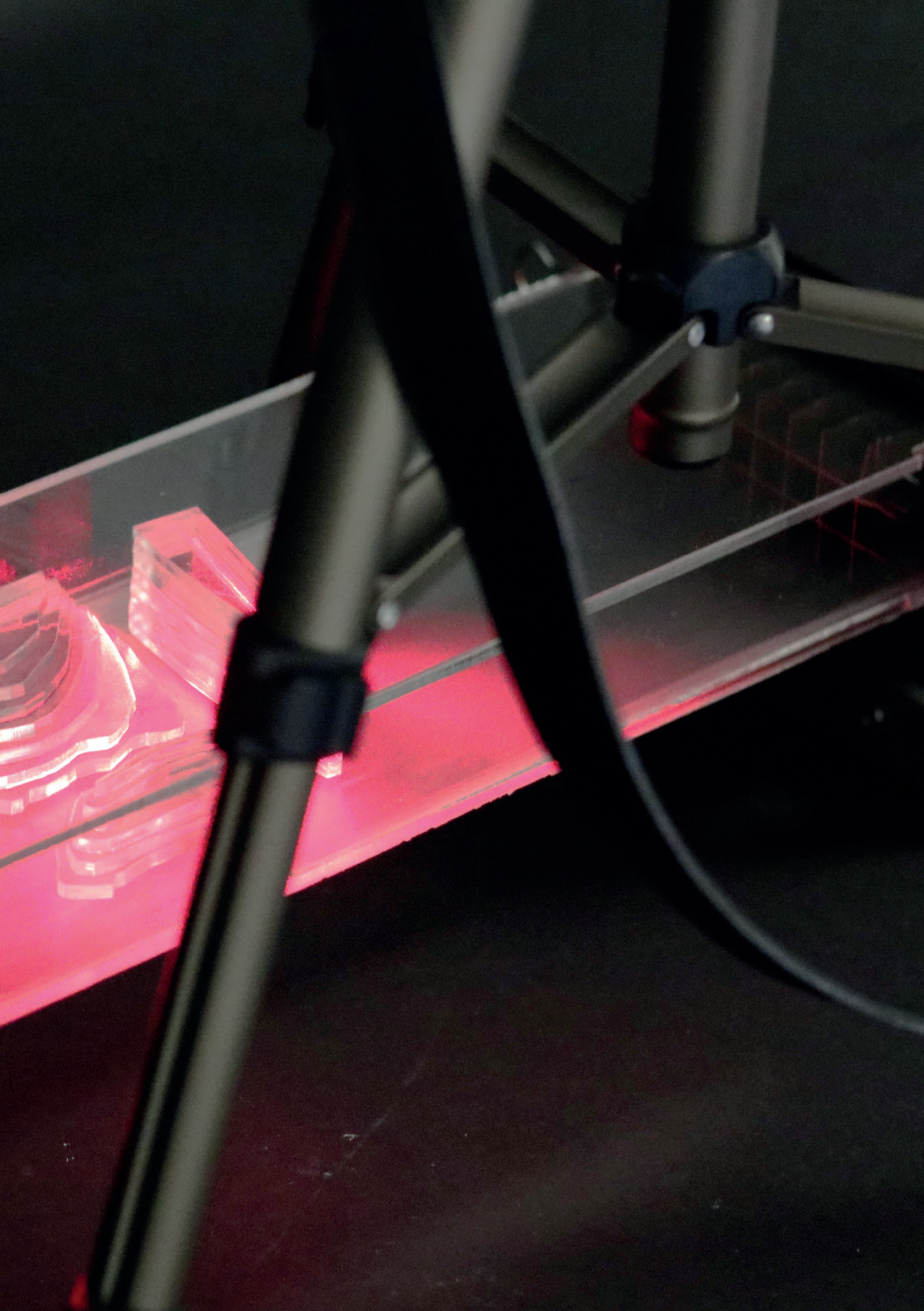


LISA MOFFITT | THE STREAMLINES, VORTICES, & PLUMES OF THE BLUE LAGOON AND BATH



Wind Tunnel Prototype

November 2018, Kirstin Forsyth, Fritz Holtgrewe and Jamie Wilson



01

INSTRUMENTAL ARCHITECTURES

JAMIE WILSON | KIRSTIN FORSYTH | FRITZ HOLTGREWE

Instrumental Architectures explores the refinement, prototyping and adaptation of wind tunnel componentry for use as architectural elements that mediate between controlled and contingent environments. Early wind tunnel prototypes revealed productive insights about componentry assembly and disassembly, tightness of fit, and stability and registration of air movement. An architectural language of funnels, straighteners, pipes, filters, chambers, and rudders emerged from this exploration. These elements were further refined and adapted at an architectural scale in proposals both in the Blue Lagoon and Bath.

A collective narrative underpins design interventions in Bath. In 2120, Bath is situated within a global context of climate change, whereby habitable and productive land is greatly reduced and where climate change makes dwelling in continental temperate climates unbearable, leading and to mass migration north. This in turn pushes the city to reconsider its approach to food security and food autonomy, forming a network where perishable foods are grown locally within the urban context and larger agricultural processes are relegated to enhanced existing farmland at the periphery of the city. Lifestyle patterns are drastically altered to reduce energy consumptions by collectivising heat intensive activities. The existing stratified nature of Bath is intensified: the subterranean level holds the capacity for heat distribution and retention, the existing building fabric holds potential for dwelling densification, and a new aerial layer above the city supports a productive landscapes of food cultivation.



01a

RESCRIPTING CIVIC PERFORMANCES:

ENVIRONMENTAL TUNING IN THE CITY OF BATH

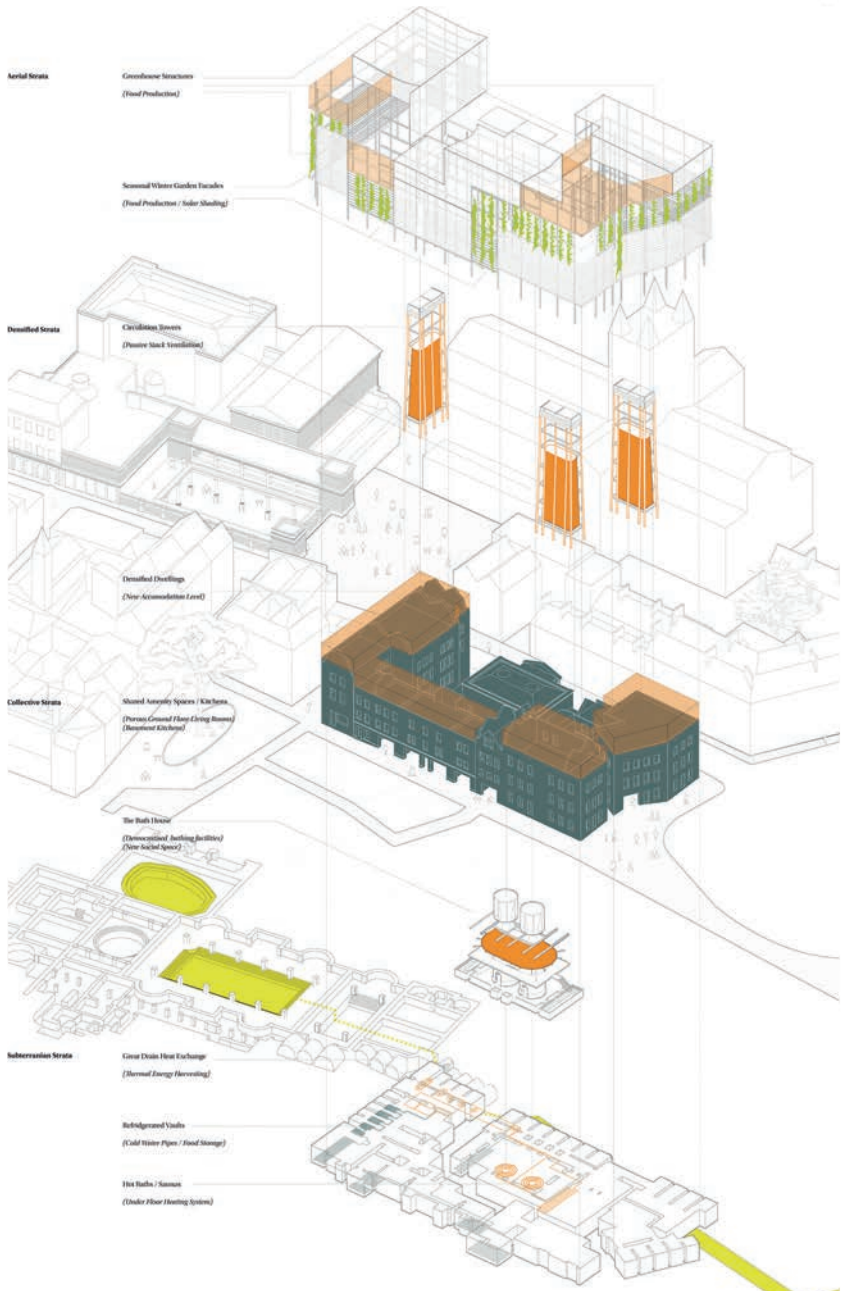
JAMIE WILSON

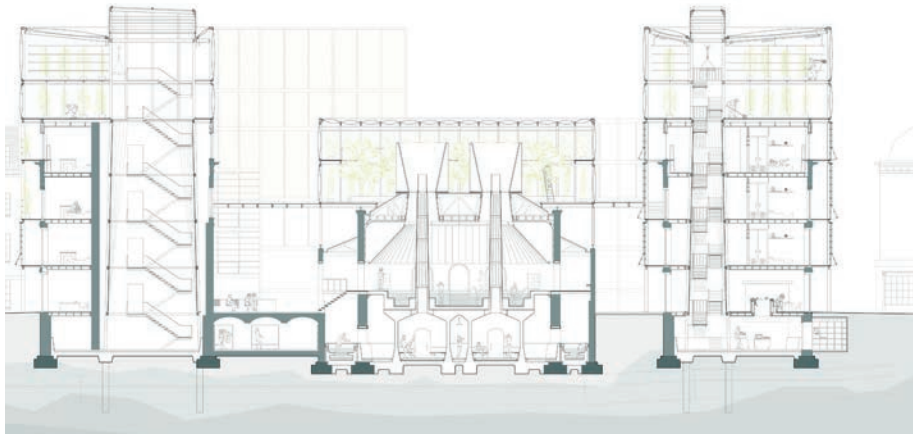
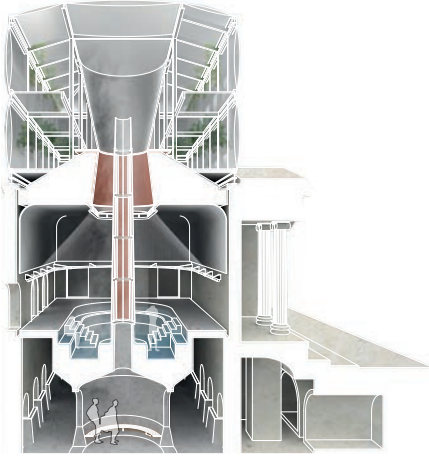
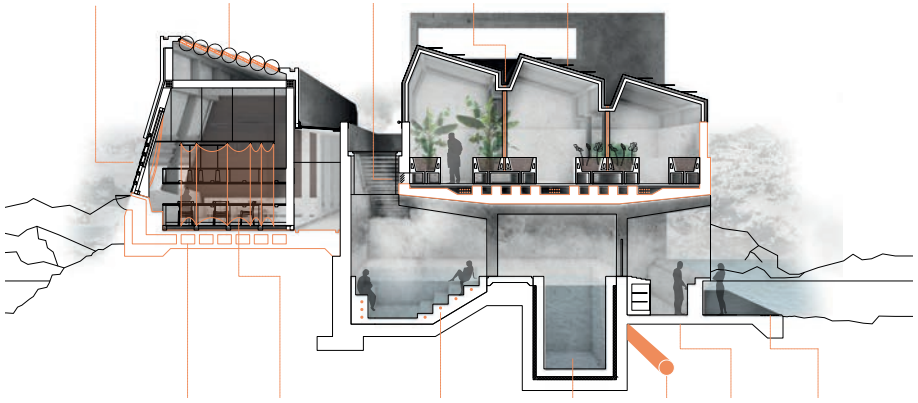
This thesis considers the augmentation of existing building fabrics to accommodate drastically altered living patterns in the post carbon future of 2120. Sited within an historic urban block, adjacent to the Roman Bathhouse, the intervention codifies existing spatial configurations into functional strata, into which insertions of new architectural componentry rescript performances which are enacted on each level.

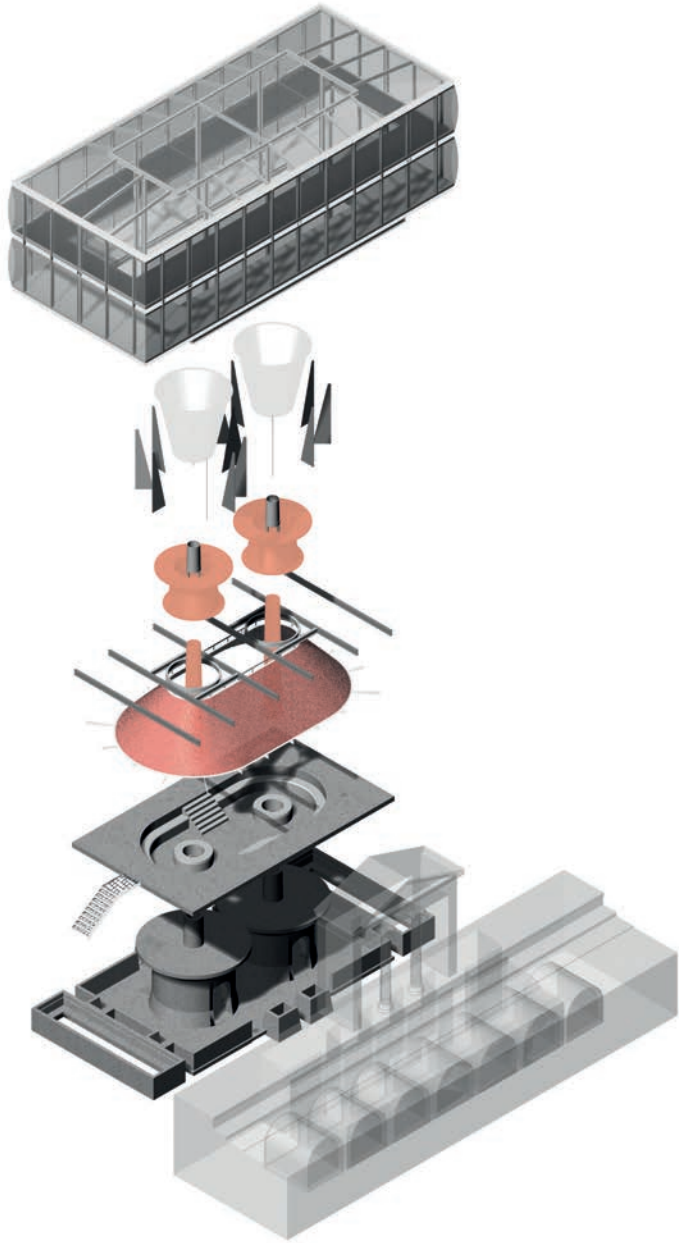
Public baths which serve the block are contained within the existing masonic lodge structure, democratising both a space and activity which had, over Bath's development, become associated with exclusivity. Food preparation and storage are assigned to the subterranean vault network, utilising its capacity for thermal retention as well as allowing warm air to be vertically distributed to upper strata.

The ground condition, previously occupied by commercial activity, becomes a horizontal plane which extends domestic living space out to the city beyond and a new covered piazza space within the block's interior engages everyday life with the rituals of bathing.

Above, framed circulation funnels connect to both a radically densified residential accommodation, around which a new green facade is wrapped. Warmed air finally rises to new greenhouse structures, maintained by residents which supply an autonomous source of fresh fruit and vegetables.







-
- 2 | Blue lagoon Architectural Device
 - 3 | Section through Bath House
 - 4 | Climatic facade
 - 5 | Re-scripted Section
 - 6 | Exploded Axo, Bath House

01_b

INSTRUMENT TO SURFACE THRESHOLDS

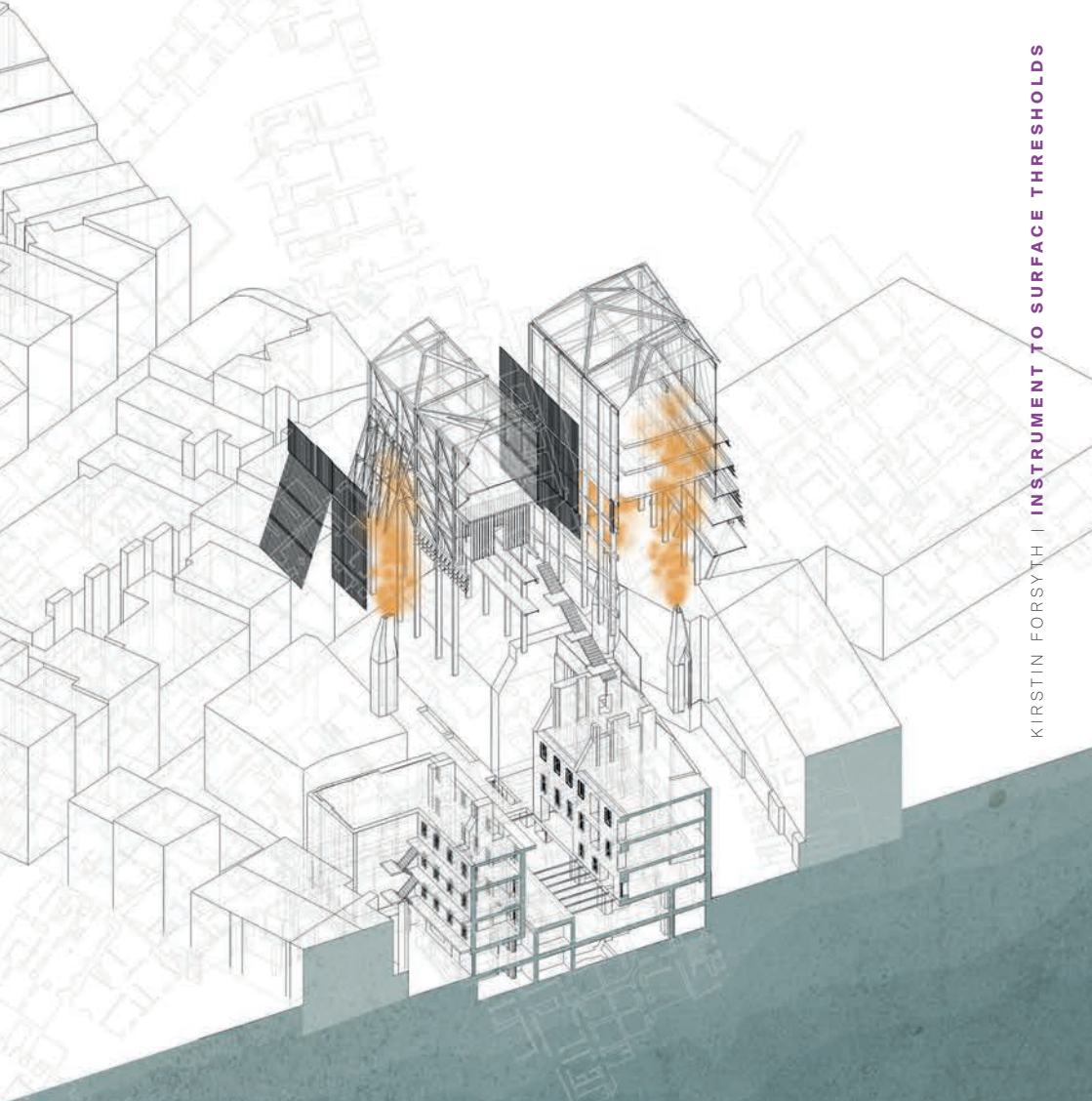
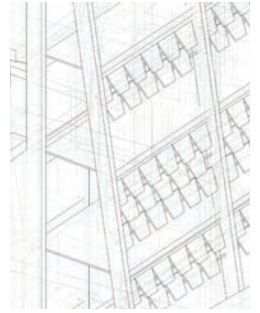
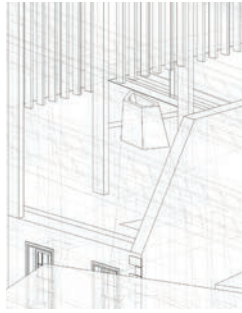
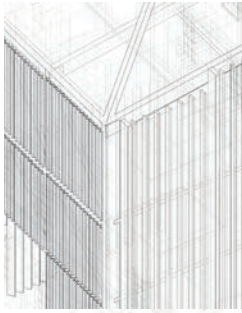
KIRSTIN FORSYTH

Instrument to Surface Thresholds is a proposal that strives to create living and working environments that facilitates a localised and sustainable approach to living, consuming, growing and producing within the collective reworked strata of the city. Spanning two existing Georgian town-houses in the centre of the old Medieval walls of Bath, the approach focuses on densification of dwelling and collective consolidation of cooking and bathing facilities, to communal spaces.

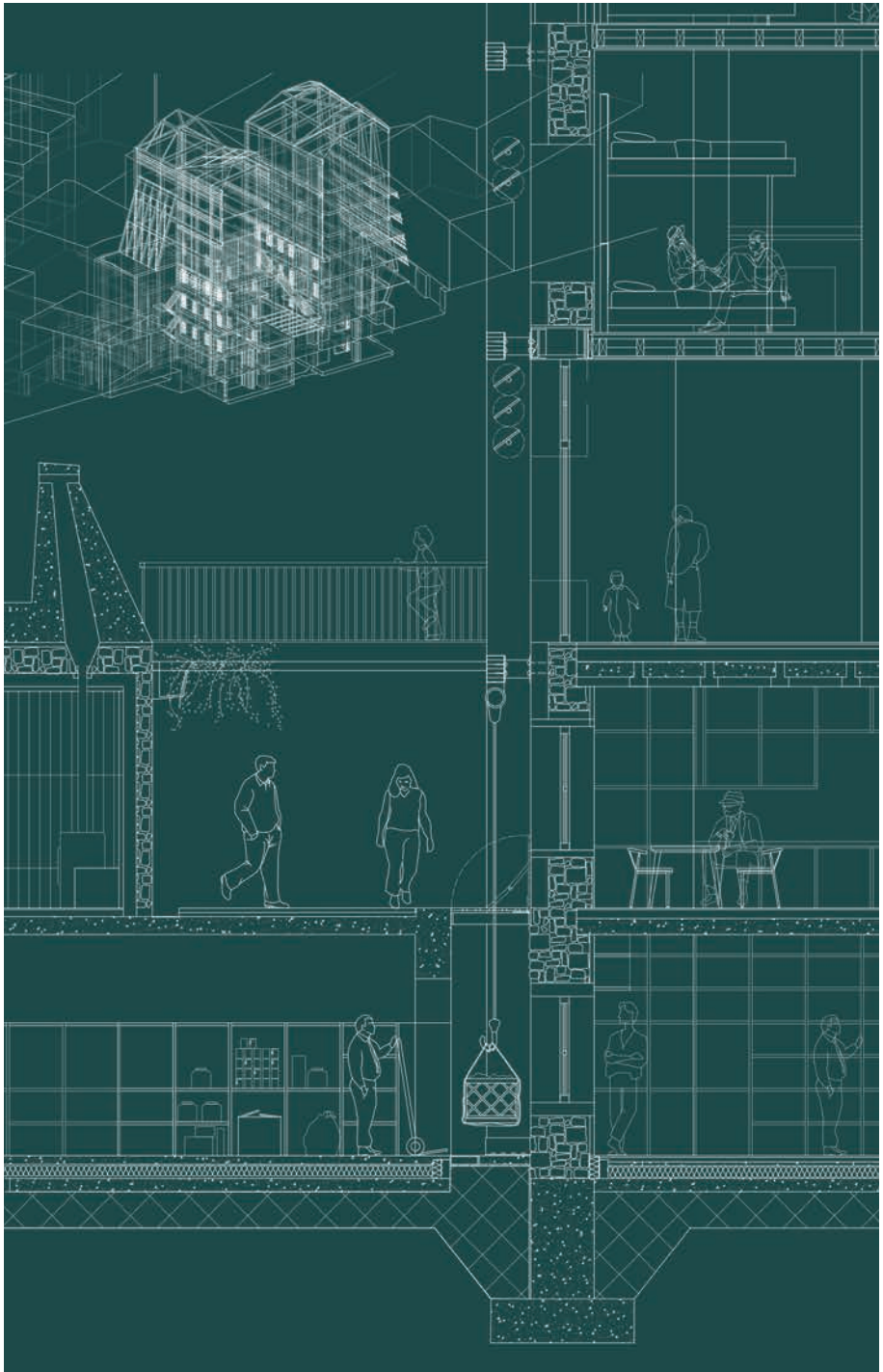
Where occupying the mid and subterranean strata, existing fabric will be retained. Thermal chimneys acting here as both heat and ventilation strategies, but also structural components to adapt the Georgian floor plans. The aerial offers a new landscape where to extend and localise productive growing space.

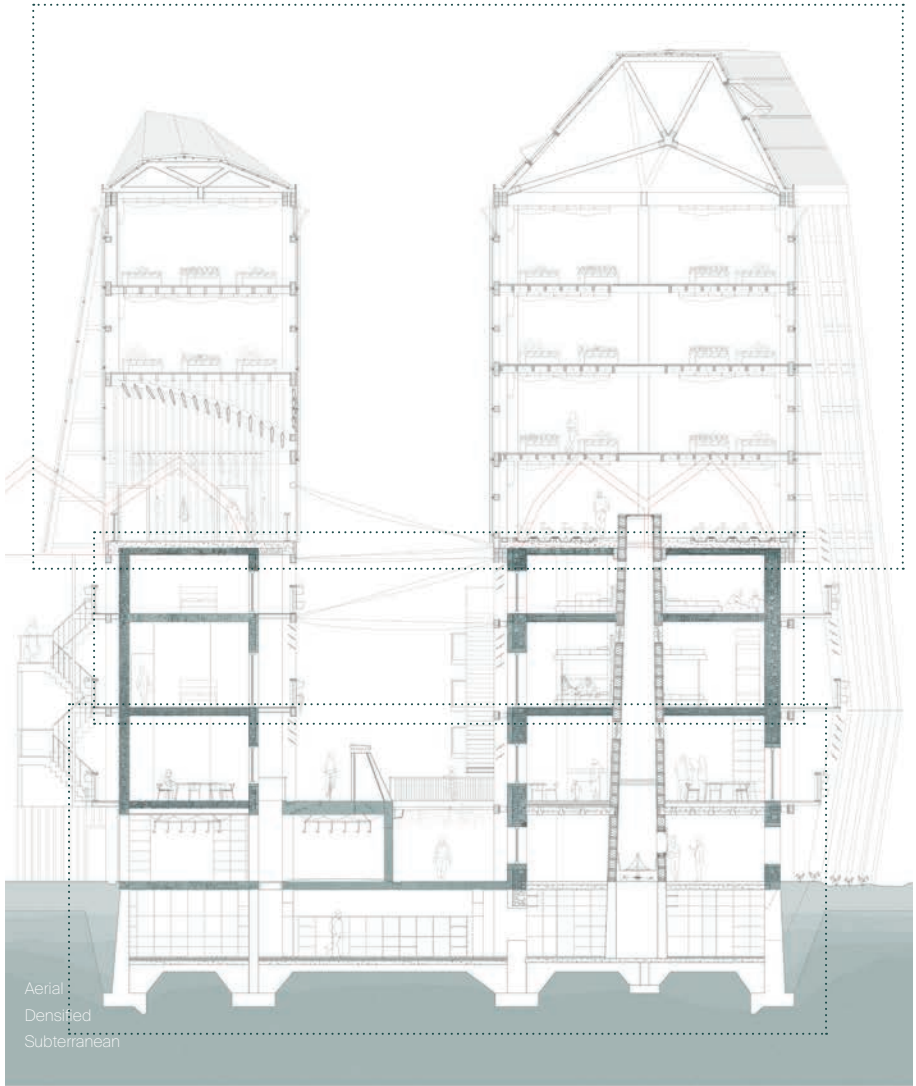
The architecture operates as a series of augmentations, additions and insertions into and onto the existing fabric. The wind tunnel is exploded and re-purposed. Funnels become chimneys, drawing air through the depth of the buildings. Rudders become fins, orientated to register and direct air flow through the site to facilitate food drying preservation. Filter structures envelop the proposal, mediating thermal climates through site specific shading and greening. The controlled test chamber evolves into the subterranean vaults, providing retention properties and constant low temperatures for food storage. All instruments act to passively control environmental conditions.

The architecture pushes towards a reduction in energy consumption and food wastage, buffering and insulating climates through a layering of structural conditions and plantings, facilitating natural ventilation, utilising heat producing domestic processes, and also providing opportunities for food preservation and recycling.



KIRSTIN FORSYTH | INSTRUMENT TO SURFACE THRESHOLDS





- 2 | Sectioned Axonometric and Food Storage | Preservation Detail
- 3 | Stratigraphic Section [Section B-B]

01c

MEDIATING STRATA

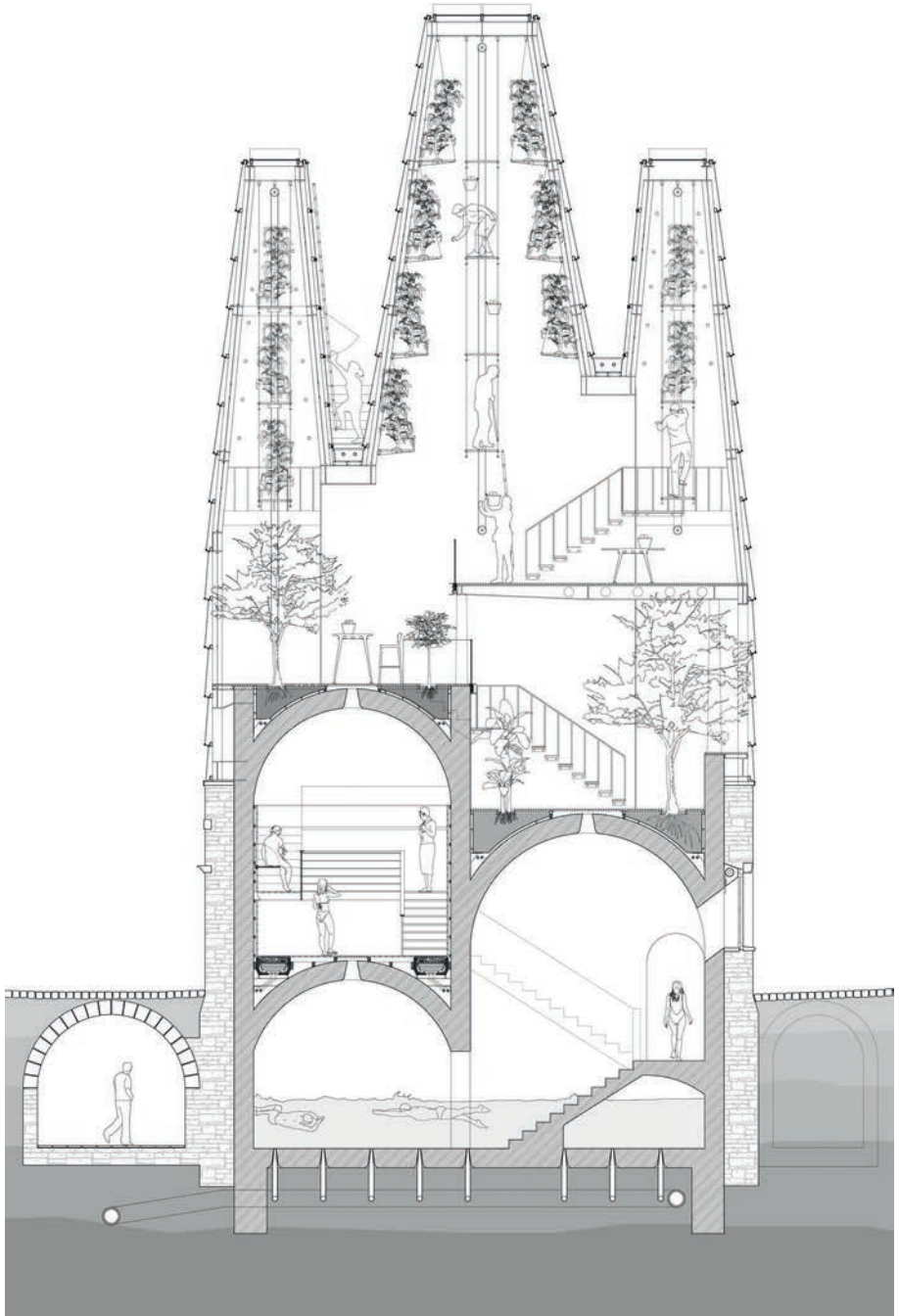
FRITZ HOLTGREWE

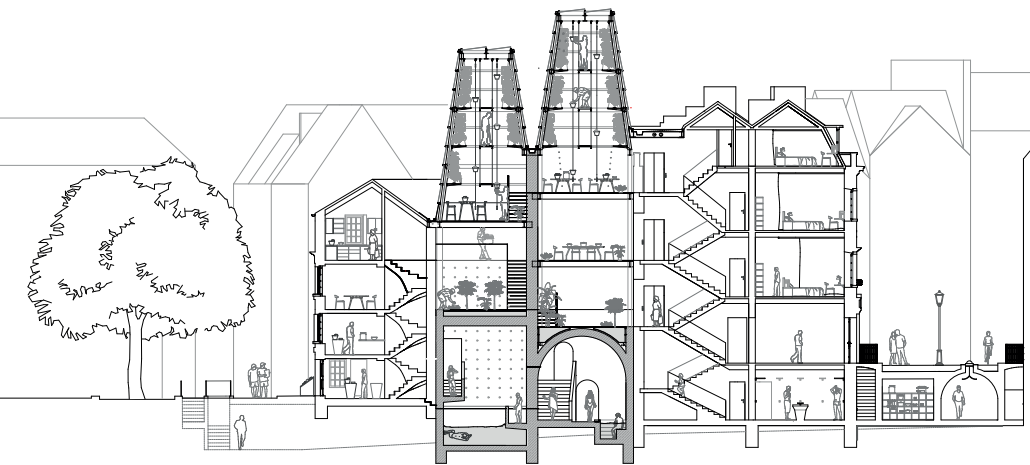
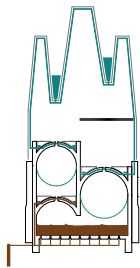
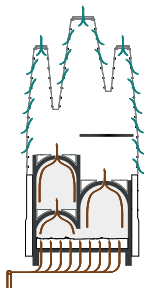
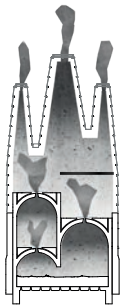
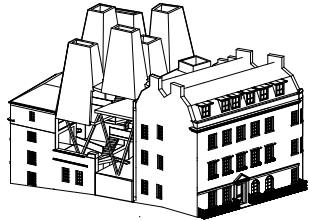
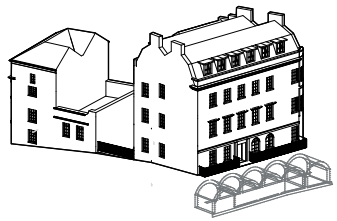
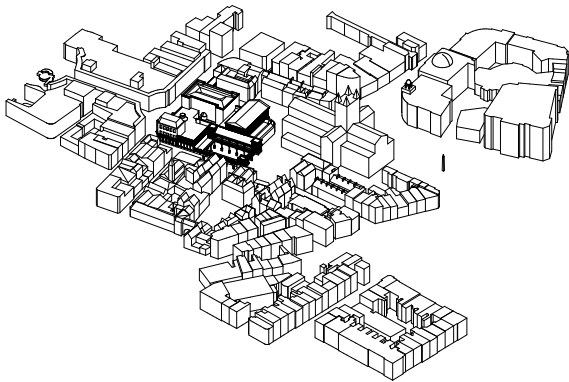
This proposal hybridises bathing and dwelling and reconfigures social structures and spatial elements within a historic urban block in central Bath. The proposal reworks the interior of two existing Georgian buildings and adds a new built collective bathing and communal food cultivation space within an existing gap between the two buildings. The project thus mediates space both horizontally between existing and new and vertically through collectively reworked strata as follows:

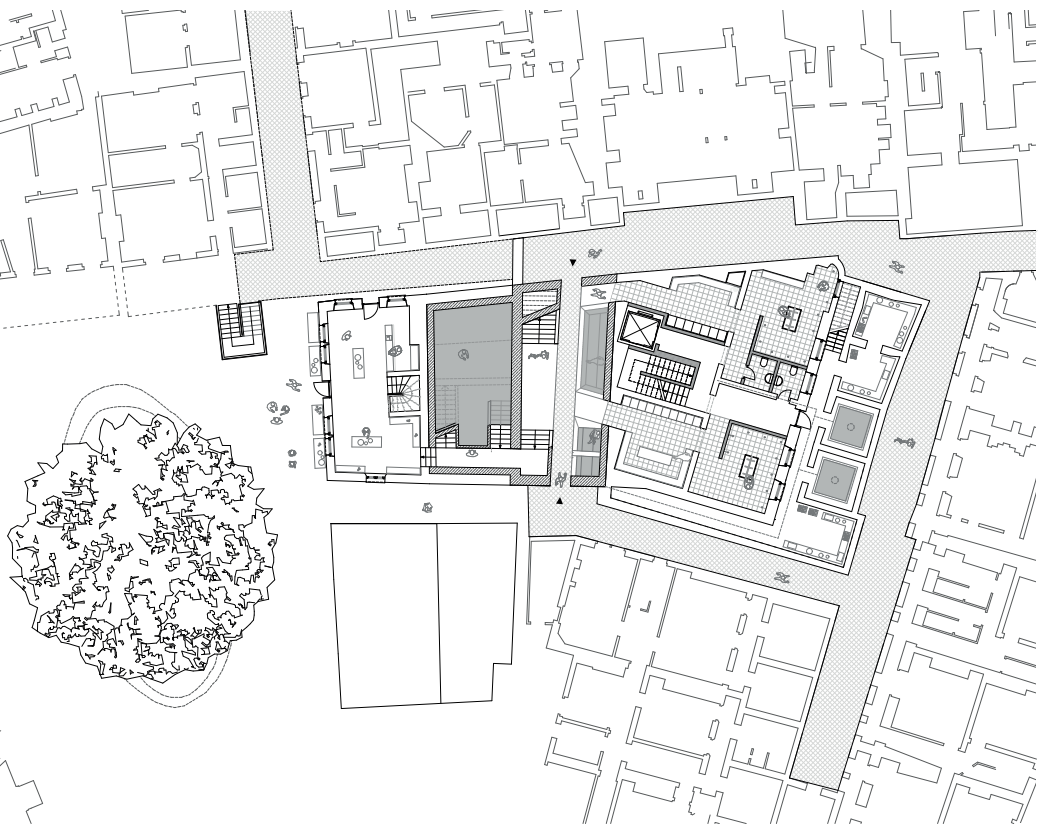
First, the project provides a subterranean point of connection to Bath's hot spring and vault network. Previously occupied by commercial activity, this new heavy, heat-retaining layer contains new modes of energy production and collective bathing facilities, creating a new public/social space throughout the city.

Heat from the subterranean baths leaks into the new 'middle ground' of the city within and between the two existing buildings. This layer is reconfigured to increase occupancy of the Georgian townhouse; living rooms, dining and kitchen are placed in new communal areas that mediating between the two existing dwellings.

Finally, the project proposes a new steel structure composed of large solar chimney greenhouses that perches lightly on the concrete core of the new bathhouse. Wrapped in a porous glass enclosure, allowing ventilation from the warm bath below and the cool outside air, they serve as food growth spaces of exotic and domestic fruits and vegetables.







-
- 2 | Roman Bath
 - 3 | Axonometric existing | proposal
 - 4 | Diagrammatic sections
 - 5 | Section A-A
 - 6 | Ground Floor Plan

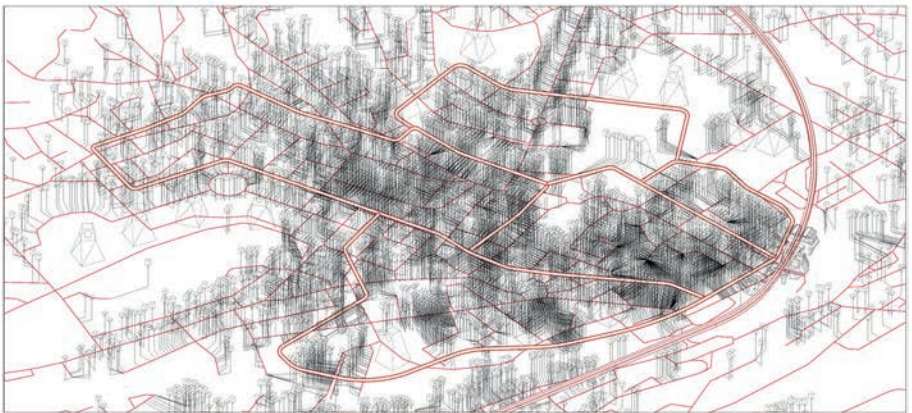
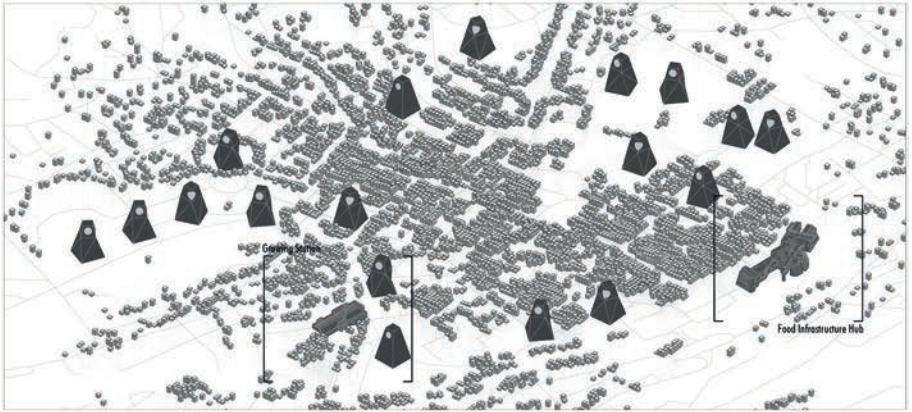
02

INFRASTRUCTURAL EFFICIENCIES AND INTENSIFICATIONS

BULAT GAFUROV | HENG ZHU (MAX)

A tectonically complex wind tunnel prototype offered a strong design language of frames, folded skins, and baffles and a conceptual strategy about constructed nested environments. These insights, combined with an interest in the interface between infrastructure, energy, and agricultural production informed design proposals in both the Blue Lagoon and Bath. In the Blue Lagoon, projects established infrastructural connections within the Svartsengi Geothermal Power Plant. In Bath, projects intensify urban agricultural production, leading to urban food autonomy in the city.

The project hypothesises that in the year 2050, fossil fuels will be fully depleted. Renewable energy sources remain relatively inefficient, but the existence of the amenity of geothermal hot water source enables Bath to become a major food hub in the United Kingdom. Hot water enables the replication of all distinct biomes in the world, enabling the cultivation of tropical and Mediterranean foods in particular. As passenger train travel wanes, train stations become new points of agricultural intensity in the city, acting as collection points, storage points, markets, greenhouses, and training facilities for urban cultivation. This project is supported by intensive per capita food consumption calculations and environmental parametric tests to ensure that the city's needs in terms of the greenhouse space and associated electricity is provided. In a post carbon future of energy and food shortage, resource efficiencies and optimisation, Bath's greenhouses offer a respite from austerity--a fragrant, warm, tropical wonderland--a space of natural and spatial exuberance.



- 1 | Food production facilities
- 2 | Overall post-carbon future of Bath food autonomy proposal
- 3 | Hot water infrastructure

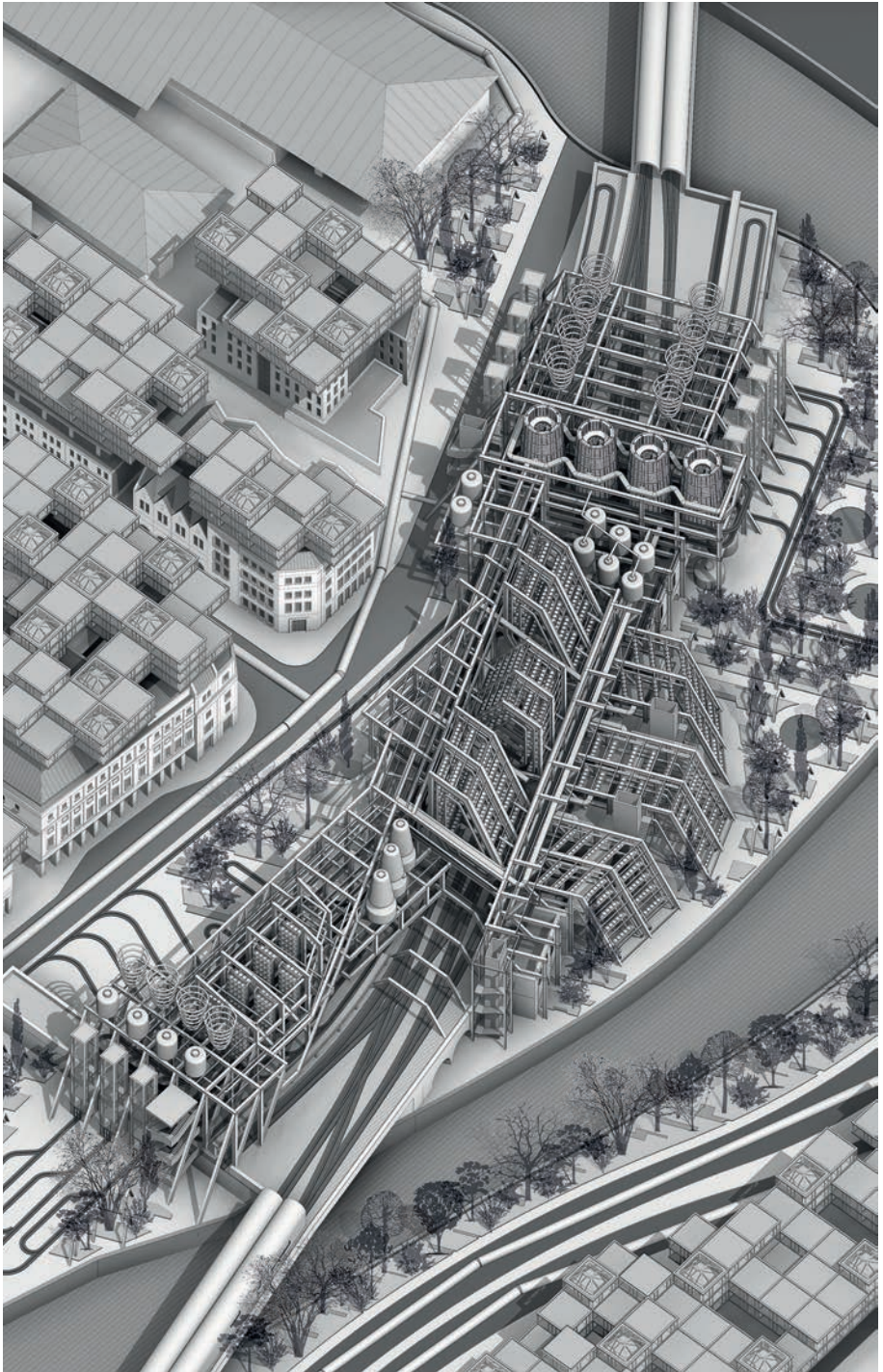
02_a

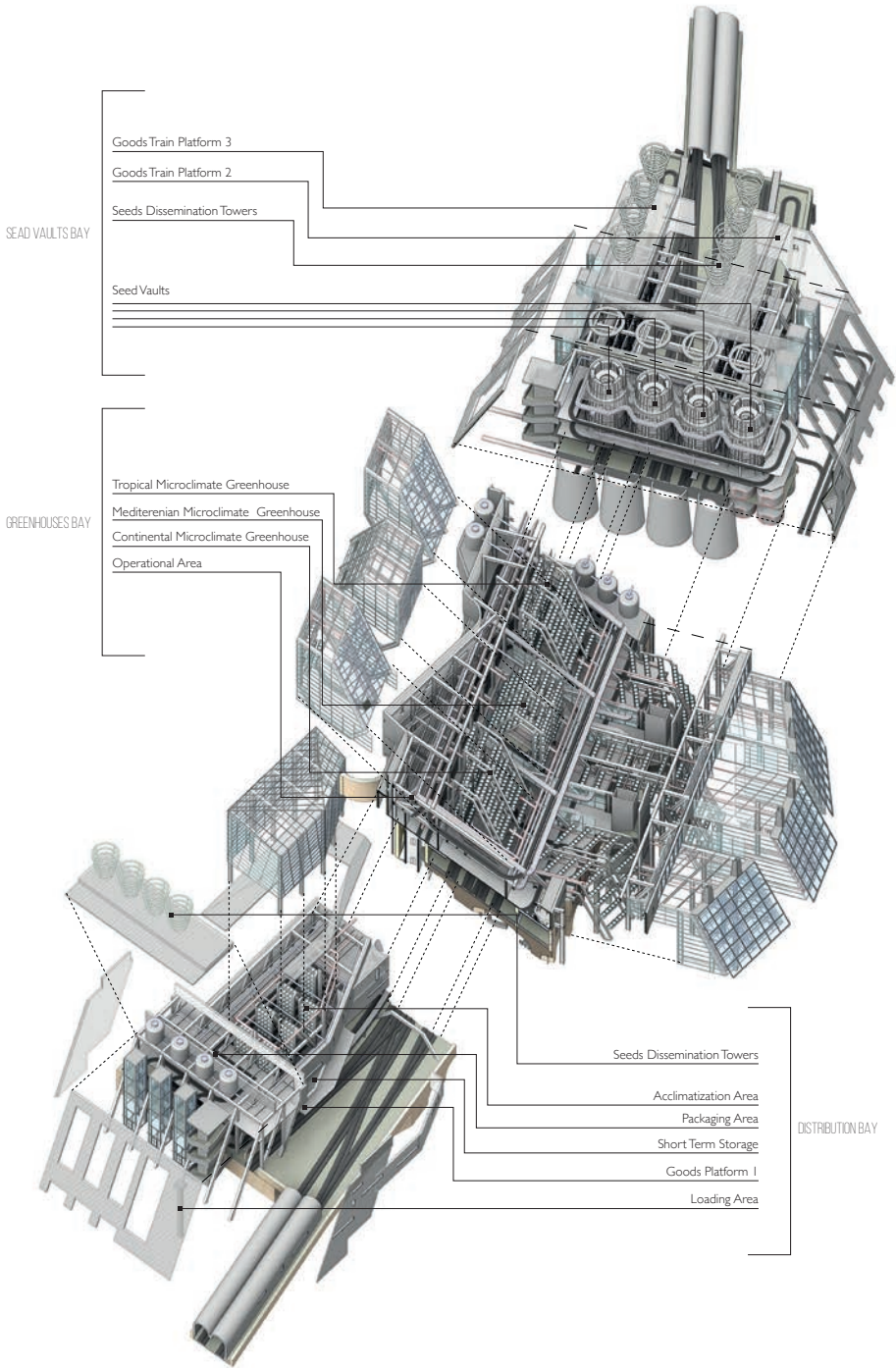
THE FOOD INFRASTRUCTURE HUB

BULAT GAFUROV

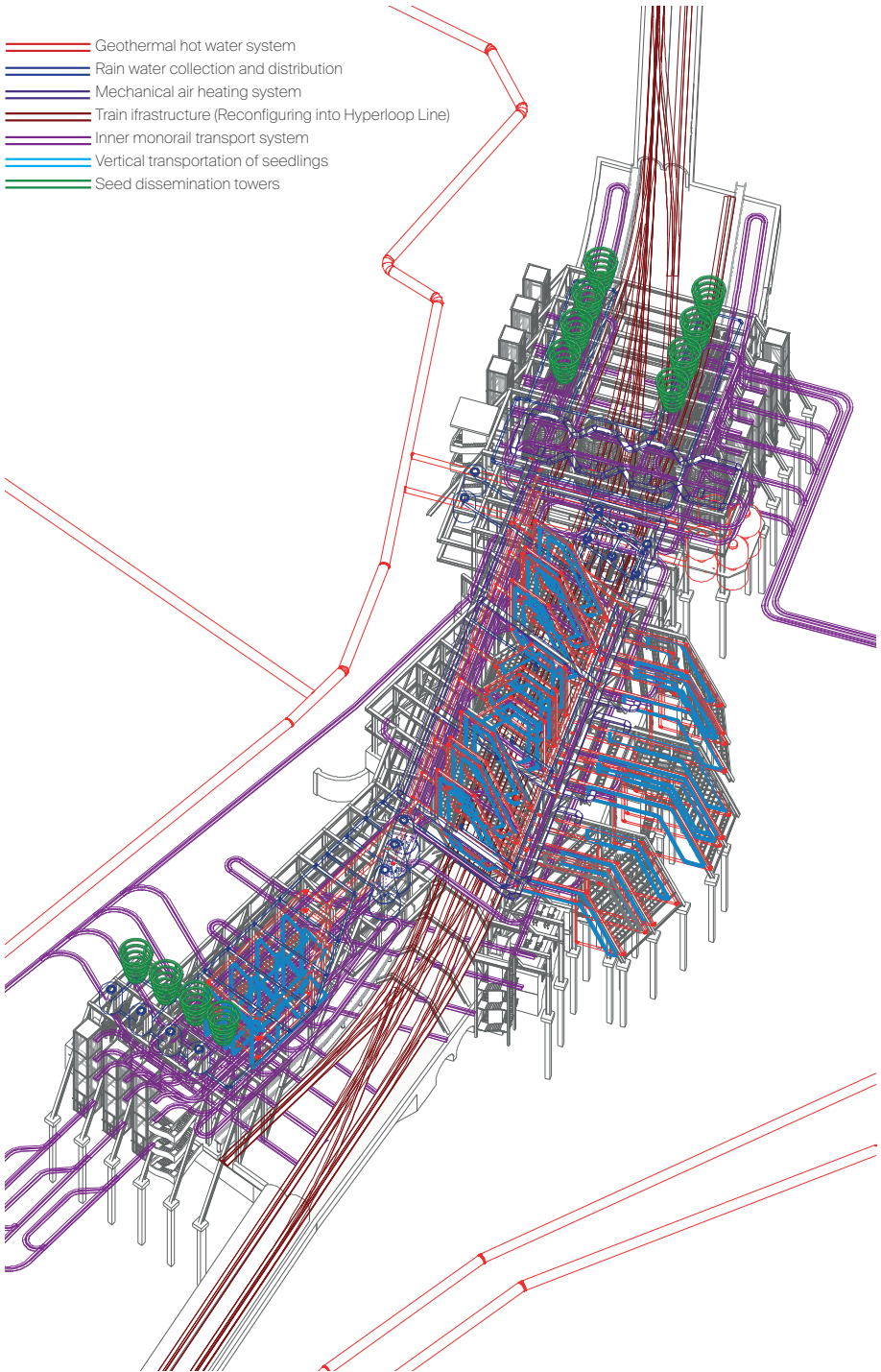
The Food Infrastructure Hub is part of a strategy of self-reliant food production in the city of Bath. The project is an extension of the existing Bath Spa train station, housing a nursery, seed vault, food storage and distribution facilities, and a market, while retaining limited train travel facilitated by high energy efficient technologies such as magnetic levitation and Hyperloop.

The project is organised around four key programmatic features: existing rail lines and platforms, the addition of three new microclimate greenhouses, each of which creates a distinct biome to facilitate growth a wide range of fruit and vegetable species; new protected seed vaults, and internalized infrastructure supporting the movement and short-term storage of food from elsewhere in the city. The existing structural system subdivides the project into distinct bays. A series of frames and lightweight cladding interface with this existing structure. The structural and material language of the project is derived by earlier investigations focusing on baffles, frames, skins, and nested environments. Passive ventilation strategies, rainwater irrigation collection strategies, seed dissemination and geothermal water distribution enables the construction of distinct environments that entangle infrastructure, food, and occupation.





- Geothermal hot water system
- Rain water collection and distribution
- Mechanical air heating system
- Train infrastructure (Reconfiguring into Hyperloop Line)
- Inner monorail transport system
- Vertical transportation of seedlings
- Seed dissemination towers



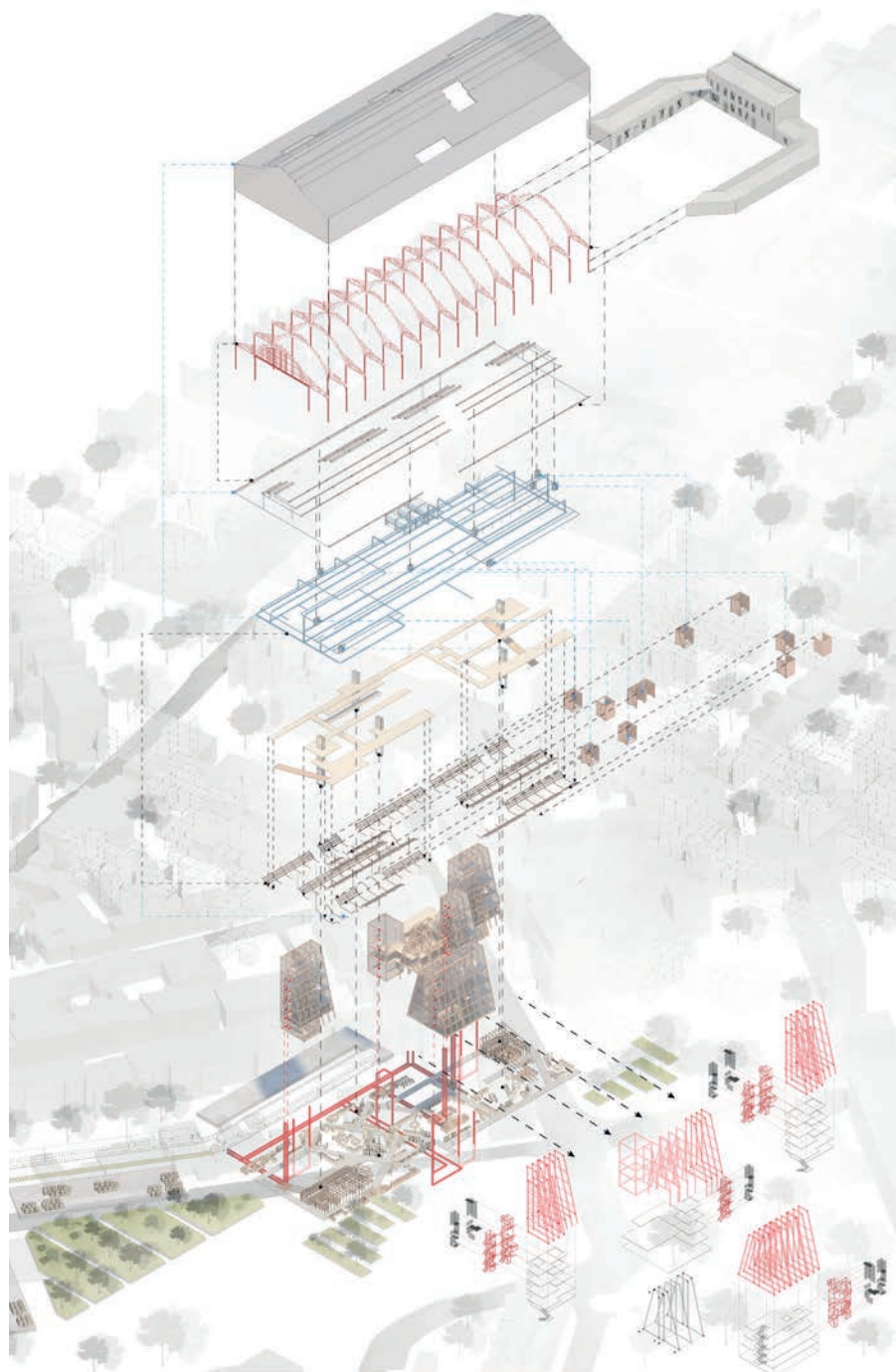
02_b

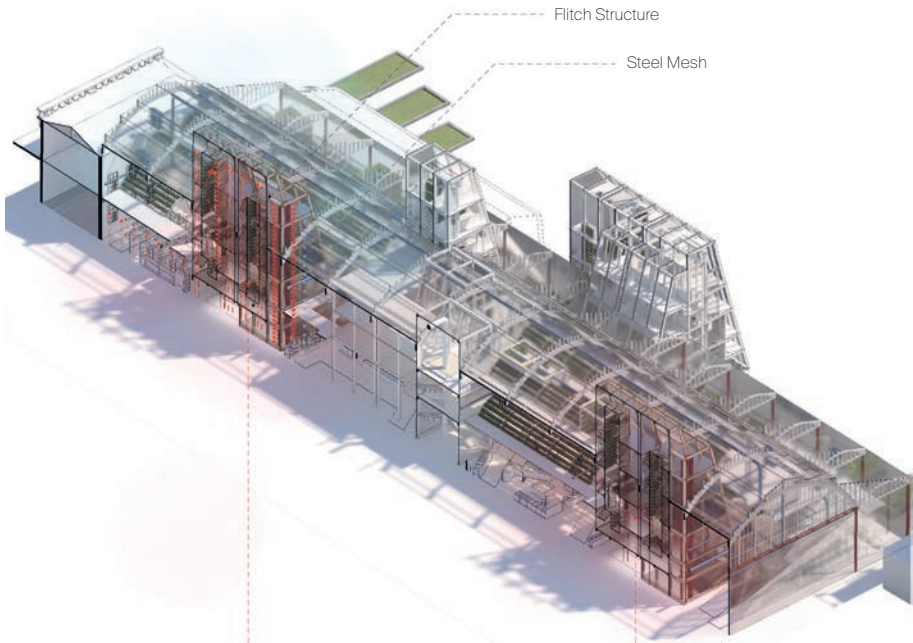
THE GROWING STATION

HENG ZHU (MAX)

The Growing Station contributes to the overall post-carbon strategy of creating food autonomy for Bath. Calculations and parametric studies revealed the vast volume of greenhouse area required to support produce production in the city. To facilitate this extensive cultivation, all citizens in post-carbon Bath voluntarily work on a part-time basis to run greenhouses and urban allotments. The project includes educational and personnel training facilities to train the urban workforce about how to cultivate food in the extensive system of greenhouses within the city. The building provides a variety of microclimates in order to educate and conduct research in all types of climatic conditions.

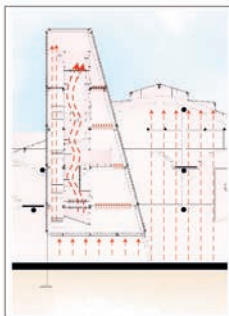
The project is implemented in the Green Park Train Station. Initially a hub for the transport of coal and later gas, the station lost relevance in the 20th century due to the decrease in coal consumption and changing modes of gas delivery. It has been repurposed as a food market space. This project aims to create a new typology by merging greenhouse, educational and food production and consumption spaces. The project proposes new interventions where educational processes and food cultivation are carried out simultaneously. The conceptual and tectonic language of the project borrows from extensive work with the environmental model and the proposal in the Blue Lagoon, where the main distinctive features of the project included steel frames structure and nested environments.





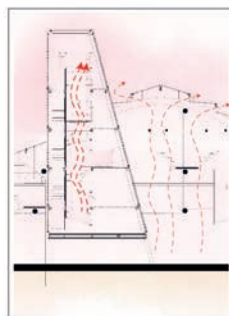
Winter Time

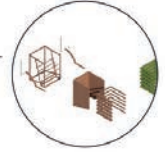
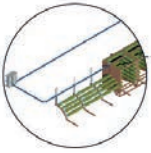
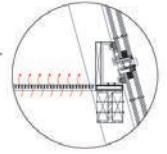
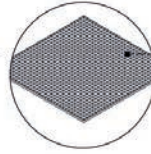
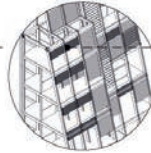
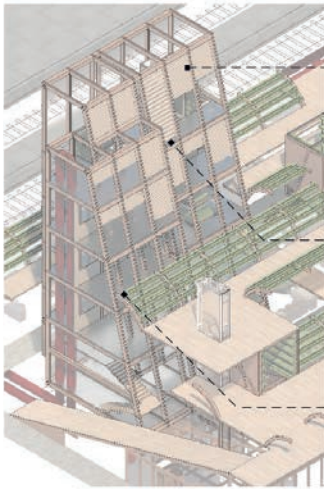
Hot air go inside the tower to prevent cool down



Summer Time

Hot air go out from the tower and roof to cool down





- 2 | Environmental condition
- 3 | The Growing Station
- 4 | The Growing Tower

03

SEQUENTIAL TRANSMUTATION

JOSHUA SIU

Sequential Transmutation is a prototypical architectural framework designed within the specific context of Bath. The proposal promotes the decentralisation of energy and introduces a shift in dietary habits as means to sustain both the planet and the human body in a post-carbon future. The methodology for developing this framework relies on auditing and recalibrating components associated with two buildings: the Svartsengi Power Station in the Blue Lagoon and the Roman Baths of Bath. The architectural language of the power station offered a system of lightness and aeration; that of the Roman Baths offered a language of thermal mass, chimneys and heat distribution. Through sequential set of operations, these elements were displaced and tested as part of a proposal for a new bath and food cultivation seam in the existing vaulted undercarriage of central Bath.

The journey through the project starts in the Roman baths, which is adapted to operate as a functioning *thermae*, works through through the subterranean urban fabric, which incorporates spaces for food production and consumption, and terminates at the ruins of the Parade Garden pavilion?. The existing underground vault network and excavated ruins are augmented through the introduction of architectural elements that enable food production and energy harvesting.



JOSHUA SID | SEQUENTIAL TRANSMUTATION

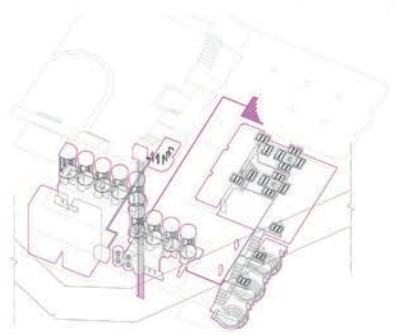
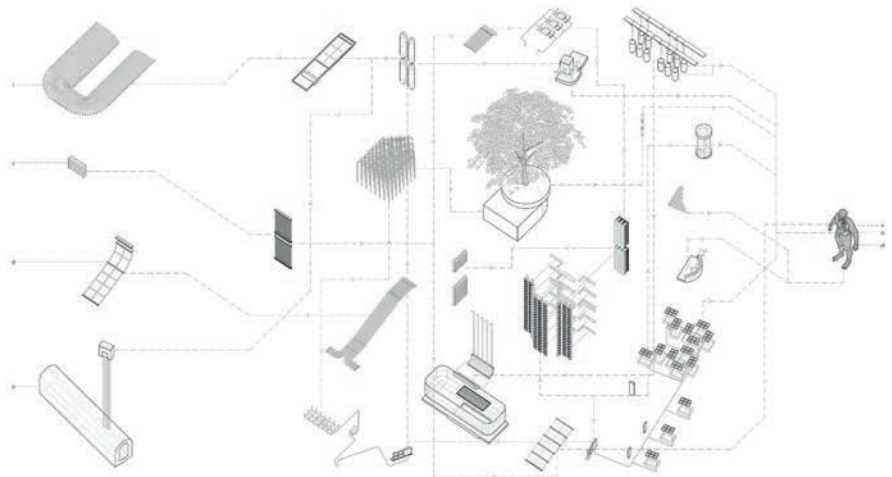


Figure 01

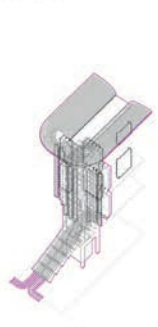


Figure 02

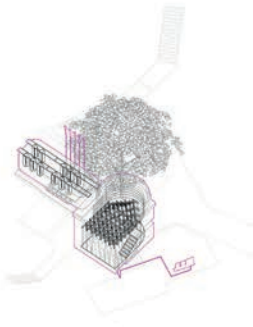
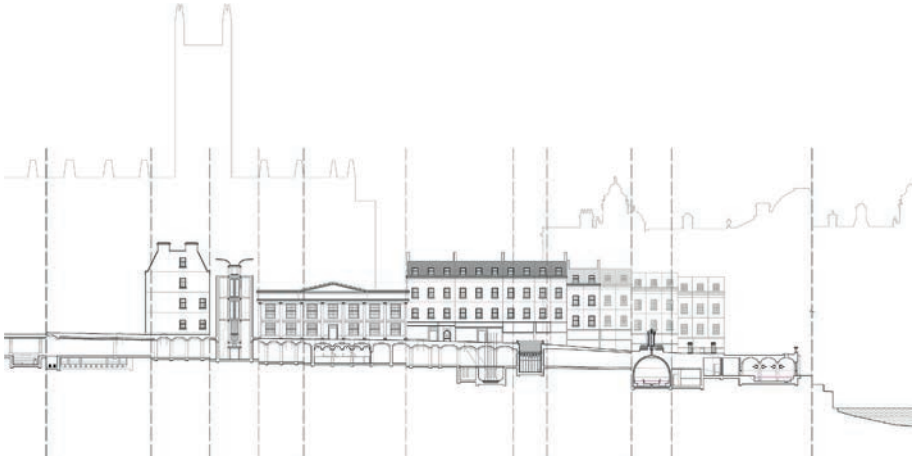
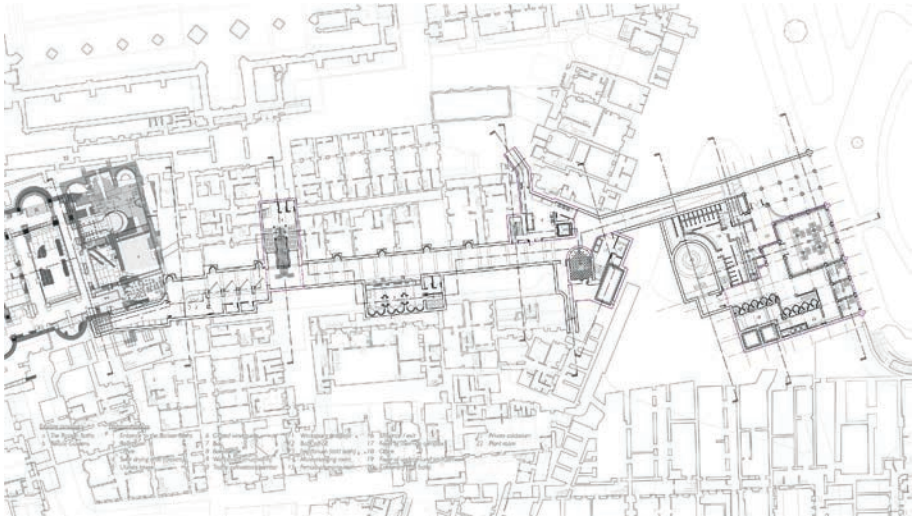


Figure 03





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- 2 | Component build-up ; Architectural fragments ; Proposal parameters in central Bath
 - 3 | -1/F plan highlighting the three fragments
 - 4 | Long section across spine from the Roman Baths to Parade Gardens

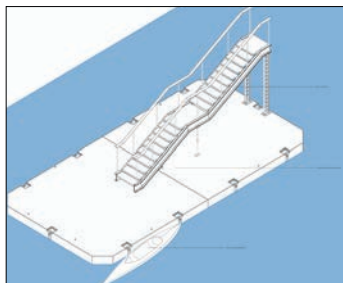
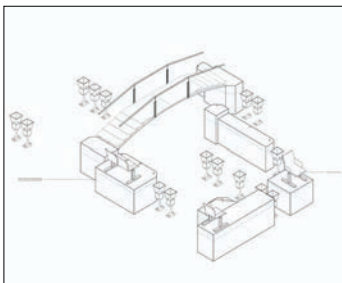
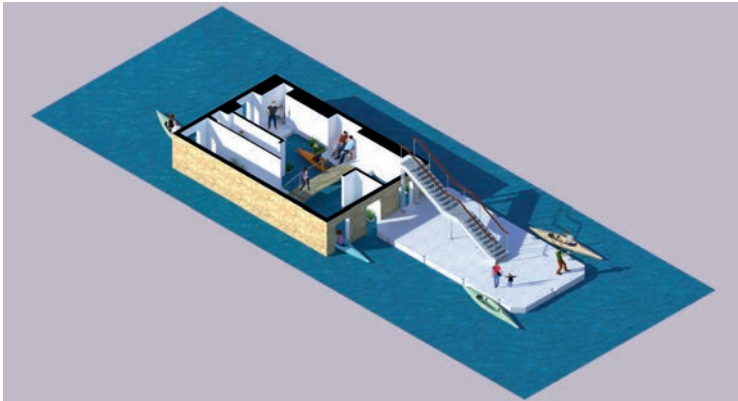
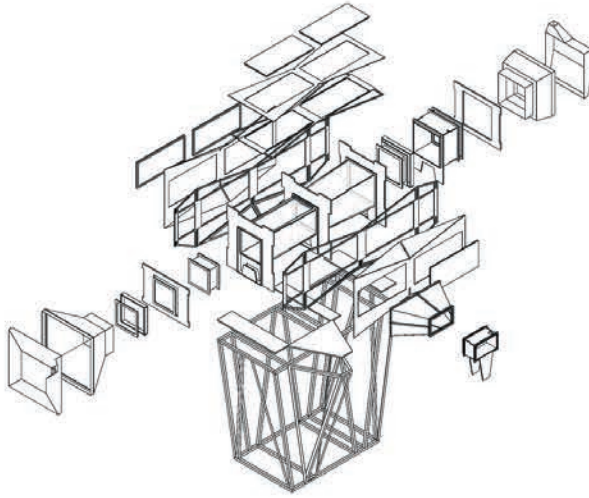
04

FLOTATION & SUBMERSION

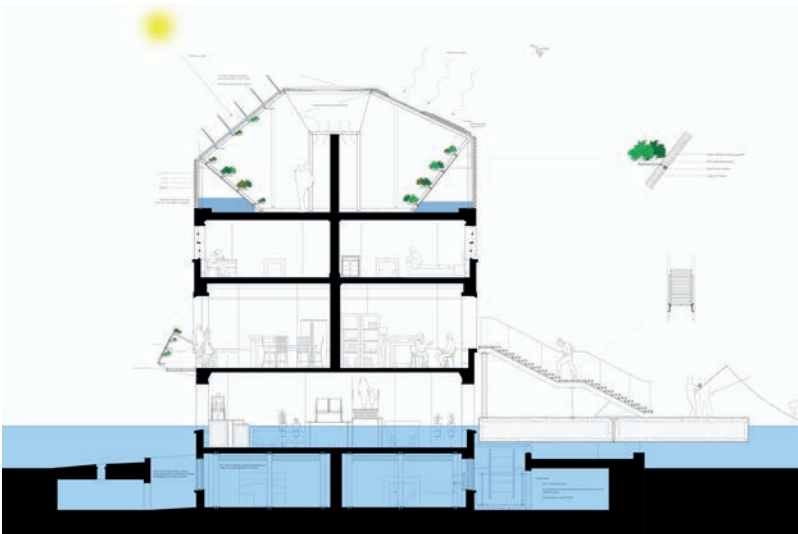
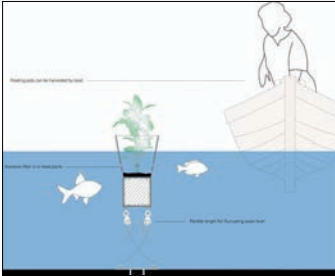
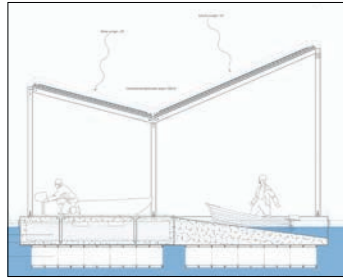
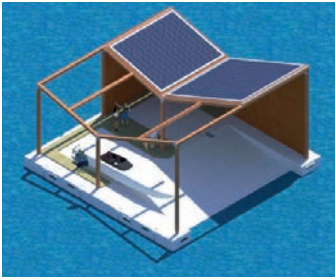
CHRISTOPHER TOLMIE

This project explores themes related to building adaptation prompted by climate change. More specifically, the project hypothesises about a future in which the River Avon floods substantially, inaugurating the need for a reworking of the general use and configuration of the Georgian tenement building. A series of components are designed to be deployed within existing urban fabric; these components attempt to restore functionality that has been lost to a watery grave and to prolong the lifespan of the partially submerged structures. Designed components include:Moreover, the organisation of spaces within the Georgian buildings are reconsidered to take into account.... The architectural language of the project was derived from early wind tunnel prototypes, which were composed of a strong tectonic language of frames and folded surface





-
- 2 | Exploded componentry of the wind tunnel
 - 3 | Render of first floor systems
 - 4 | Axonometric of "islands" and aquaponic pots
 - 5 | Axonometric of entrance pontoon



- 6 | Render of service pontoon
- 7 | Section through service pontoon
- 8 | Section through aquaponic pot
- 10 | Internal render of aquaponic pots
- 11 | Section showcasing systems within Georgian house

05

ANCHORING & SUSPENSION:

BATH WELLBEING

FENGYI WANG | MAOYU MAO | JINGYI WANG

Suspension & Anchoring explores a fascination with the dialogue between tectonic lightness and heaviness in relation to orientation. Early environmental model prototypes raised questions about how the forces of air movement transform and activate material assemblies. Two wind tunnels, one vertical and one horizontal, further revealed how structural forces transfer through material systems of suspension and anchoring. These insights, displaced to the thermally asymmetric context of Iceland, suggested a particular contextual understanding of environment as one of material activation.

Architectural proposals designed for the Blue Lagoon in Iceland, titled ‘Thermal machine’, ‘Stockfish Laboratory’ and ‘Organic Kitchen’, understand architecture as an environmental instrument, responding to working between environmentally controlled and environmentally contingent environments and between exterior, interior and threshold spaces through the careful articulation of materials.

Bath is a city of layered stratigraphies of varying material and environmental qualities and weights. This project reworks these layers by establishing a series of new health and wellbeing complexes in Bath, building on the city’s productive therapeutic past. Projects rework the ground; roads become ecological corridors, introducing new confrontations between human, plants and animals. Projects use the thermal springs for heat, humidity and to support plant cultivation to facilitate health and wellbeing. Projects are flipped from horizontal (Blue Lagoon) to vertical (Bath) to test the implications of reorientation on building tectonics.



FENGYI WANG | MAOYU MAO | JINGYI WANG | ANCHORING & SUSPENSION

05_a

HERBAL HYDROTHERAPY INSTITUTE

FENGYI WANG

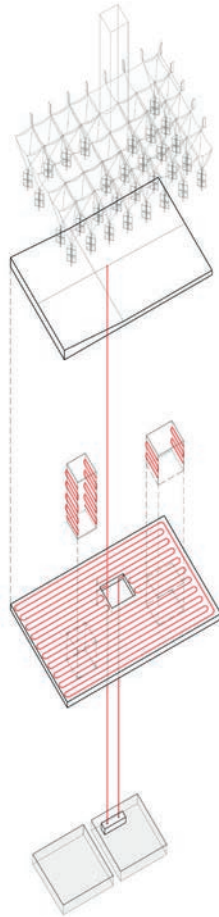
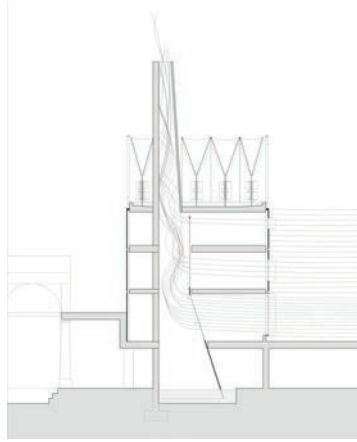
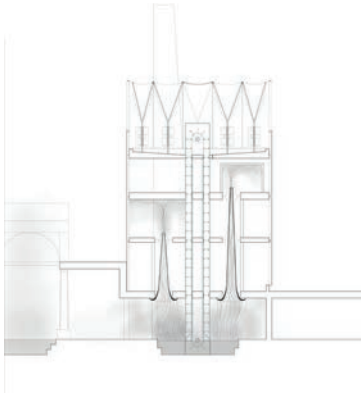
This proposal combines Bath's historical hot spring skin disease treatment with contemporary herbal therapy regimes. The proposal combines the effects and qualities of the existing source of geothermal hot water with cultivation of particular aromatic herbs to create a rich, sensorial therapeutic environment for a range of hydro-therapies.

The proposal is sited adjacent to the East Bath of the ancient Roman Baths, where the hot spring is still actively maintained at a temperature of 40 degrees. The tectonic language of anchoring and suspension has been explored in this proposal through vertical orientation of the horizontal proposal developed in the Blue Lagoon; thick, thermal walls from the Blue Lagoon have been transformed into sculpted thermal floors with different thickness and thermal retentions. A suspended fabric internal chimney, lightweight water collection system, vertical herbal tea-bag conveyance system and rooftop drying mechanisms offer a lightweight tectonic counterpoint to the heavy cast floors.

The project's verticality enables thermal zoning with varying temperature, ventilation and humidity levels to create distinct experiential environments on each floor. The basement level houses "tea bathing" in which the hot spring infuses herbal tea bags to create a distinct aromatic environment. The mid-section of the building supports herbal cultivation and smaller scale focused therapies. On the roof, herbs are dried and water is collected for gravity-fed systems used throughout the building below.



FENGYI WANG | HERBAL HYDROTHERAPY INSTITUTE





- 1 | reception
- 2 | clinic
- 3 | waiting area / hydroponic
- 4 | office
- 5 | facial steam treatment
- 6 | waste herbal tea bag disposal (from the vertical delivery system)
- 7 | staff changing room
- 8 | chimney
- 9 | external herb planting

s

- 2 | Humidity diagram
- 3 | Ventilation diagram
- 4 | Temperature diagram
- 5 | Site plan

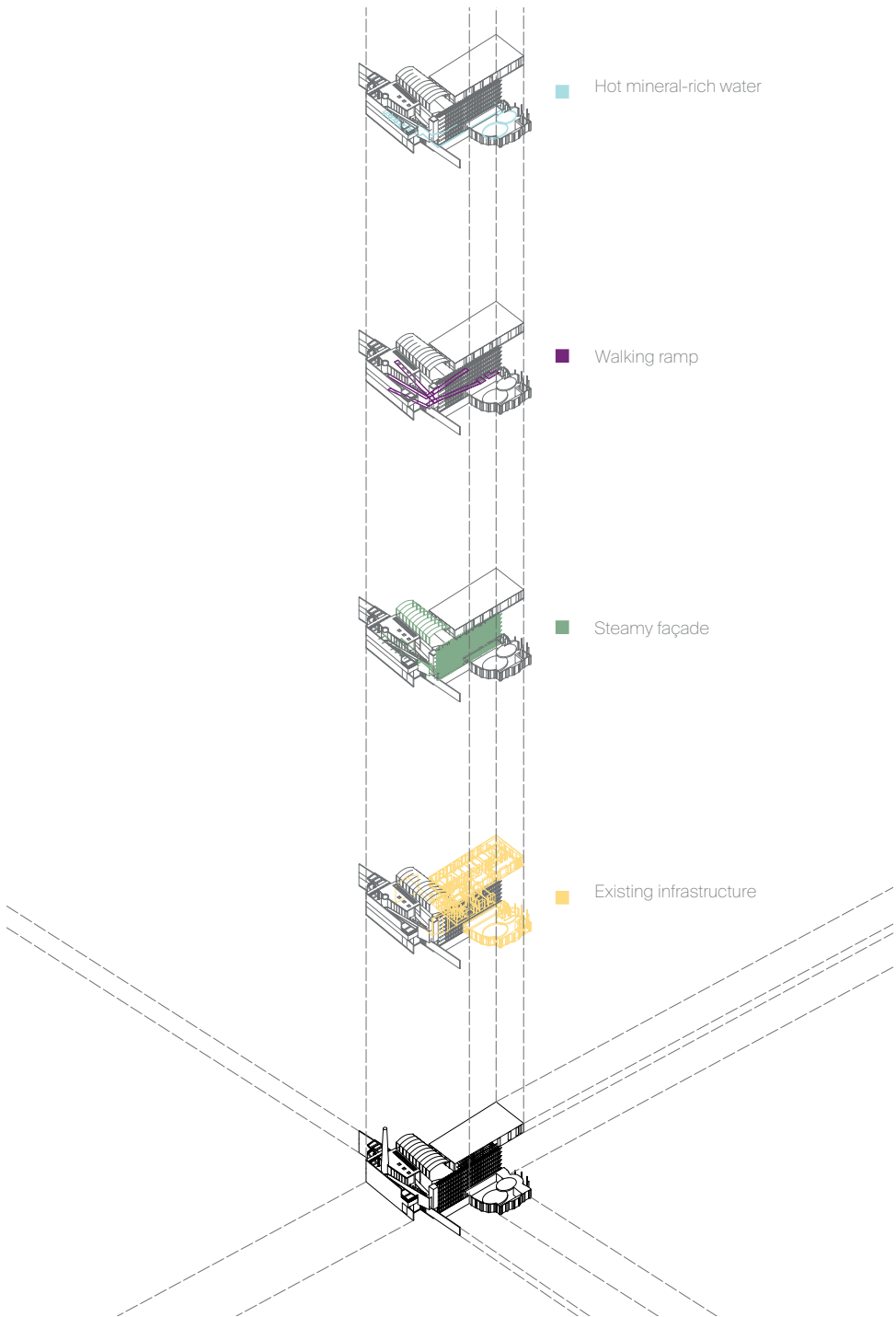
05_b

BIOCLIMATIC PROTOTYPE OF SANATORIUM

MAOYU MAO

The Thermae Sanatorium assembles a series of spaces devoted to treating chronic illness associated with joint pain. The project is located in the Cross Bath, a historic site adjacent to St. John's Hospital in close proximity to the ancient Roman baths and the Bath Abbey. In the building, guests, primarily suffering from rheumatoid arthritis, are offered therapies and pain relief by using vapotherapy, hydrotherapy, dietary therapy and hot spring crystals for home treatment. Each of these therapies is associated with a particular space that amplifies the environments associated with the aromatic, visual, and acoustic properties of each therapy type.

The project is composed of the following key moves. A threshold vertical steamy facade traps steam, enables avocado cultivation, and directs steam into and through the partially ruined St. John's Hospital, which contains spaces for hydrotherapy. This facade also acts as entry and circulation. The wind tower is used to encourage air movement through the central atrium. The salt crystallisation wall is used to drying out the mineral-rich water by the natural ventilation. On the roof, a sky planting field incorporates a grove of avocado tree at later stage for using as ingredient in the photosynthesis kitchen. Grassy plants register activation of air movement and weather balloon are flown on windy days that carries small version of environmental instruments (wind sock etc) aloft to visually illustrate atmospheric phenomenon.

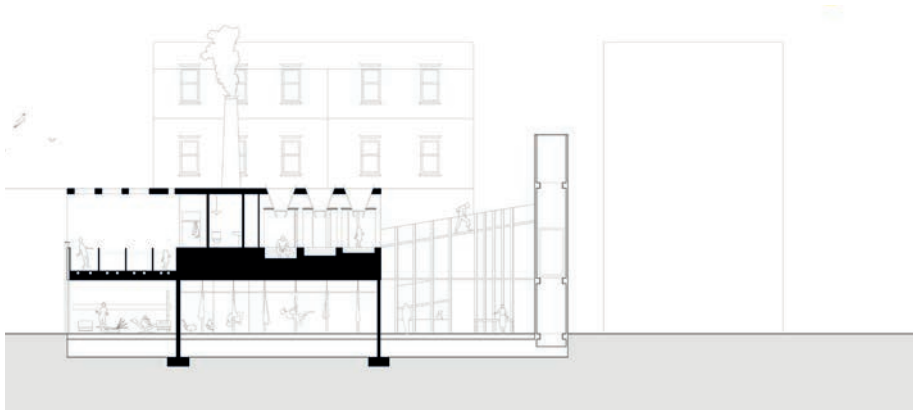
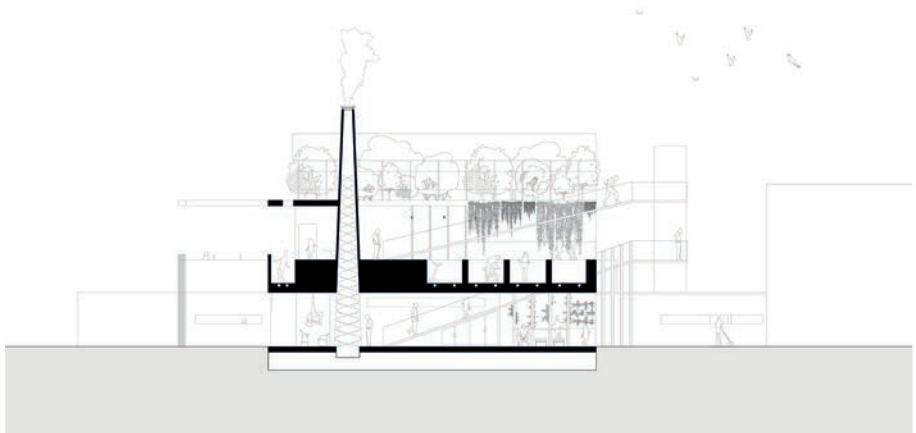
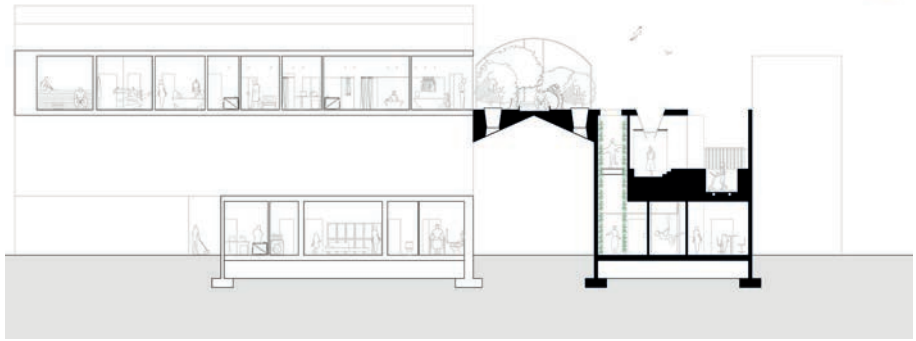


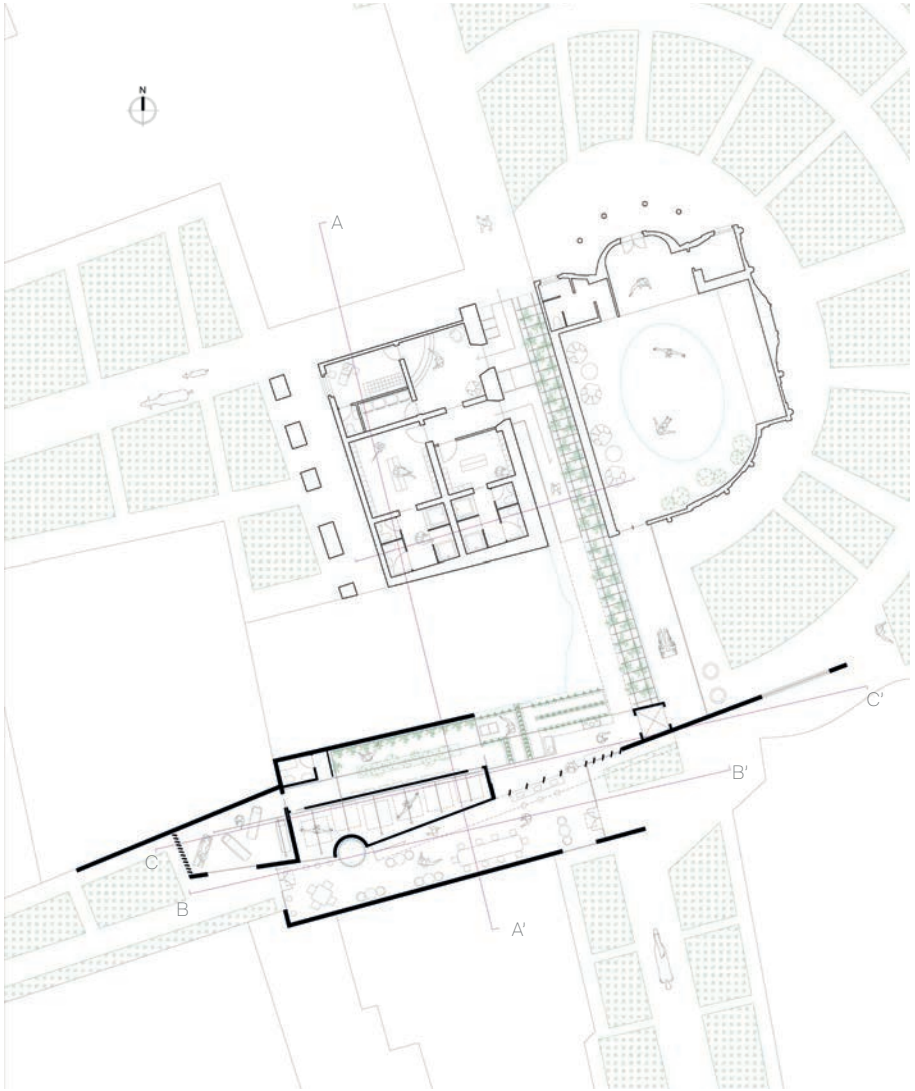
Hot mineral-rich water

Walking ramp

Steamy façade

Existing infrastructure





-
- 2 | Section AA'
 - 3 | Section BB'
 - 4 | Section CC'
 - 5 | Ground Floor Plan

05c

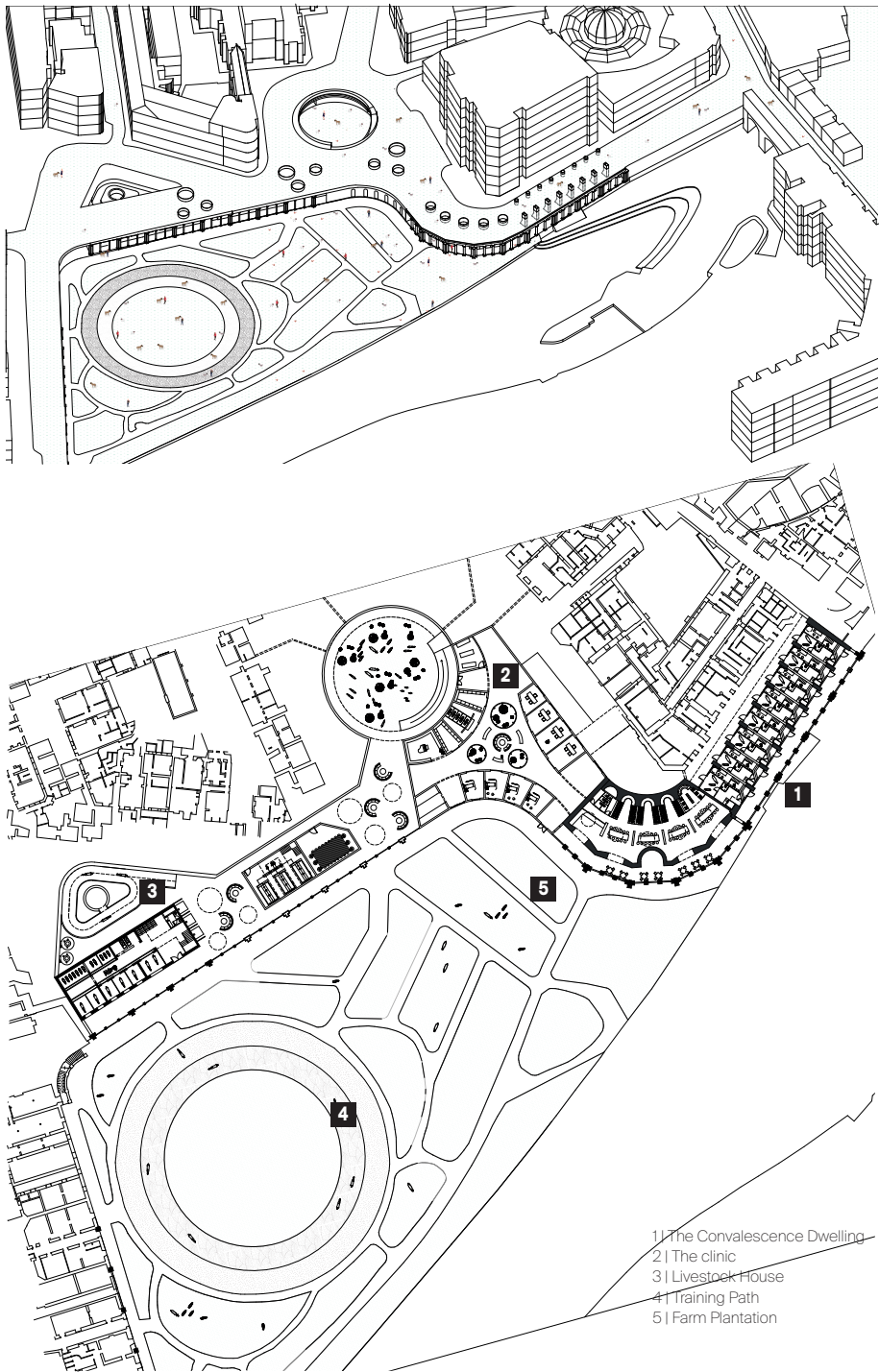
RE-WILDING + CONVALESCENCE

JINGYI WANG

This project re-works the ecology of the city and builds on this enhanced ecology by introducing spaces for humans and animals as a means to facilitate health and wellbeing of both.

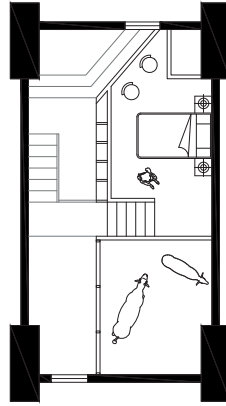
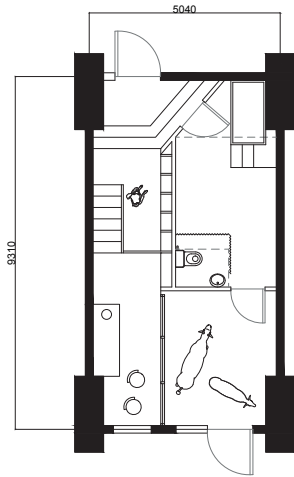
In post-carbon Bath, roads act as wildlife corridors as their current use for car-based transport becomes obsolete. Plants absorb CO₂ and to release O₂; animals eat plants and leave waste to fertilize the ground; these new plants further increase biodiversity of urban green spaces. Within this new urban ecological context, this project hybridises a convalescent home with a livestock farm, facilitating interactions between human beings and grazing animals, strengthen their relationships and healing both. People tend animals with injuries using water-based therapies. Animals help heal people through petting, feeding, and bathing.

Located near the riverside and the Parade Garden, the site is close to the thermal water Great Drain. The Parade Garden provides open space for animals grazing. The River Avon and Great Drain offers a comfortable warm microclimate and animal bathing. The convalescent home is built into an existing Georgian arcade along the River's edge. While the project is divided in three distinct elements-- animals shelter, canteen and convalescent dwelling-- the project is designed to facilitate regular chance encounters between humans and animals.



- 1 | The Convalescence Dwelling
- 2 | The clinic
- 3 | Livestock House
- 4 | Training Path
- 5 | Farm Plantation

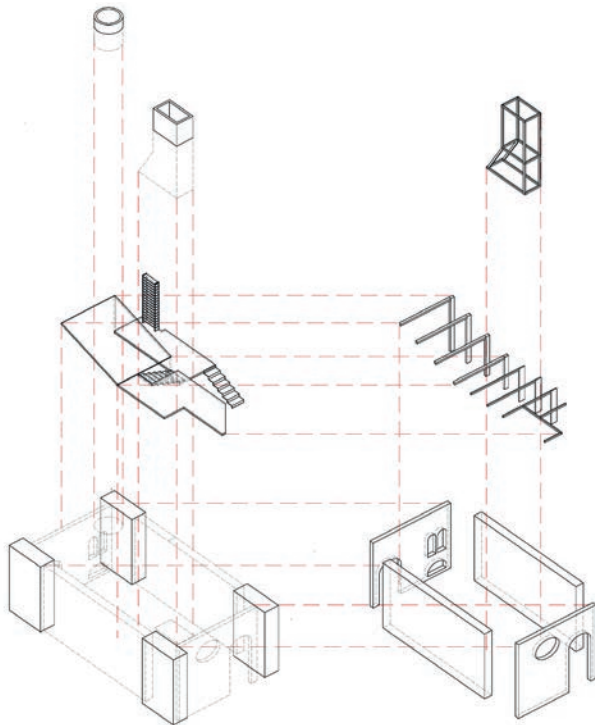
1 | Site plan

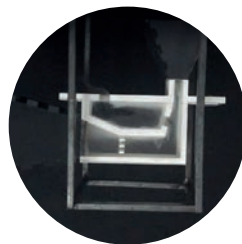
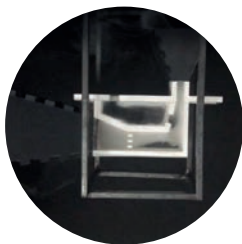
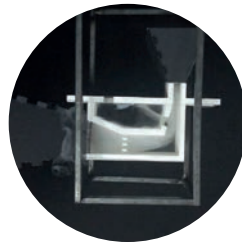
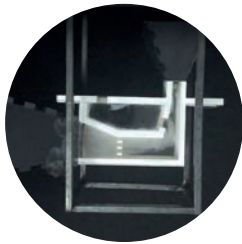
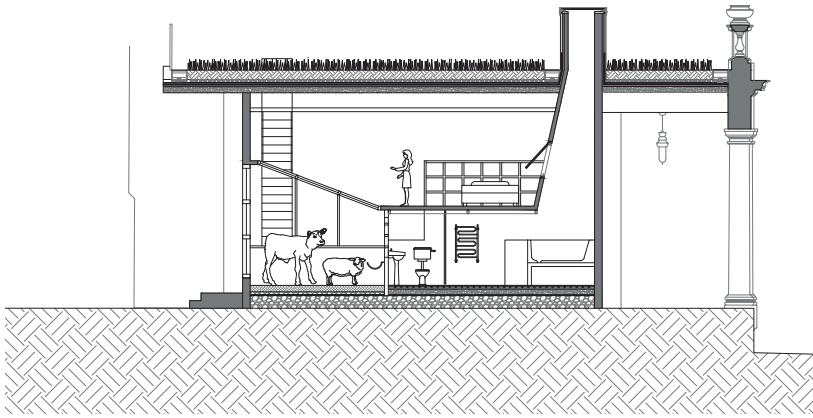


Chimney

Timber Floor

Existent Column





-
- 2 | Ground floor plan
 - 3 | Loft floor plan
 - 4 | Exploded axonometric drawing of the new supporting system
 - 5 | Section
 - 6 | The Record of Environmental Model Testing



Filling Tank Prototypes

2018/2019, Laura Haylock, Calum Rennie and Katy Sidwell



06

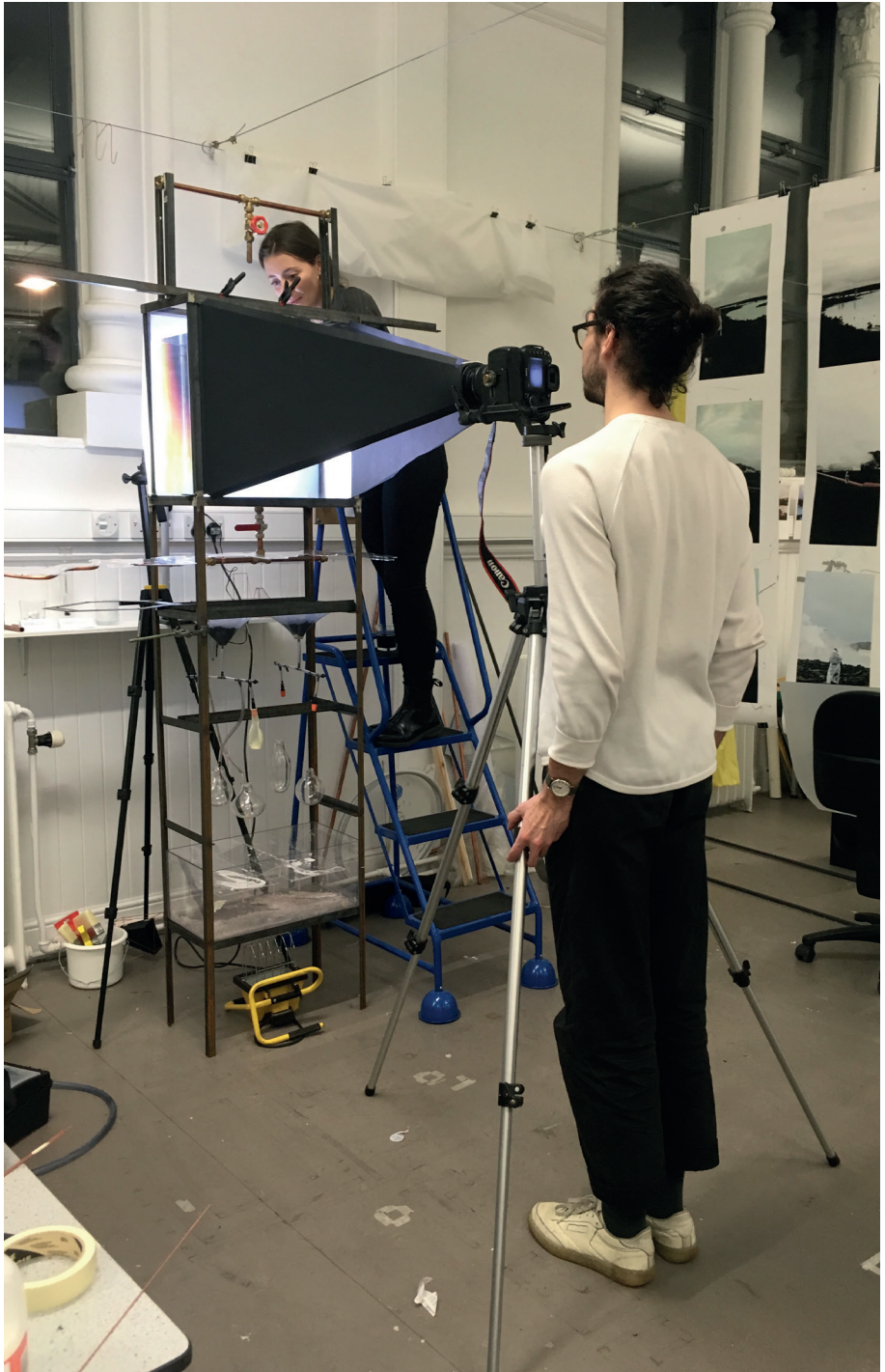
INHABITING INFRASTRUCTURES

LAURA HAYLOCK | CALUM RENNIE | KATY SIDWELL

Inhabiting Infrastructures explores the process of closing loops of material and energetic systems within re-purposed or obsolete infrastructures. The investigation was initiated by design of a filling tank model that both visualised buoyancy-induced airflow while also recycling associated material streams into their constituent elements (water, salt and dye). The tank pivots between scales, between the controlled site of the studio and the contingent sites of Bath and the Blue Lagoon; between the performance of recording immersion at the building scale and the performance of calibrating the individual components within the system at the infrastructural scale.

Three design interventions in the Blue Lagoon test these themes: Occlusion, Distribution and Production. Each intervention is resituated within a distinct layer of the filling tank, thus displacing infrastructural conditions from the ground and exaggerating the strange juxtapositions of the natural and artificial systems in place at the Blue lagoon.

Three proposals in Bath test these themes at wider scales within distinct obsolete infrastructural sites—a gas works, a quarry, and a combined heat and power urban hub. Each project operates within a consistent post-carbon narrative for Bath. In this narrative, space heating is radically reduced and the historic social practice of bathing is de-centralised and re-democratised, serving as anchors for thermal hubs. Collectively, projects present post-carbon Bath as a landscape of strange and intricate reappropriations of existing infrastructural and building fabrics.



06_a

RECALIBRATING URBAN HEAT DENSITIES

Laura Haylock

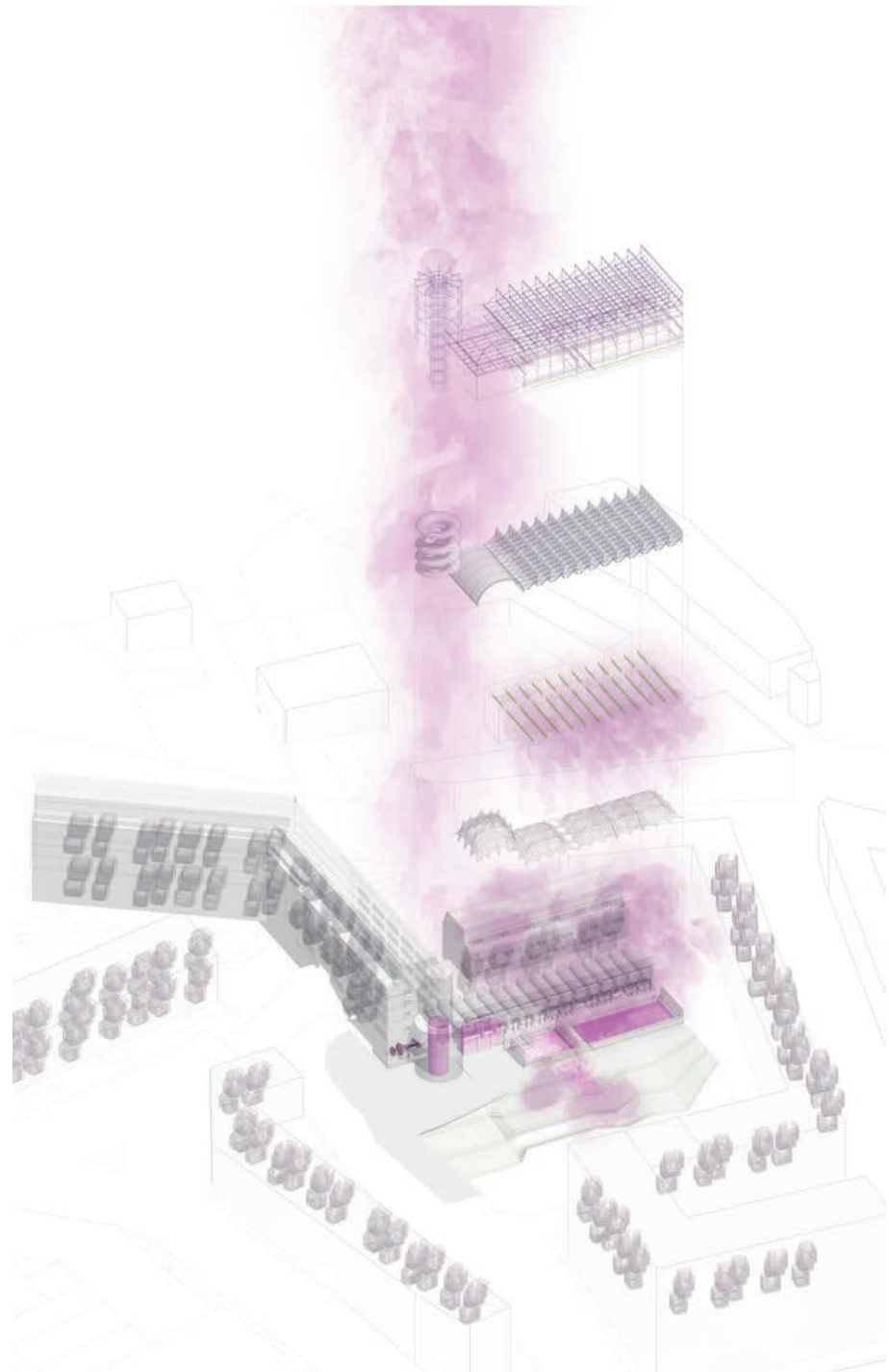
Heat density denotes the energy consumed by space heating, over a specific area, to maintain 'comfortable' occupancy.

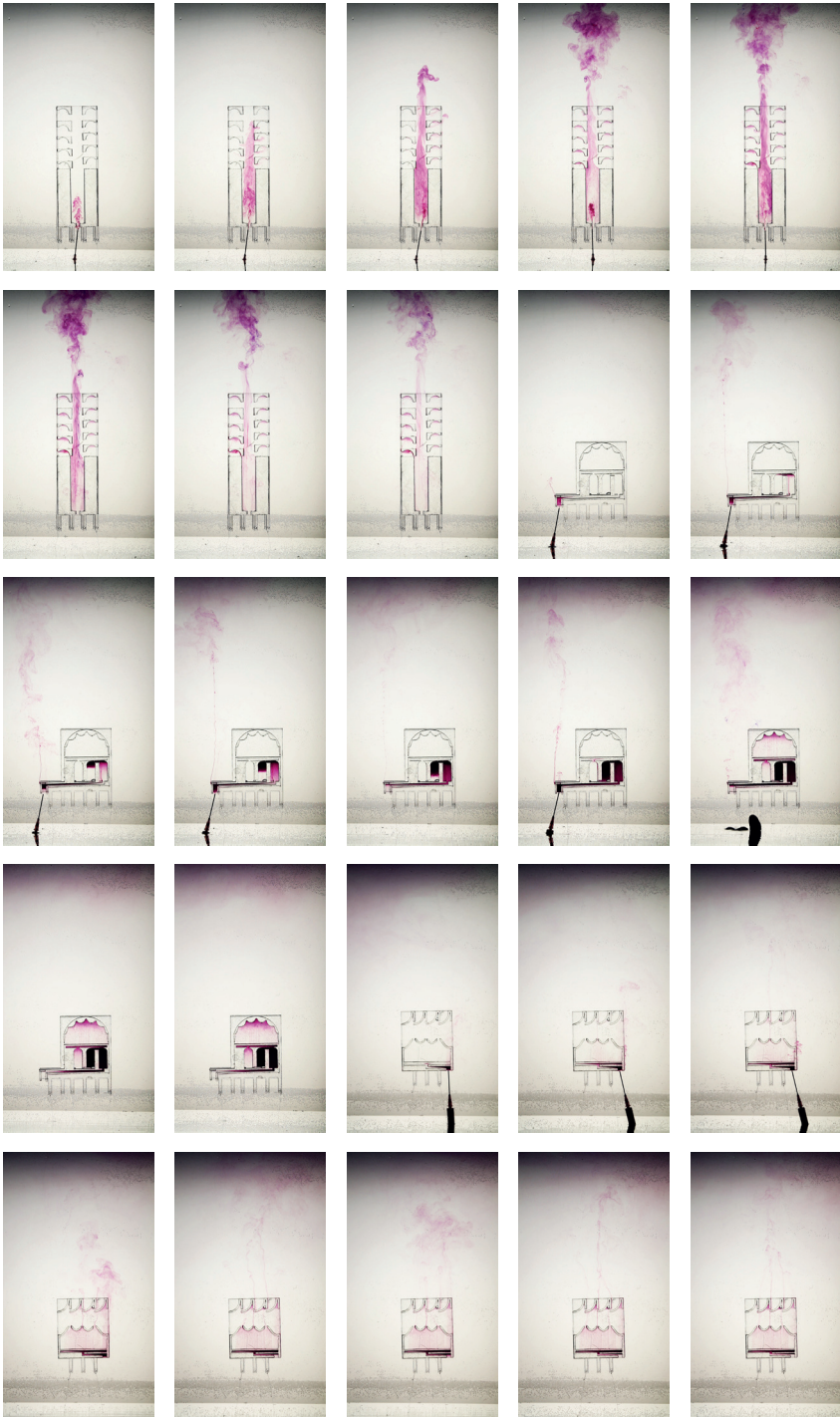
This thesis understands heat as an equitable amenity. A re-working of the city's social order is inaugurated through displacing thermally intensive activities from the private-domestic sphere to the commons. The 1960's Ballance Street Social housing development, situated in the High-Georgian area of Lansdowne, forms a test bed for this investigation. Beneath a monotonous skin of Bath Stone, the site presents a condition of heightened disparity in architectural style, in building tenure, and in existing building heat densities.

Recalibrating Urban Heat Densities operates at three scales. Infrastructurally, it re-appropriates and extends Ballance Street's existing Combined Heat and Power network, proposing a conversion to switchgrass biomass cultivated in the adjacent periphery of Bath.

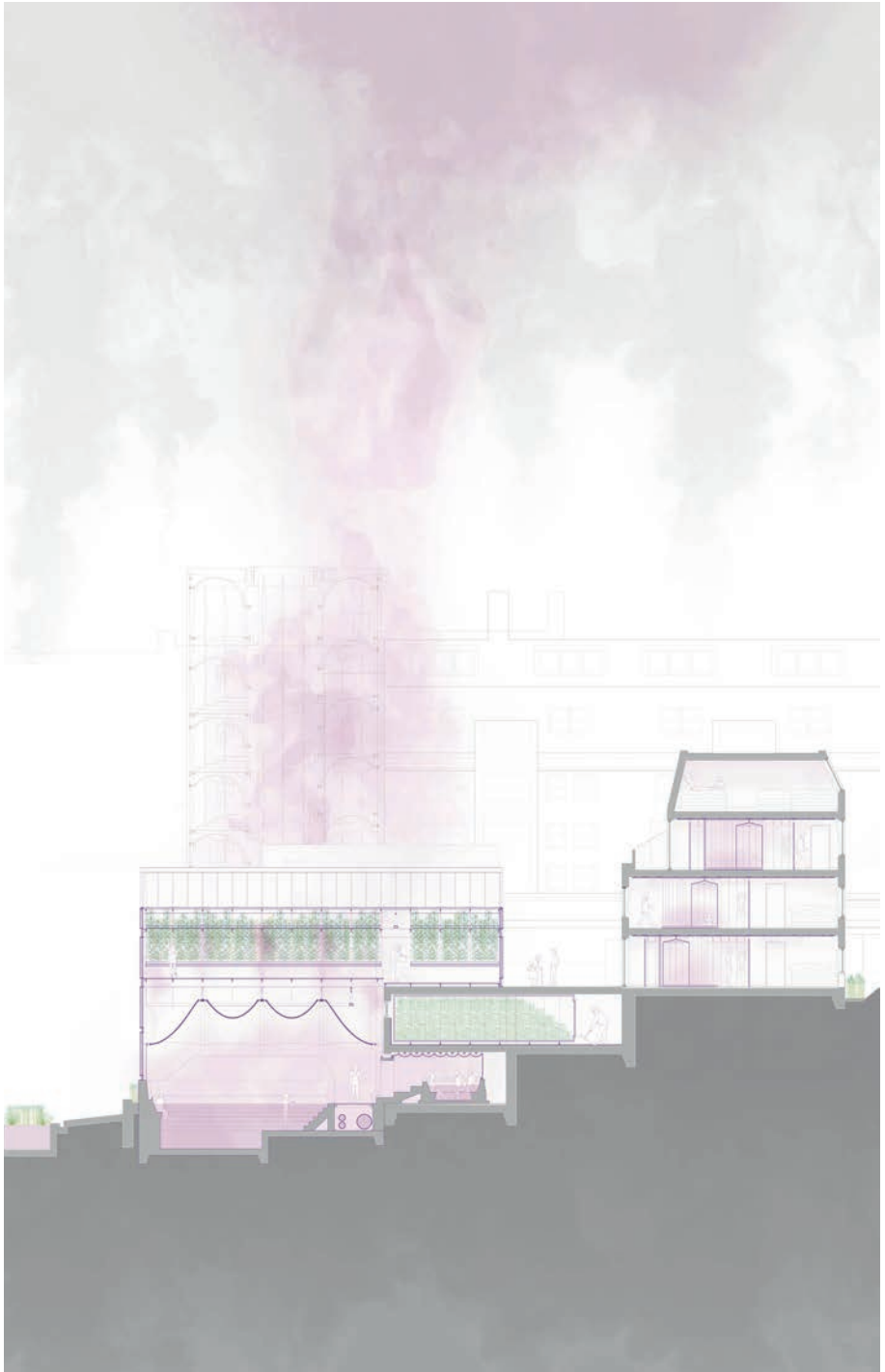
At the domestic scale, it reworks the traditional logics of dwelling, displacing spaces for bathing, cooking and laundering and densifying spaces for sleeping. Thermal energy demands are radically reduced through the introduction of small enclosures associated with sedentary activities.

At the building scale, a new shared building houses the dislocated domestic activities. The commons is marked by an architectural language of light, hanging canopies that trap heat, material draping, vertical stratification, steam and condensation. This strange and intricate language acts as a counterpoint to the thermal mass of the Ballance Street housing beyond.





2 | Filling tank test sections, developed in the proposition for the thermal commons building.



06_b

REWILDING OBSOLESCENCE

CALUM RENNIE

The former gasworks of *Bath Gas Light and Coke Company* lingers impressed on the banks of the River Avon. Three adjacent decommissioned gasholder bases are a spatial anomaly in the homogenous Georgian cityscape of central Bath, latent disclosures of the city's occluded productive industrial heritage. The site now lies fallow; a hinterland on the cusp of modern residential development.

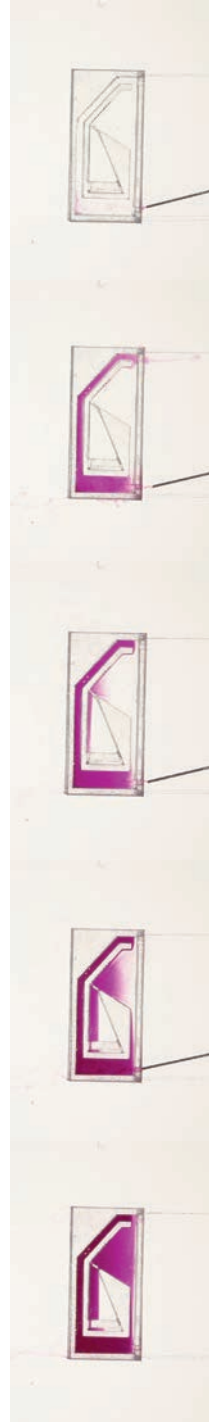
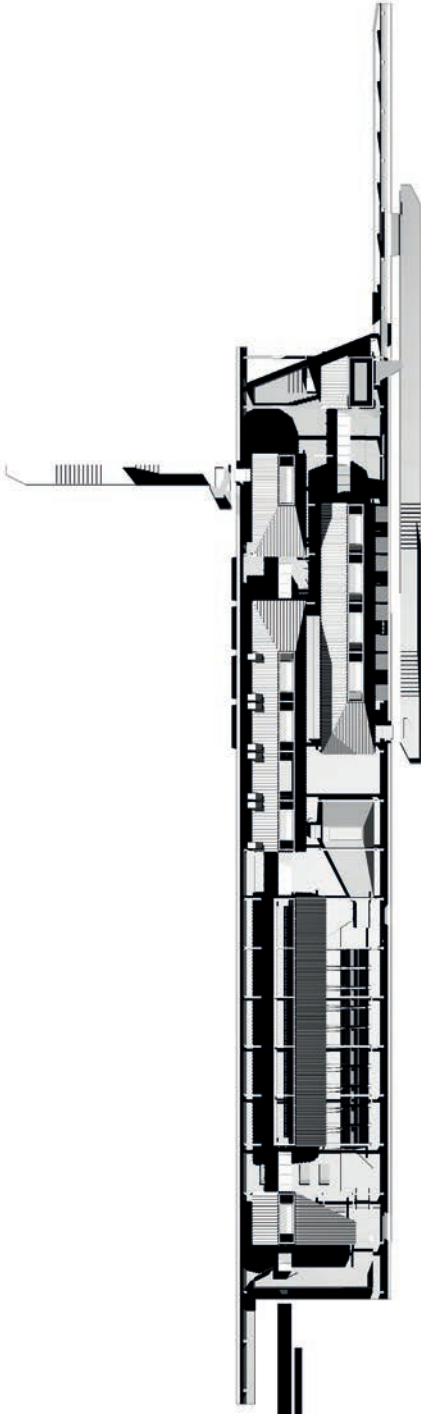
Rewilding Obsolence proposes a re-working of the former gasworks site through a choreographed re-inhabitation. Whilst the broader site is given over to ecological processes, Bath's mineral rich spring water is re-directed into the three bases enabling the concentrated growth and harvesting of algae biomass for heat and energy, and, following filtration, collective bathing.

The pristine articulation of the Bathhouse acts as a visual counterpoint to the re-wilded site. Bathers perform a carefully scripted route through spaces materialised in lightweight frames and pools retained in a heavy, cast base. Light is diffused, leaking between finned screens amid airflows. Constructed apertures focus colocations of sky, ground, verdure and built fabric. Surfaces regulate and radiate. Steam rises through steel grating from hot pools below; engulfing, veiling, condensing on skin. Strategically placed interventions punctuate the wider site as outposts, annexes of Bathhouse apparatus. Bathers are orientated within this landscape of strange symbiosis, between ecology, infrastructural operations and an instated culture of communal bathing.





-
- 2 | Tectonic Assemblage
 - 3 | Spatial Distribution
 - 4 | Filling Tank Section Tests:



06c

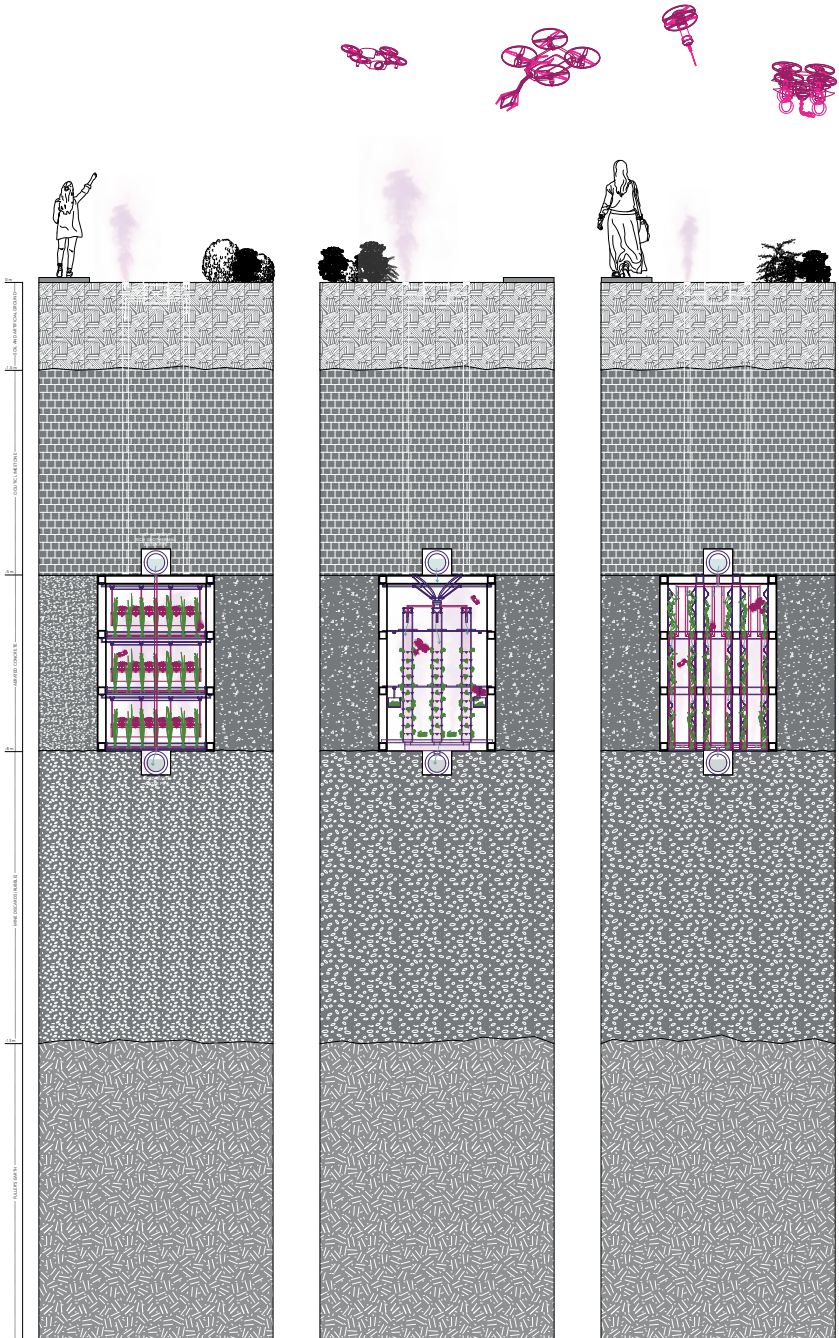
PRODUCTIVE STRATIGRAPHIES:

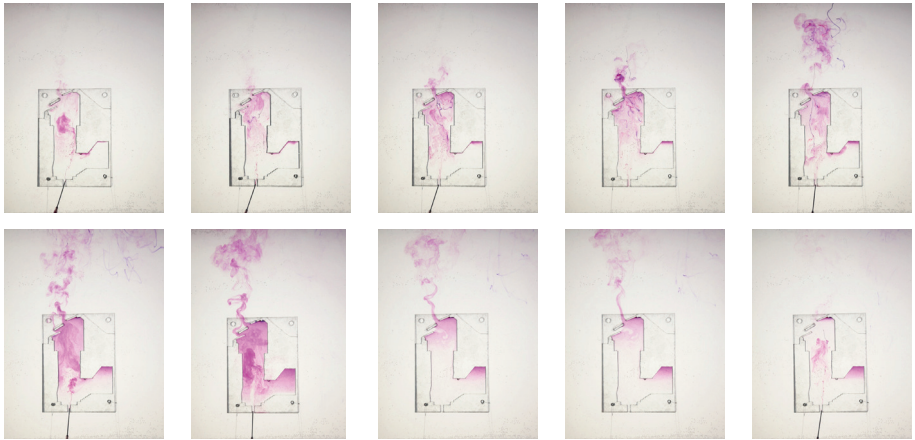
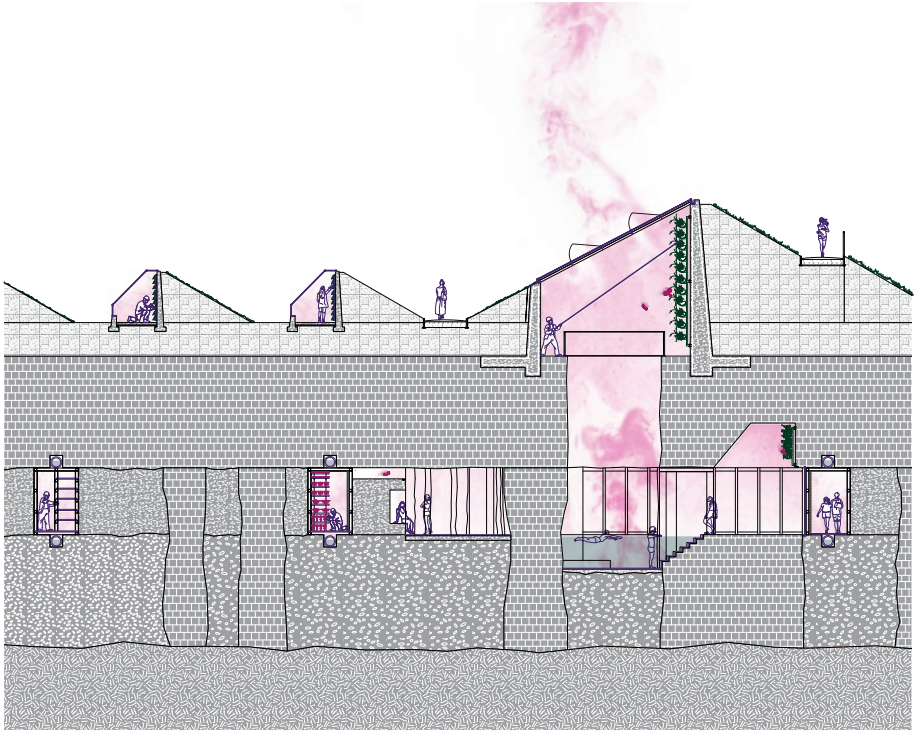
INHABITING THE DISUSED COMBE DOWN QUARRIES

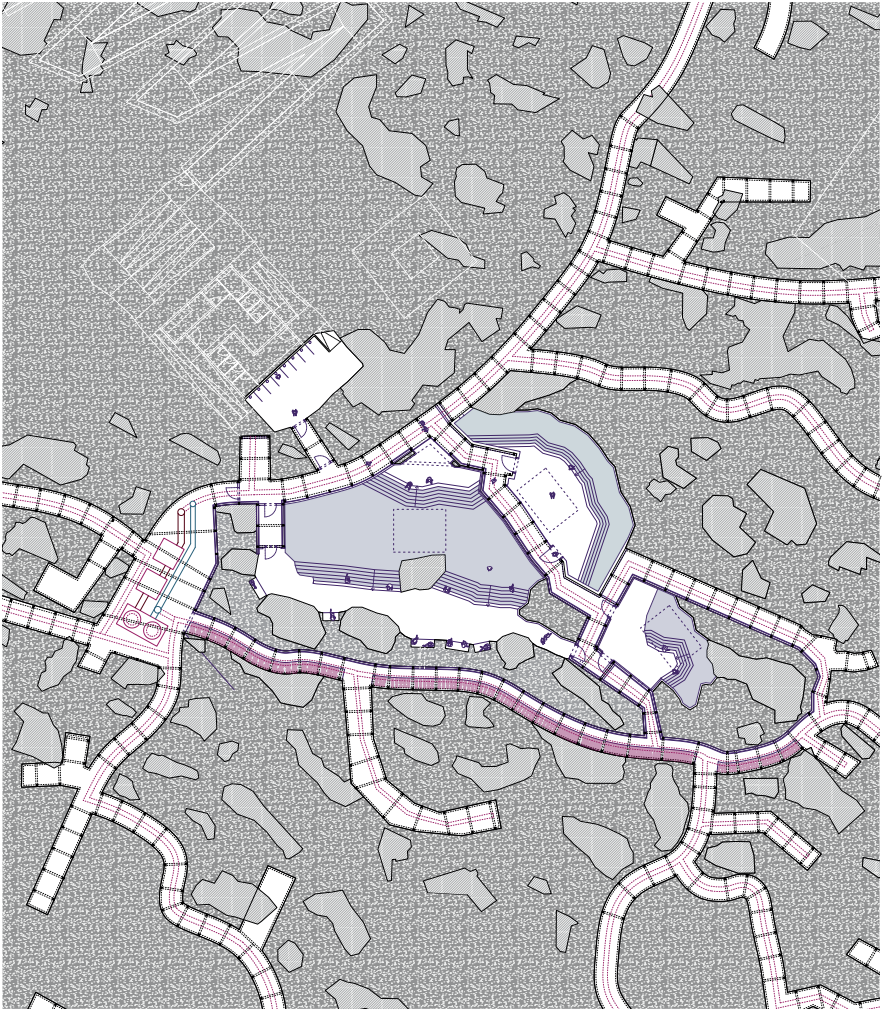
KATY SIDWELL

The village of Combe Down sits atop a disused, infilled quarry region of the buttery-limestone used to build much of Bath's celebrated Georgian architecture. Though traces of this mining activity are no longer evident at ground level, just metres below the surface lies a weaving network of 'roadways', constructed for access and stability during a stabilisation project of the abandoned underground spaces.

This project transforms this abundant, but redundant, subterranean infrastructure into an industrious landscape of automated food production. The roadways are inhabited by three growth systems: hydroponic beds, hydroponic tubes, and aeroponic towers, scaled to accommodate a robotic production network of automated infrastructural 'components' for fertilisation, collection and surveillance. At the centre of the network lies a bath house, which utilises geothermal water from the aquifer deep below the site for bathing, thermal comfort, and growing conditions; a 'heat hub' for both residents and production. The bath house is both contained within the quarry, whilst also involving additional quarrying, forming an architecture which responds to the materiality of the horizons of earth removed to create it. Stone, soil, and concrete are carved and repurposed, as gabion walls, as aggregate, as new earthworks, creating a new landscape at ground level that responds to the subtractions and geological qualities below.







-
- 2 | Bath House Section
 - 3 | Filling Tank Tests: Bath House Section
 - 4 | Filling Tank Tests: Roadway Geothermal Heat Dispersal
 - 5 | Bath House Plan: Mining Strata (Cut 7m Below Ground Level)

07

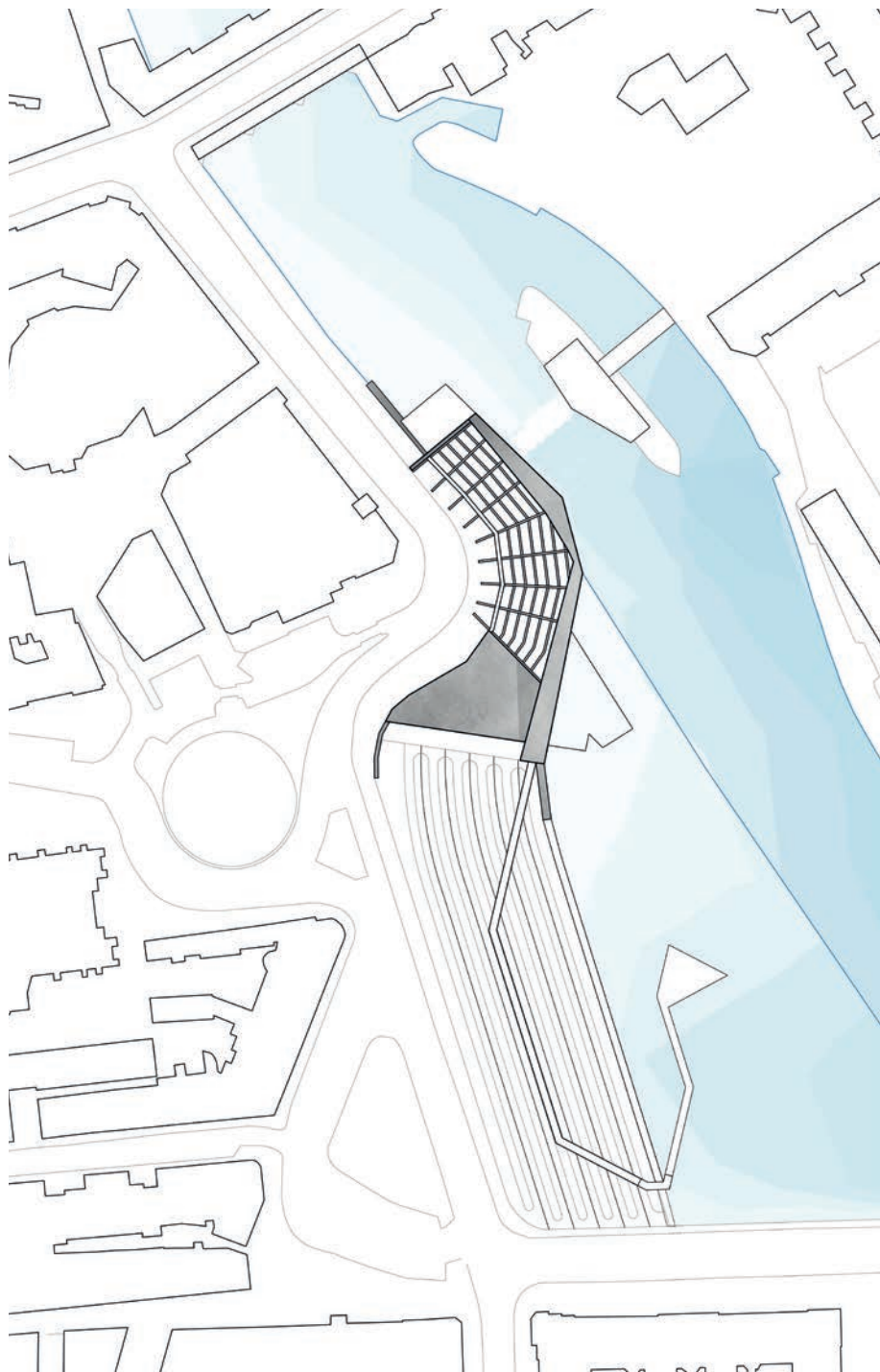
FLOOD LINES

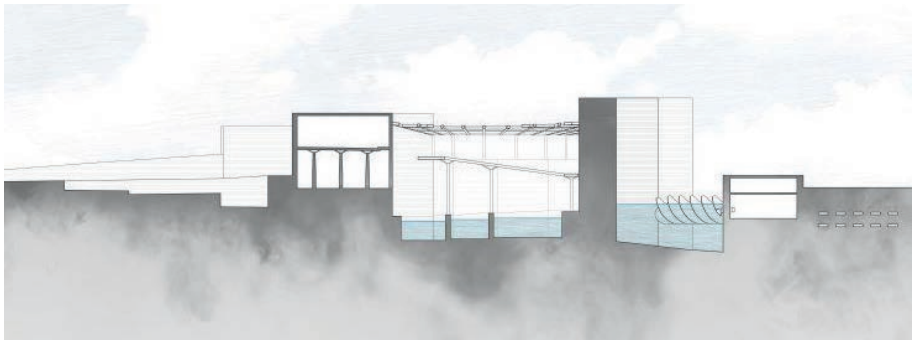
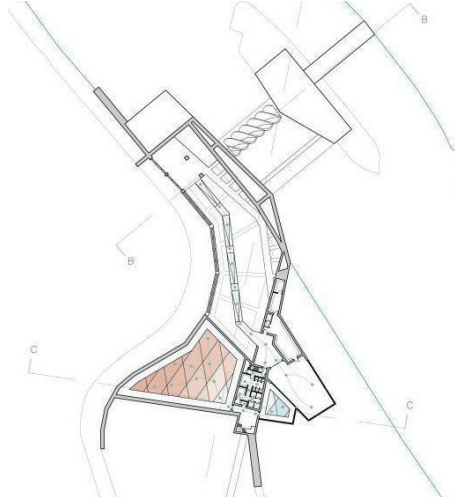
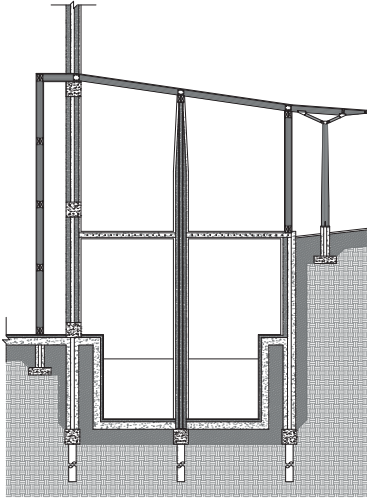
ANA TAYLOR

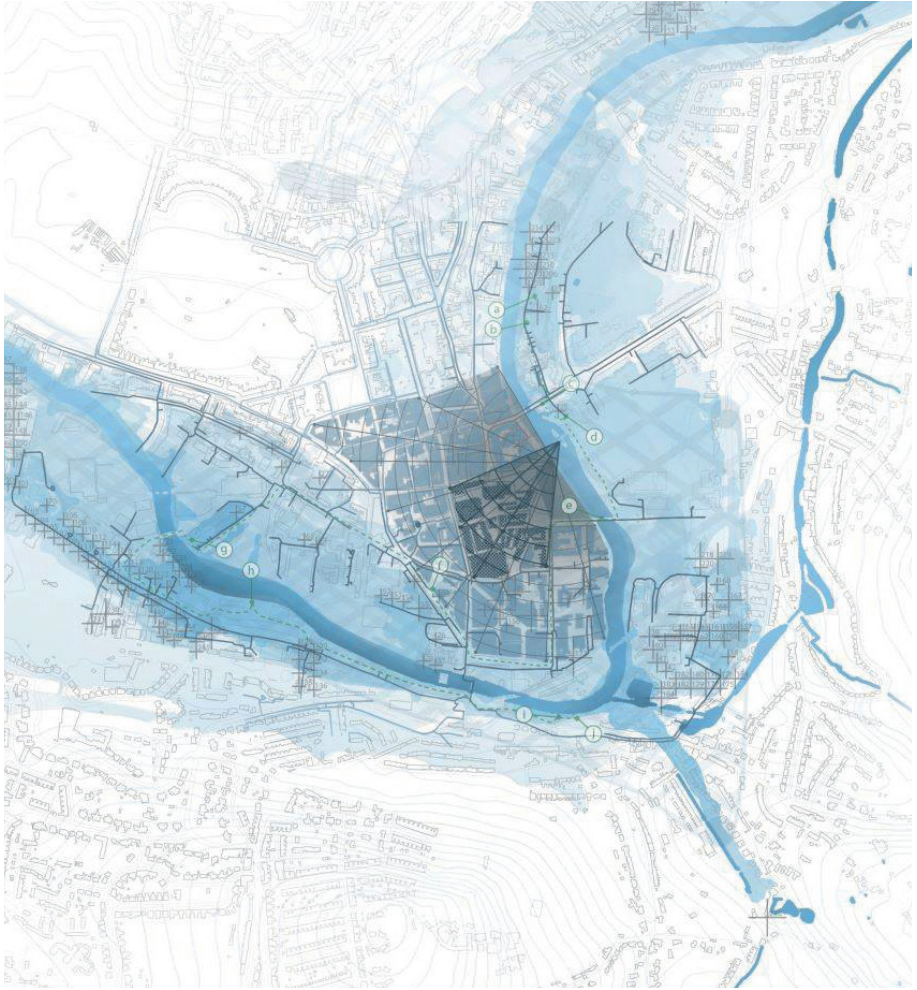
This project creates an inhabited flood defence for the city of Bath, creating a new edge between central Bath and the River Avon. Water is used to generate energy and processed for general consumption; and warm water contained within vessels for bathing. Subtle topographical variability informs circulation, landscape and building massing strategies.

Fieldwork in Bath uncovered both the water's subtle and intense properties; even the smallest topographic change can induce major destruction on building fabrics and interiors; in larger quantities, its weight and pressure is extreme enough to generate significant amounts of electricity.

The proposal's functions across two levels are harmonised by an intermediate level, uniting different flows of people and water. The ground level is integrated with the river for processing water. A wall perpendicular to the river's edge incorporates a water turbine and dam system, enabling the project to generate hydropower. Ramped circulation into and through the intermediate floor lifts the occupant into the upper level, where public baths are supported as tanks floating within the double volume space. This experiential journey ultimately descends into a water garden, where water is filtered through phytoremediation. The architectural and topographic language of the building is that of an inhabited infrastructure of flood controls, incorporating both hard and soft boundaries and subtle and extreme methods for containing, directing and holding water.







-
- 2 | Constuction Detail Through the Water Treatment Process and Main Atrium
 - 3 | First Floor Plan with Bathymetry and Occupancy Overlaid
 - 4 | A Long Section Through the Phytoremediation , Thermal Bath, Water Treatment and Hydropower Systems
 - 5 | External Perspective of the Proposal
 - 6 | Contextual Mapping of Bath

08

MIRRORED TOPOGRAPHIES

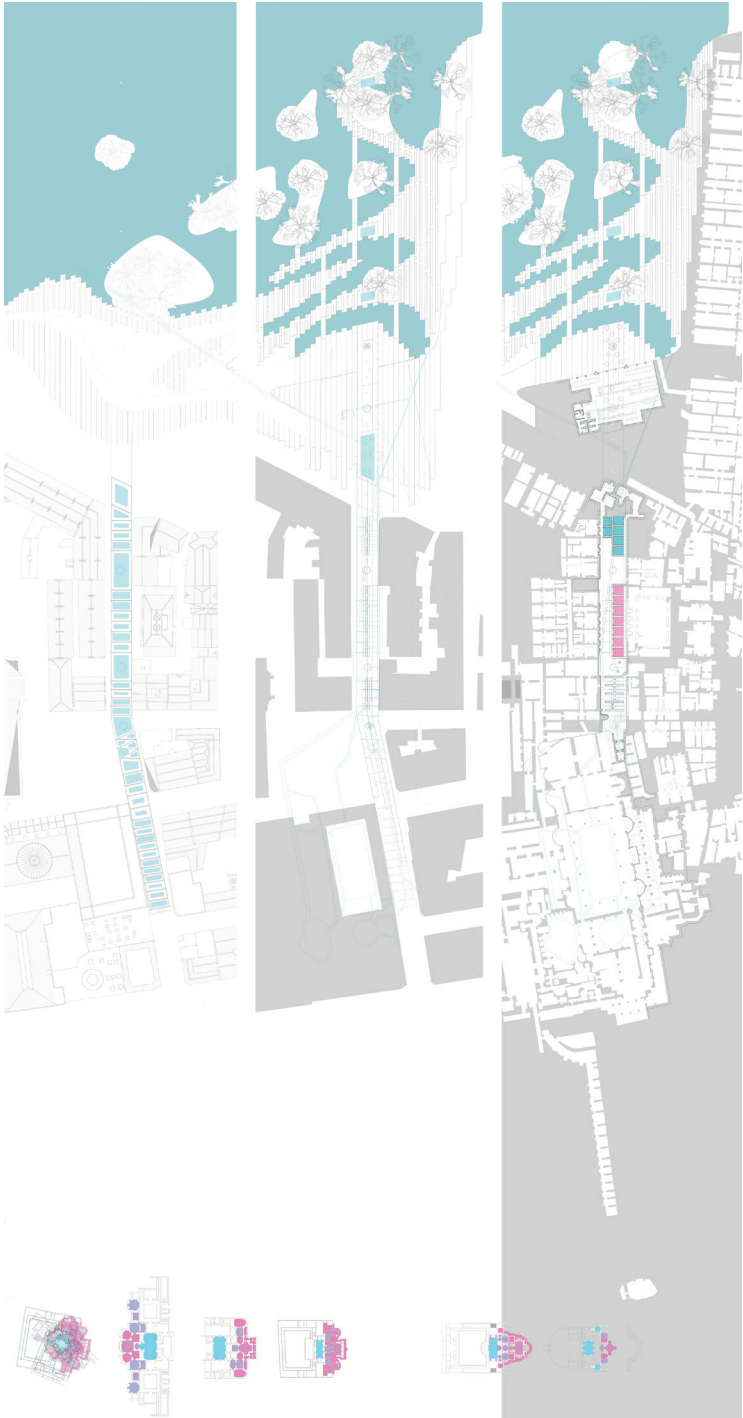
A REFLECTIVE AXIS OF BUOYANCY AND GRAVITY

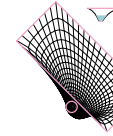
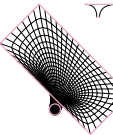
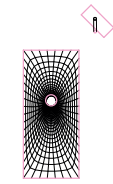
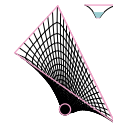
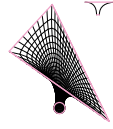
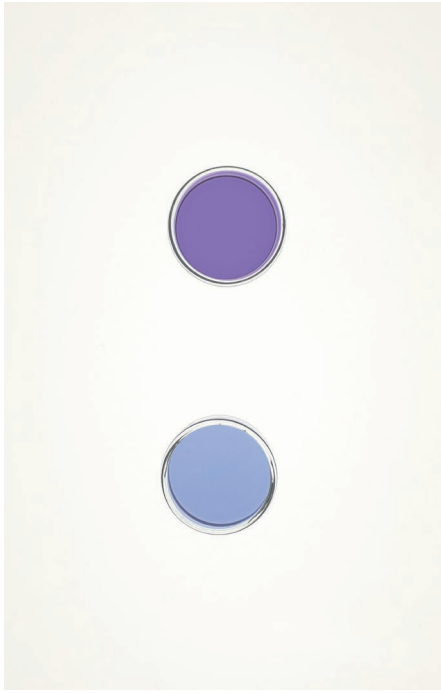
SARAH BETTS

Operating within the framework of a future post-carbon Bath, *Mirrored Topographies* integrates bathing with food production and consumption. Predicting urban densification and the need to feed a growing population displaced by climate change, the proposal argues for the democratisation of bathing and for restoring its public and social role, as well as for the scaling down and localising food production. The project employs different scales of resource exchange and weaves a semi-autonomous network of matter, energy, and fluid flows.

Spaces are organised according to the properties of water and air—heat, buoyancy, mineral content, humidity, cleanliness and chemical makeup— which are channelled towards programme associated with bathing and food cultivation, production and consumption.

A series of umbrellas, stacks and pipes collect and direct fluids into networks of closed and open circuits. There are two primary directions of movement, which are mirrored in a tectonic language of light projecting structures and heavy underground thermal masses: on one side, rainwater is collected in devices that funnel downwards due to the effect of gravity; on the other air is circulated through subterranean vaults and discharged into drying towers upwards due to buoyancy. The mirrored movement of buoyancy and gravity-driven flows echoes the dual reading afforded by the filling tank environmental model.







-
- 2 | PH of Bath water / PH of River water
 - 3 | Gravity flow test
 - 4, 5, 6 | Buoyancy flow test
 - 7 | Parametric studies in filling rainwater collection devices
 - 8 | Slicing through the axis of reflection supra/sub-terranean containment and flow



Water Table Prototype

October 2018, Rachel Briglio and Camille Davison



09

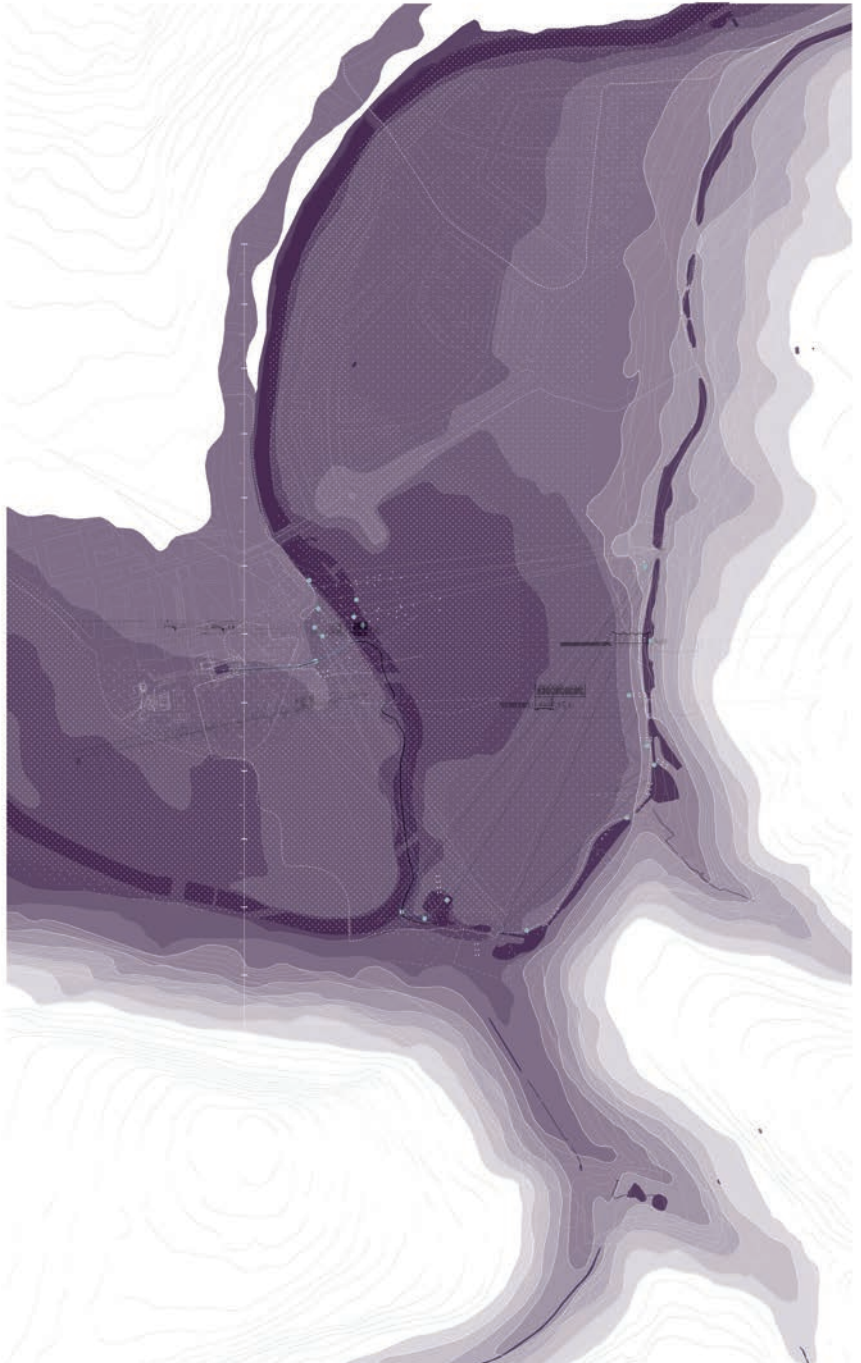
WATER FRONTS

RACHEL BRIGLIO | NAOMI WRIGHT

With current trade negotiations underway within the UK Government prompted by the impending exit from the EU, a future in which the UK becomes increasingly reliant on local trade for economic stability is largely plausible. This project hypothesises a post-carbon Bath of self-sufficient local production and consumption, specifically focusing on water and agriculture.

Water Fronts engages with interfaces between heat, water, and ground in three zones – the high and dry ground of the city centre, newly flooded marshland between city and river, and the floating world of canal dwelling. Individual projects investigate the generation of productive and interdependent water and food cultivation systems that respond to and accommodate future social, environmental and agricultural demands.

Anticipating forecasts for extreme weather relating to climate change, and aiming to increase resilience and carbon sequestration, the project partially floods the city. The resulting marshland erases the existing hard edge between river and the city and choreographs encounters between thermally charged zones, water flows, and human habitation in two zones. The first, a reworking of the Kennet and Avon Canal, augments existing canal infrastructure to enable water filtration and recycling, irrigation, food cultivation, collective cooking and bathing. The second, along the River Avon in central Bath, merges wet and dry topographies by exposing gradients to introduce a productive marketplace and associated cultivation landscape.



09_a

CANAL FRONTS:

FLOATING, DWELLING

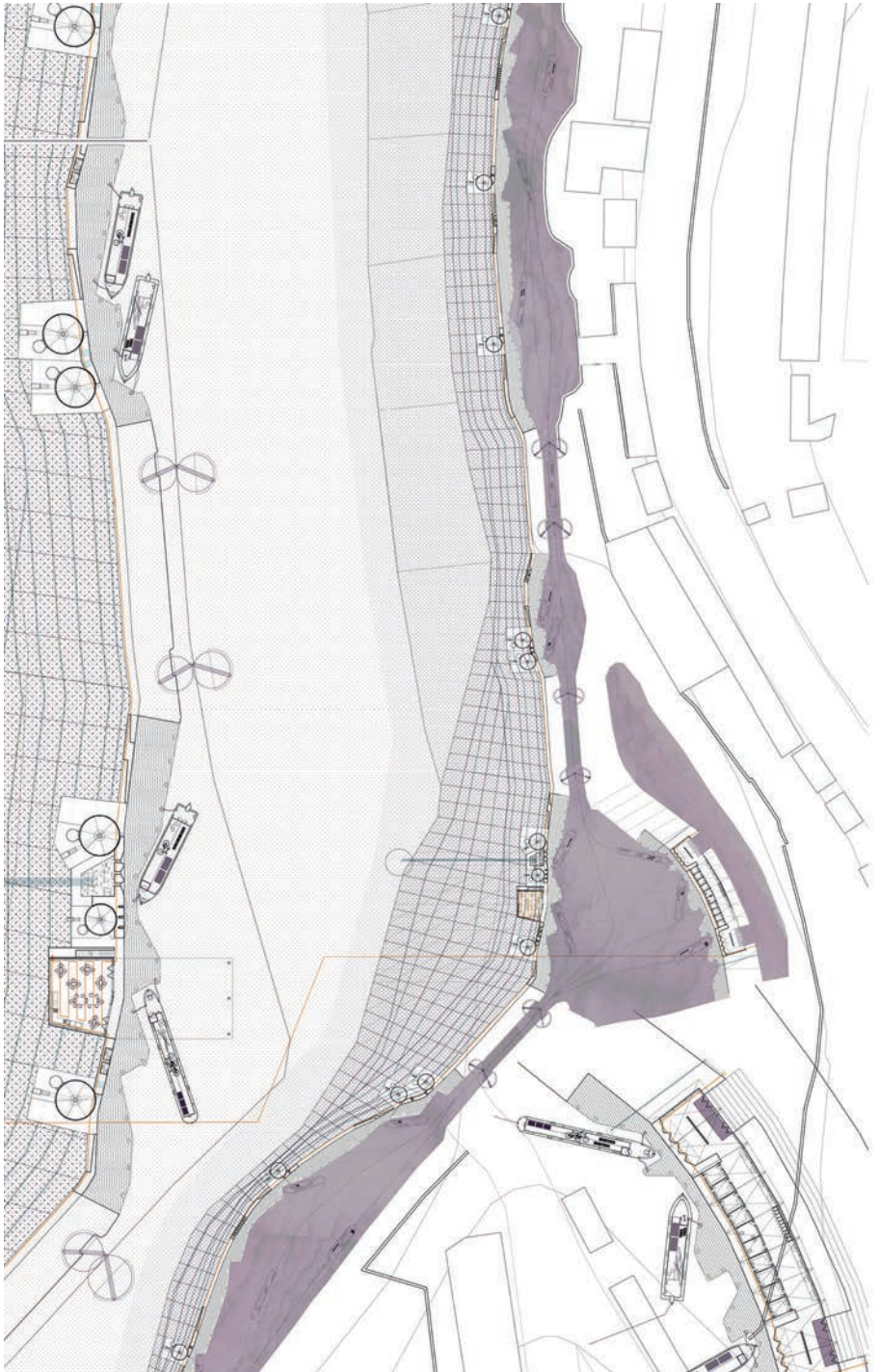
RACHEL BRIGLIO

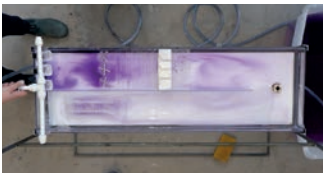
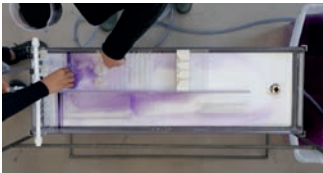
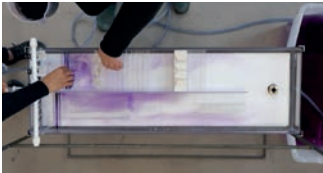
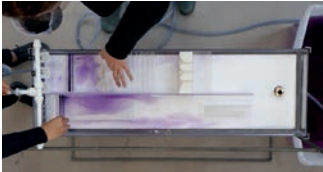
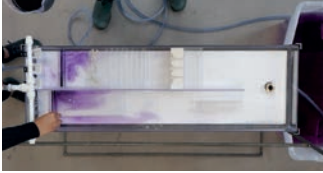
Built in 1810, Bath's Kennet and Avon Canal was originally used for transporting coal. Currently underutilised, it is a space of low-density dwelling for a canal boat community. This project reworks the canal's infrastructure to support high-density boat dwelling that is autonomous with regards to food, water, waste and energy.

Surrounded by high and dry land ideal for grain cultivation, this project questions the infrastructure of the canal, enabling it to initiate controlled irrigation of adjacent arable land and the flooding of marshland. The tending of smaller scale grain allotments adjacent to the canal is the responsibility of boat dwellers, using tools and supporting spaces embedded in a new spine wall that runs along the canal's edge.

Resources from canal boats are collected and filtered through components for productive re-use in the landscape. Additional architectural elements integrated into the canal support everyday dwelling and associated resource use. Rainwater is collected and distributed into greenhouses. Canal water is filtered and re-directed to water pick-up points; its temperature productive for maintaining a collective food storage system. Greywater from boats is filtered through the marshland for phytoremediation and black water is processed into fertiliser for allotments.

Hot water from Bath's Kings Spring feeds into key points in the canal, and is used for cooking, growing and bathing. Architecture associated with this programme is more abundant, representing the offering of warm collective social spaces and the celebration of consumption practices happening within them.





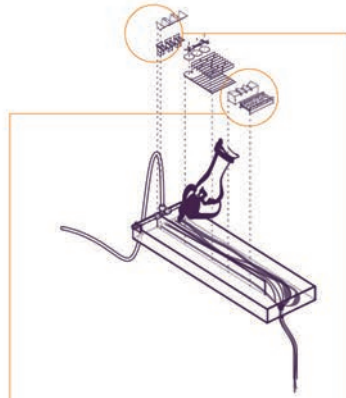
ADDED FILTRATION COMPONENTRY
Testing Filter Fragments

FILTER TYPE
Roof - Paper / Perforated Acrylic

Wall - Perforated Acrylic / Card

Waste Inlet - Cast Concrete

Water Outlet - Perforated Acrylic



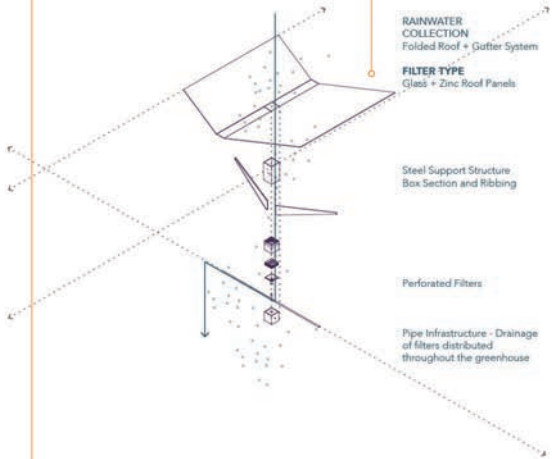
RAINWATER COLLECTION
Folded Roof + Gutter System

FILTER TYPE
Glass + Zinc Roof Panels

Steel Support Structure
Box Section and Ribbing

Perforated Filters

Pipe Infrastructure - Drainage of filters distributed throughout the greenhouse

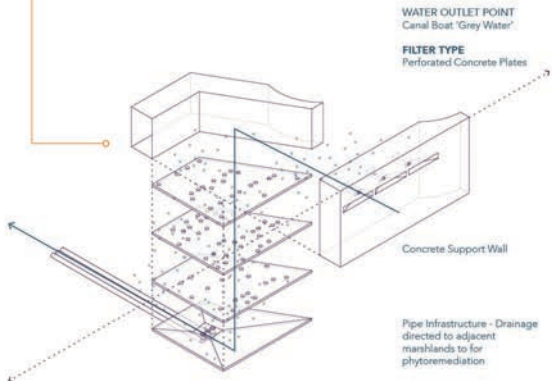


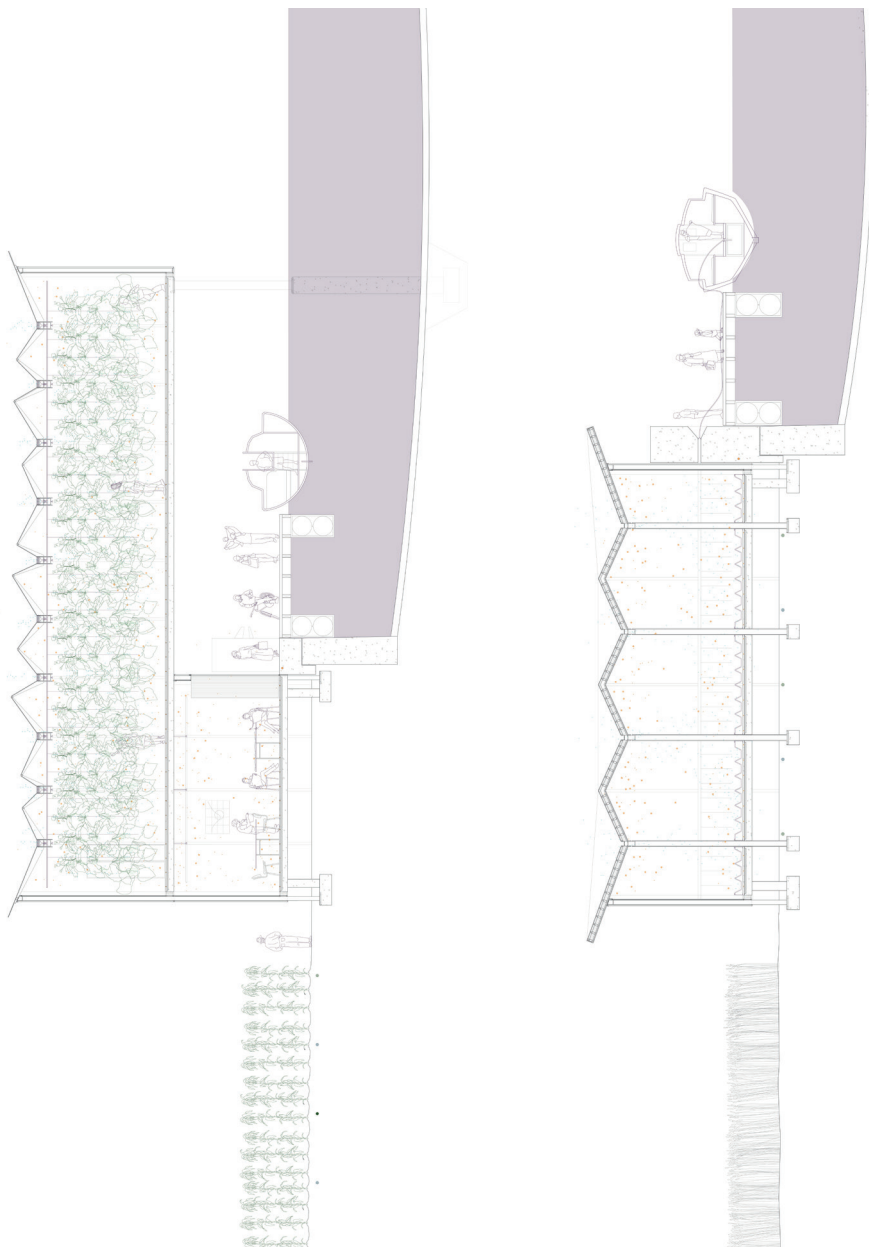
WATER OUTLET POINT
Canal Boat 'Grey Water'

FILTER TYPE
Perforated Concrete Plates

Concrete Support Wall

Pipe Infrastructure - Drainage directed to adjacent marshlands to for phytoremediation





2 | Video Stills from Test 31C

3 | Diagrammatic Exploration of Filtration Devices in the Proposal and Water Table Translation

4 | Section A: Community Kitchen + Greenhouse

5 | Section B: Waste Processing Station

09_b

CULTIVATION EMPORIUM

NAOMI WRIGHT

The Cultivation Emporium proposes a reworking of the hard edge between the city and the River Avon by removing flood control measures and introducing a marketplace along this newly constructed marshy edge. The project is conceived of as one of merged topographies, architecturally expressing gradients of wet to dry and warm to cold.

Transects link the city to the proposed made ground of the marsh and flooded river which defines a narrative of production by a journey through thresholds; selling, storing, drying, fishing, growing and harvesting. Platforms offer a counter-grain to the building as they extend and allow themselves to be submerged or exposed to the flood supported by nets, enclosures and frames.

Transposing topographical sections from Iceland to Bath lead to a sequence of undulating lines, acting as collection datums which translate into a roofing system. This system compiles the existing topography of Bath and acts as a system of gutters and filtration points in which rainwater flows through and feeds the building's services. Shelter and artefact combine with the accumulation of rifts that surge and oscillate to form this skin that sympathises with programme.

Geothermally heated water from the great drain and water from the flooded river are joined to create a unique bathing experience which is comprised of several pools that negotiate the two different thermal conditions to create a mixology of cooler and warmer pools.

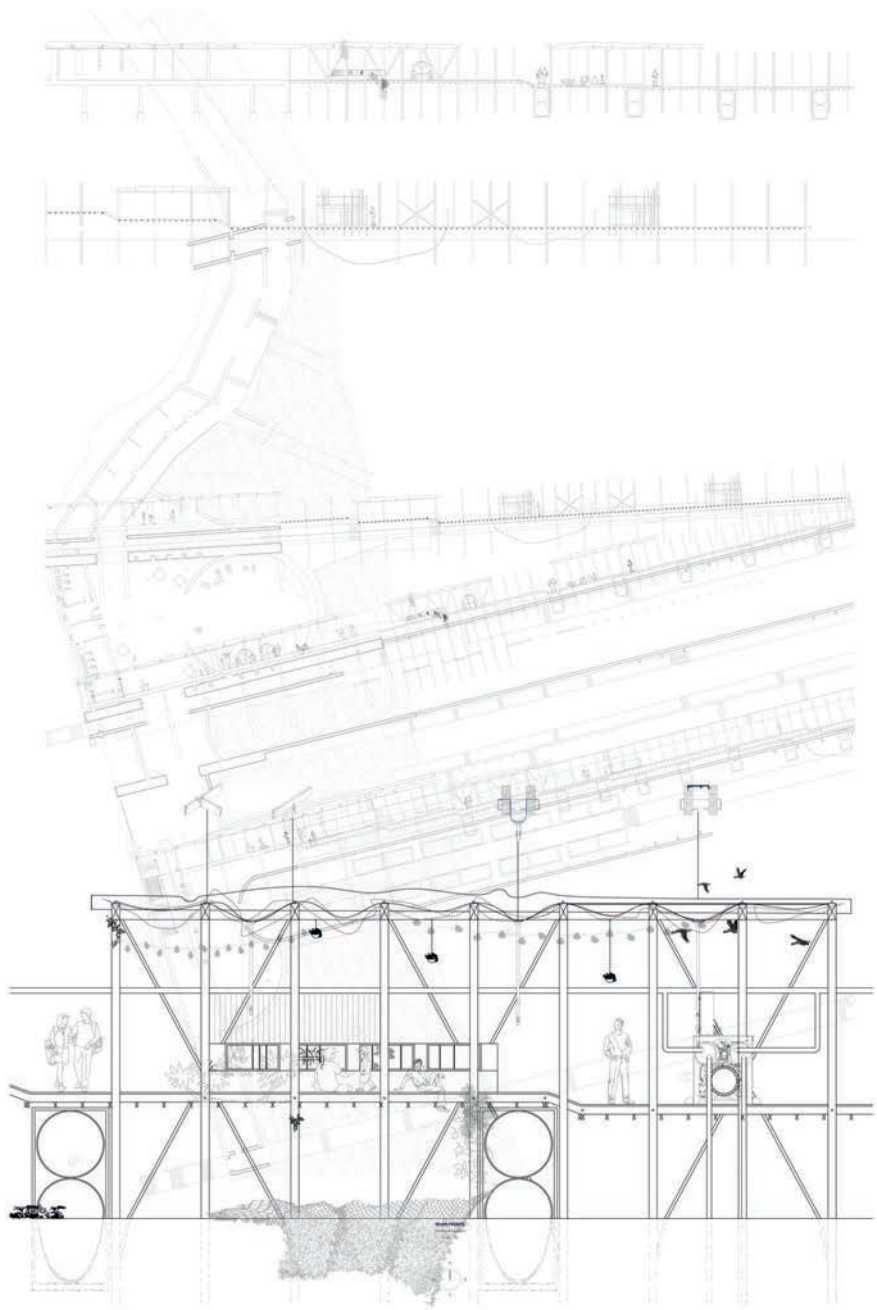


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NAOMI WRIGHT | CULTIVATION EMPORIUM





- 2 | Displaced topographies - sectional interpretation
- 3 | Topographical narrative of a market

10

MACHINIC LANDSCAPES

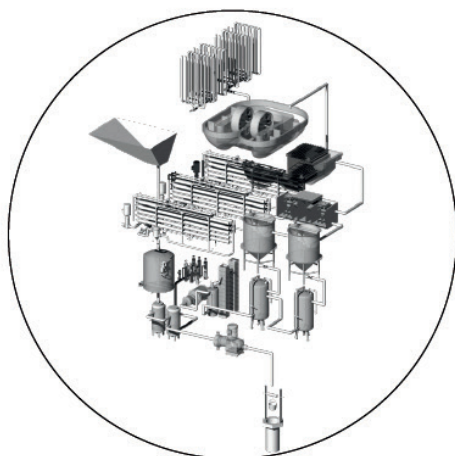
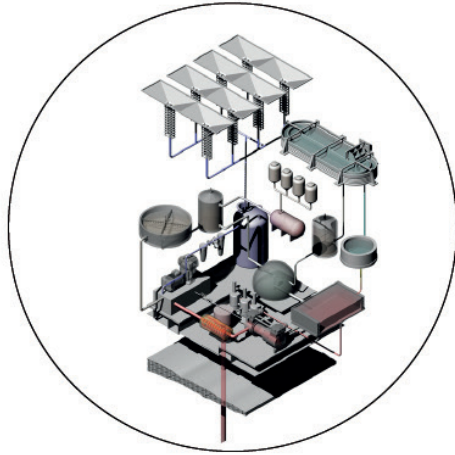
JAMES MA | STEVEN SHI | CHERIE WONG

Our project explores landscape and building processes through a machinic lens. This lens was revealed through calibration of the instrumentation of a water table and through interpretation of geothermal energy and water processing cycles in the Blue Lagoon, Iceland and Bath, England.

The initial construction and operation of a large, steel, self-circulating water table raised questions about componentry calibration, material weathering, and tectonic sensibilities of components that contain, direct and channel gravity-fed water. These insights, displaced to the thermally asymmetric context of Iceland, shifted to understanding the hidden systems of geothermal energy production, understood as a machinic process of amplified water cycles.

Three individual proposals developed from this investigation: System of Flows, The Exposed Machine, and The Mediating Mechanism which intervened with the existing Blue Lagoon thermal baths in order to expose specific hydrological and thermal potentials as a system of controlled environments.

The methodology of working with calibrated models and machinic drawings was further tested in the urban context of Bath, where low-grade geothermal potential is present. Here the investigation focused more intensively on water cycles related to district-scale water purification and recycling processes. Three projects hypothesise about a post-carbon future in which freshwater becomes a limited resource due to climate change and where centralised water processing becomes more atomised within the city. Three individual interventions grew from this hypothesis: The Remedial Bathing Machine, Bellott's Rehabilitation Prototype, and The Algae Nutritional Therapy Centre. All three interventions re-establish the medical history of Bath city centre by re-introducing spaces for health and wellbeing while establishing a didactic language exploring the materials and spaces of care and human inhabitation and the machinic processes that facilitate this care.



10_a

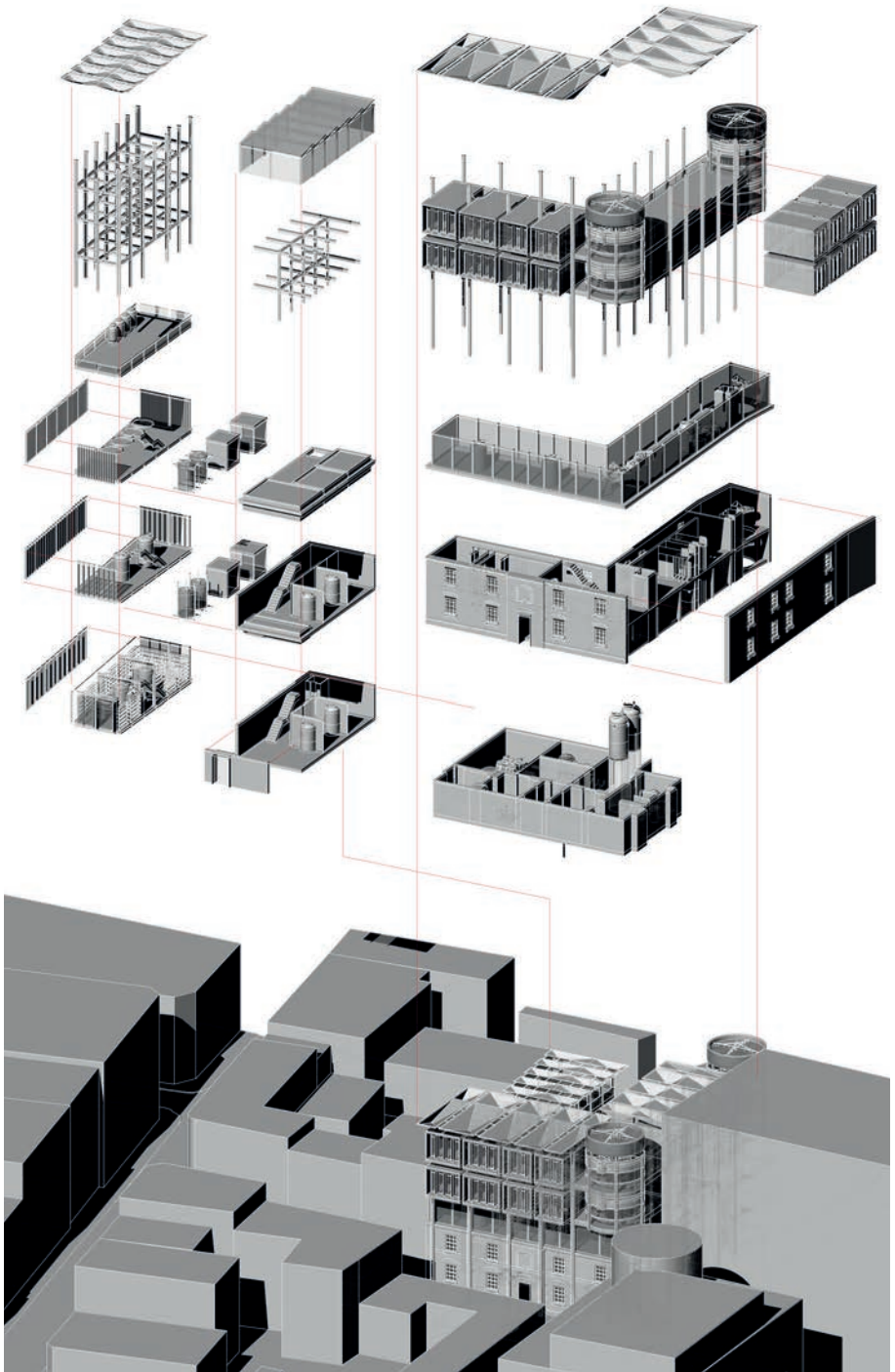
BELLOTT'S REHABILITATION PROTOTYPE

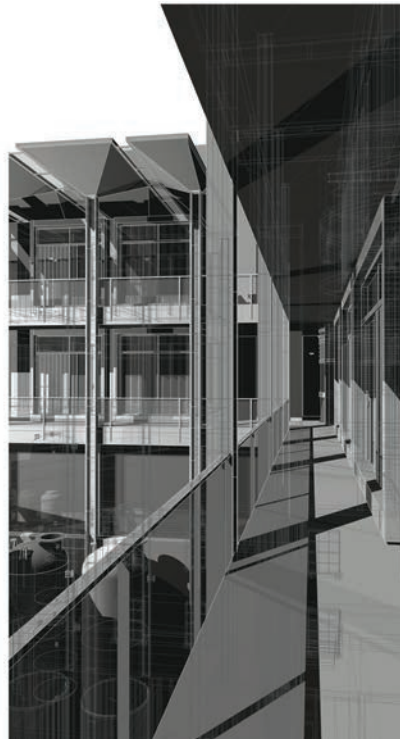
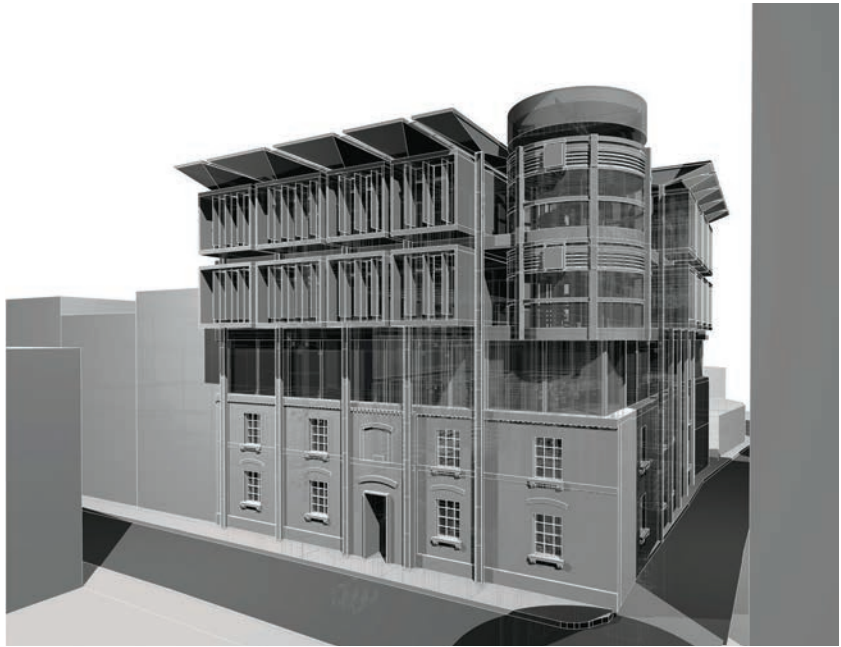
JAMES MA

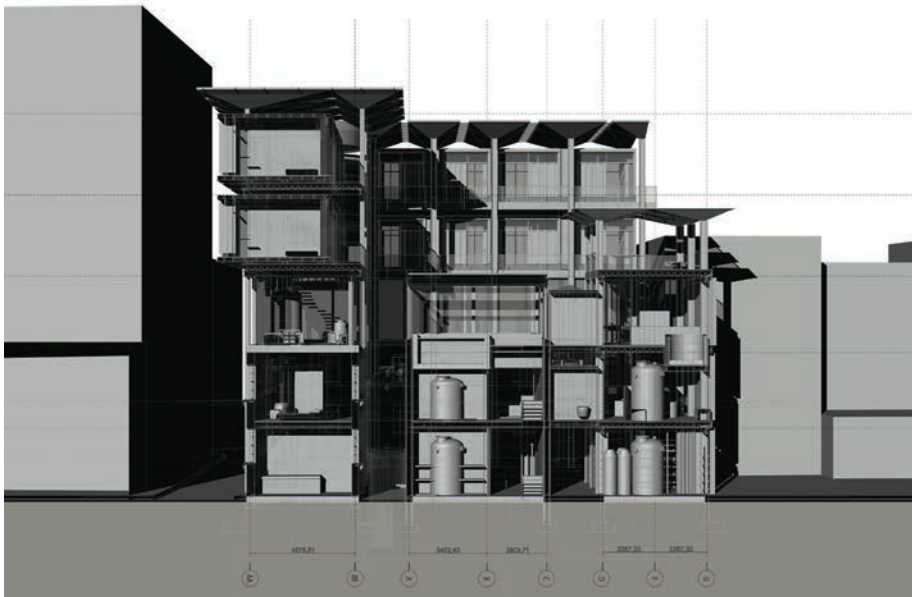
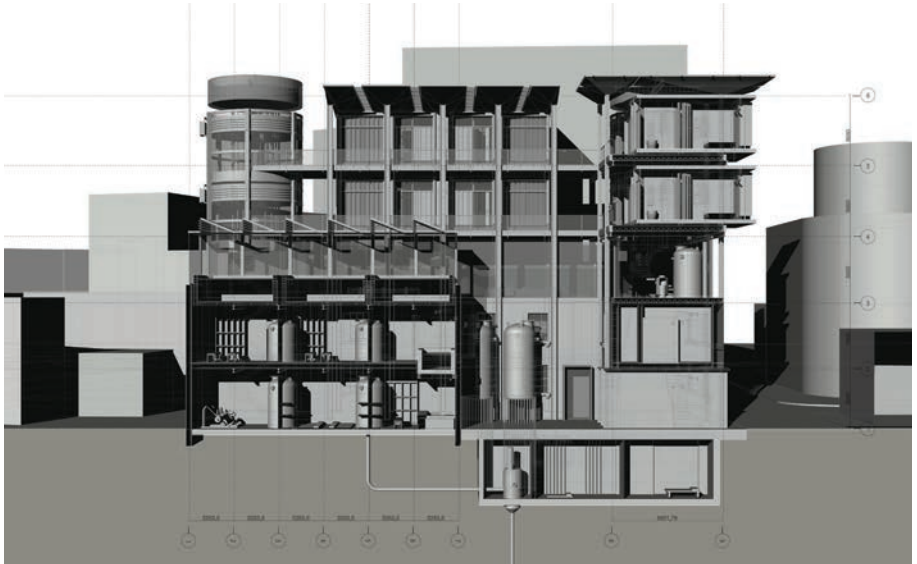
In the 17th century, Bellott's Hospital was a recovery centre for those who could not afford medical care and has since been converted to for-profit rental housing. Bellott's Rehabilitation Prototype extends the original intentions of affordable care for the vulnerable while also tackling environmental challenges of design for a post-carbon future. The project serves as a new typology of living where waste is recycled, and energy consumption is limited while also providing hydrotherapy for those suffering from rheumatic diseases. Rheumatic disease impacts mobility and the buoyancy and resistance of water provides an ideal environment for recovery.

Dwelling and recovery programmatically merges in the Rehabilitation Prototype, which is made manifest through architectural expression and materiality. Living quarters are light structures that levitate above the existing Bellott's hospital, a heavy stone building which provides communal functions and staff amenities. An articulated canopy roof collects rainwater, which visibly flows into the living units for use and storage as a back supply in the event of a draught.

The therapeutic spaces are inserted into the courtyard of the Bellott's site in order to bring treatment on-site, as traveling with rheumatic disease can be incredibly difficult. The main form of hydrotherapy is 'contrast therapy' where patients exercise in hot (35°C) pools after which they submerge into a cold pool (20°C) for 5 minutes. Through the requirements of hot and cold spaces the therapeutic structure tectonically expresses itself as divided into a heavy thermally contained space and light steel structure.







- 2 | Street view from Beau Street
- 3 | Contrast Therapy Centre
- 4 | Living Quarters
- 5 | Section - Courtyard and Entrance
- 6 | Section - Therapeutic Spaces

10_b

THE REMEDIAL BATHING MACHINE:

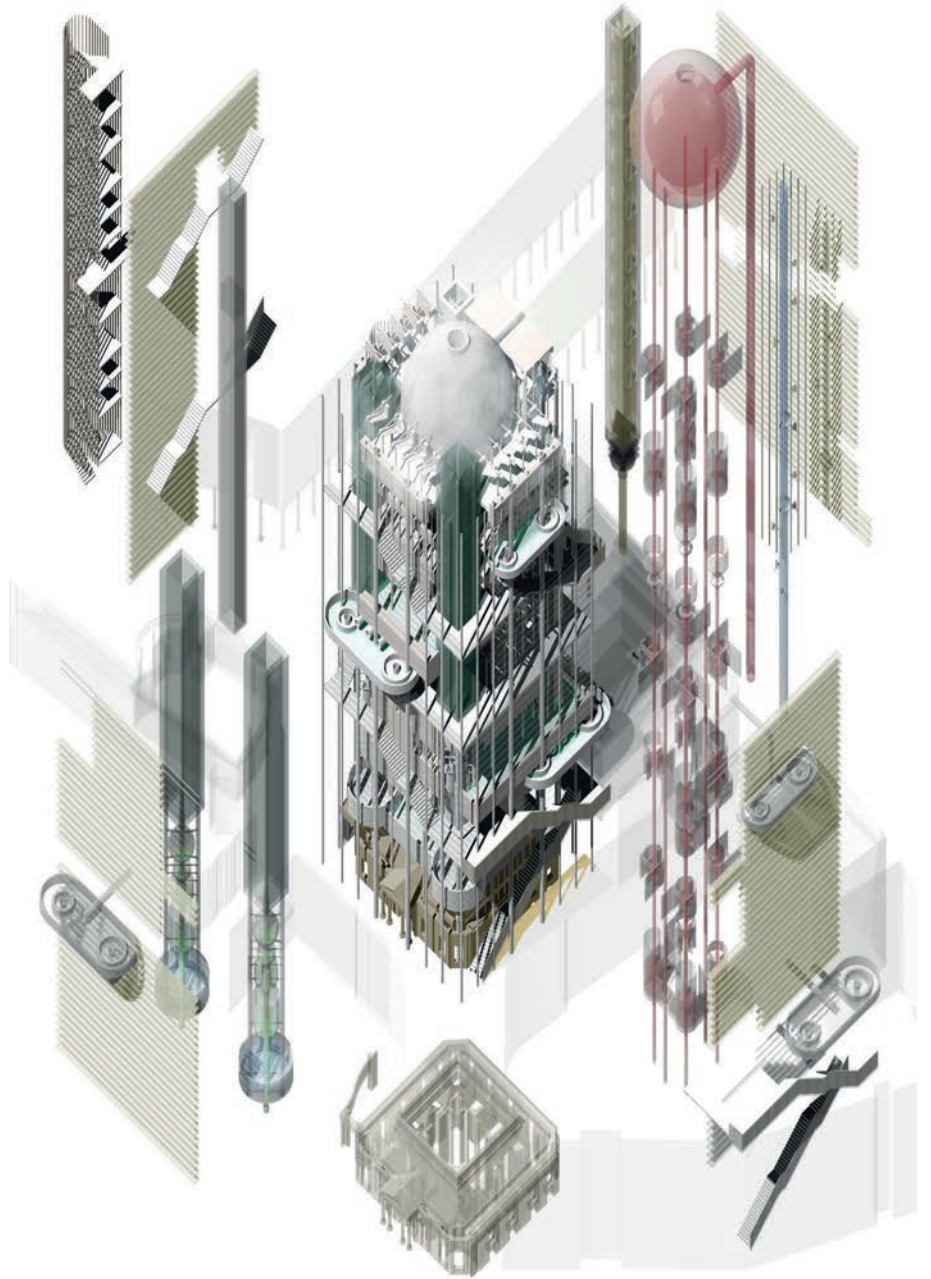
TECTONIC STATES OF FLOW

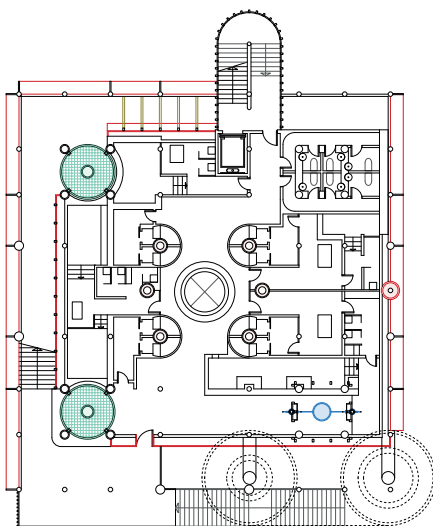
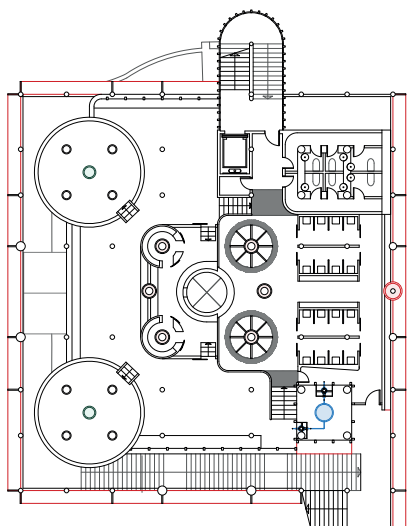
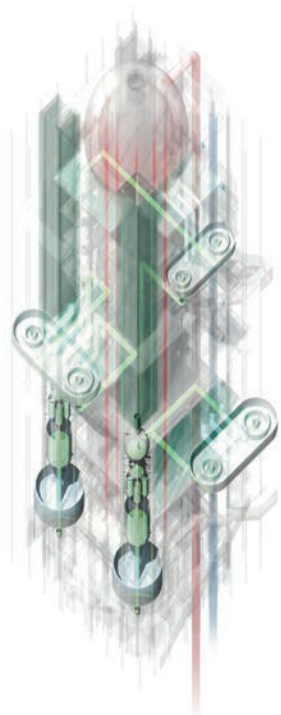
STEVEN SHI

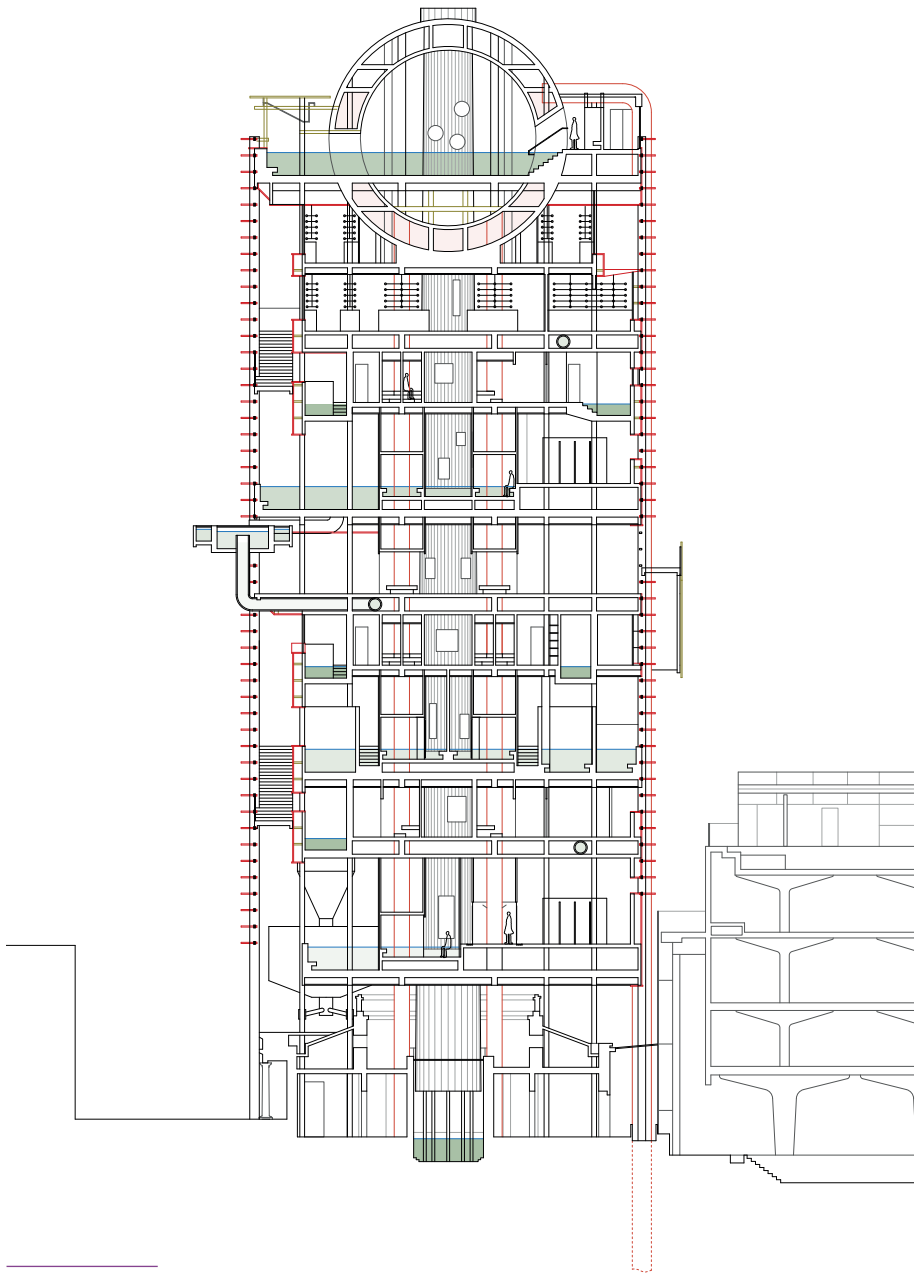
The Remedial Bathing Machine is a project in which the traditions of thermal bathing are reintroduced to treat skin disease, building on the social history of Bath as the source of mineral-rich water with purported therapeutic benefits. This project reinstates public bathing in post-carbon Bath, introducing a new building typology towering over central city, integrating natural and machinic processes and a therapeutic social space to celebrate the abundance of heat and mineral-rich water.

The project embraces the 'Machinic Landscapes' language to enact as a passive environmental instrument, vertically exaggerating hydrological cycles and tectonically expressing associated mechanisms of water filtration and processing, creating autonomous, closed-loop systems of water flow, waste treatment and algae production. The thermal water is reused and heat collected instead of draining into the municipal wastewater drainage system and human waste is metaphorically digested internally and used as biofuel.

Situated above the Georgian Hot Bath, the new structure vertically channels the extracted thermal water through various bathing tables of both controlled and contingent environments to create experientially purposed pools with transitioning and contrasting temperatures to increase the effects of healing. The building is enveloped by an enclosure of mechanised timer louvres to control airflow and sunlight within the varying internal thermal conditions. Whereas existing thermal bathing in Bath is reserved for the elite, this project proposes a free-to-book scheme, creating a densely occupied, active and thriving social space.







-
- 2 | Water Cycles; Filtration and Algae Cultivation
 - 3 | Machinic Landscapes and Experience of Bathing
 - 4 | First Floor - Bathing Table with Temperatures between 5~10°C
 - 5 | Second Floor - Skin Therapy with Controlled Environments
 - 6 | Vertical Structure of Bathing Tables, Therapeutic Pods, Biofuel & Cosmetic Laboratories

10_c

ALGAE NUTRITIONAL THERAPY CENTRE

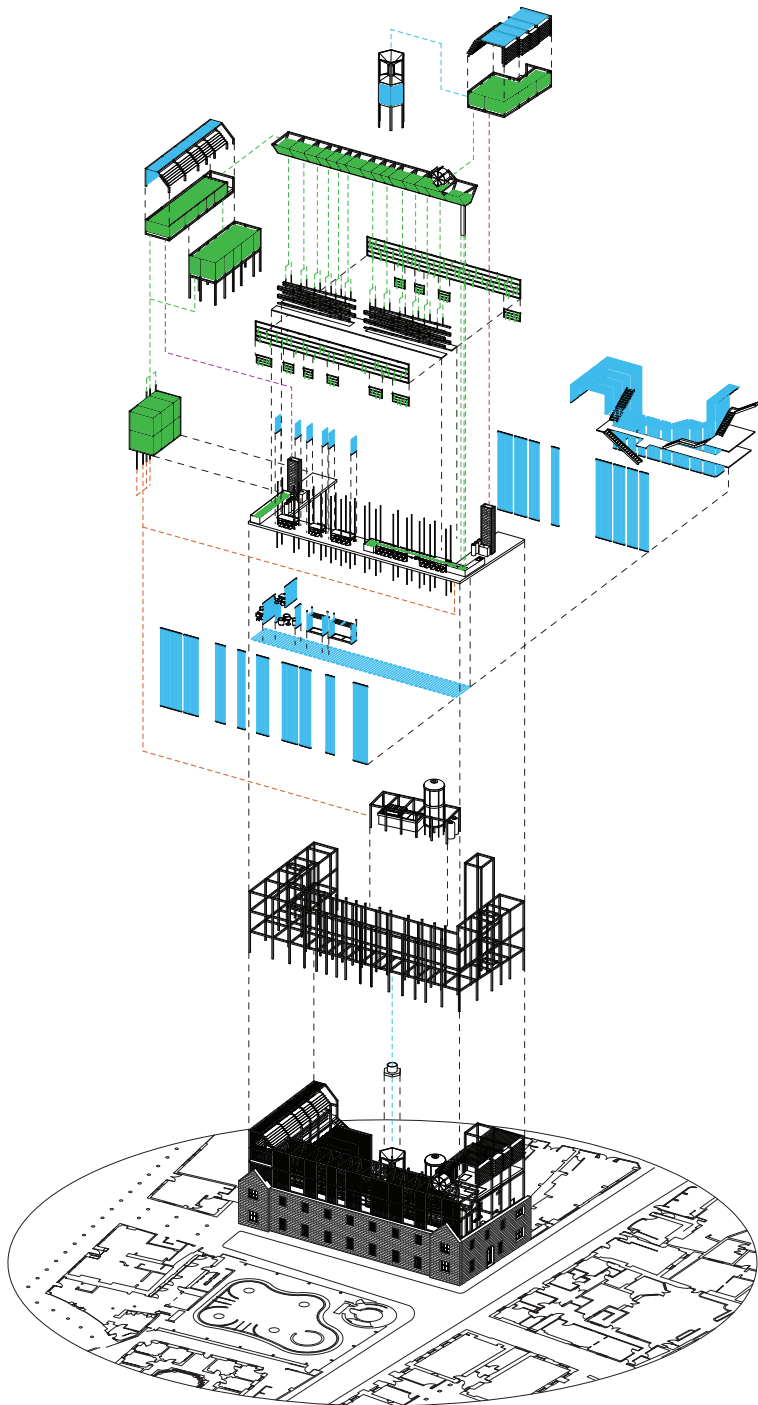
CHERIE WONG

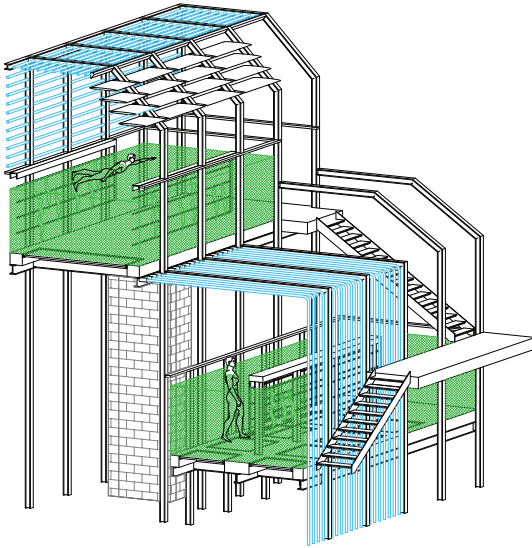
The Algae Nutritional Therapy Centre is situated within the site of St. Catherine's Hospital in Bath. Founded in 1552, St. Catherine's was dedicated as an almshouse for the elderly and poor and, was recently refurbished into private rented apartments for tourists.

This intervention re-establishes the historical medical identity of Bath city centre by projecting a new strata of energy and food production above the existing urban context where hydrotherapy exercise, and cultivation of algae and herbs take place simultaneously. Hydroculture systems maximise yields of produce and requires a minimal footprint unlike traditional farming techniques. These systems are integrated within a larger self-sufficient system throughout the rest of the building that filters geothermal groundwater and rainwater, recycles wastewater, and generates biomass energy.

The consumption area inhabits the first floor of the original building where the existing strata and the new strata interface – the materiality of the productive systems become most apparent here in the form of spatial and thermal elements. Vertical glass tubes with hot water provide an additional thermal layer to the original building fabric and glass windows in the bottom of the roof-top hydrotherapy and algae-cultivation pools allow moments of sunlight to filter through into the spaces below. A glass trough runs directly above the double-height space and shows the flow of water from one pool to another.

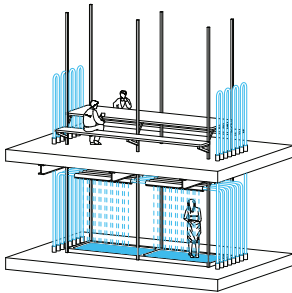
The exposure of these processes heightens the occupant awareness of consumption patterns while celebrating the confrontation between users and the different productive systems within an experiential environment.



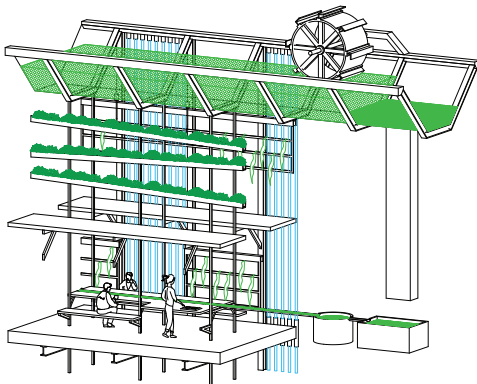


Macro-algae (kelp and seaweed) is grown in rapidly moving waters at a moderate temperature of 15-20°C. These cultivation pools are designated for high intensity exercises such as underwater walking, running and swimming.

Micro-algae (chlorella, spirulina) requires gentle agitation and warmer temperatures (25-35°C). Therefore, this is a separate pool on the other side of the building where low intensity exercise and physiotherapy takes place.



Acrylic tubes with hot water circulate between spaces and floors throughout the building as heating elements. They also double as spatial dividers for the eating space on the first floor and visual partitions on the ground floor to obscure views through the windows. The shower area utilises the run-off hot water from these tubes.



A water trough allows water to travel from the warmer micro-algae pool to the cooler macro-algae pools. It also has a collection mechanism to harvest and filter the micro-algae downwards into the eating area. Some of the pool water is also fed into the hydroponic system directly below.

-
- 2 | Macro-Algae pool
 - 3 | Heated partitions and shower
 - 4 | Eating space & Hydroponic Herborium
 - 5 | Physical model images

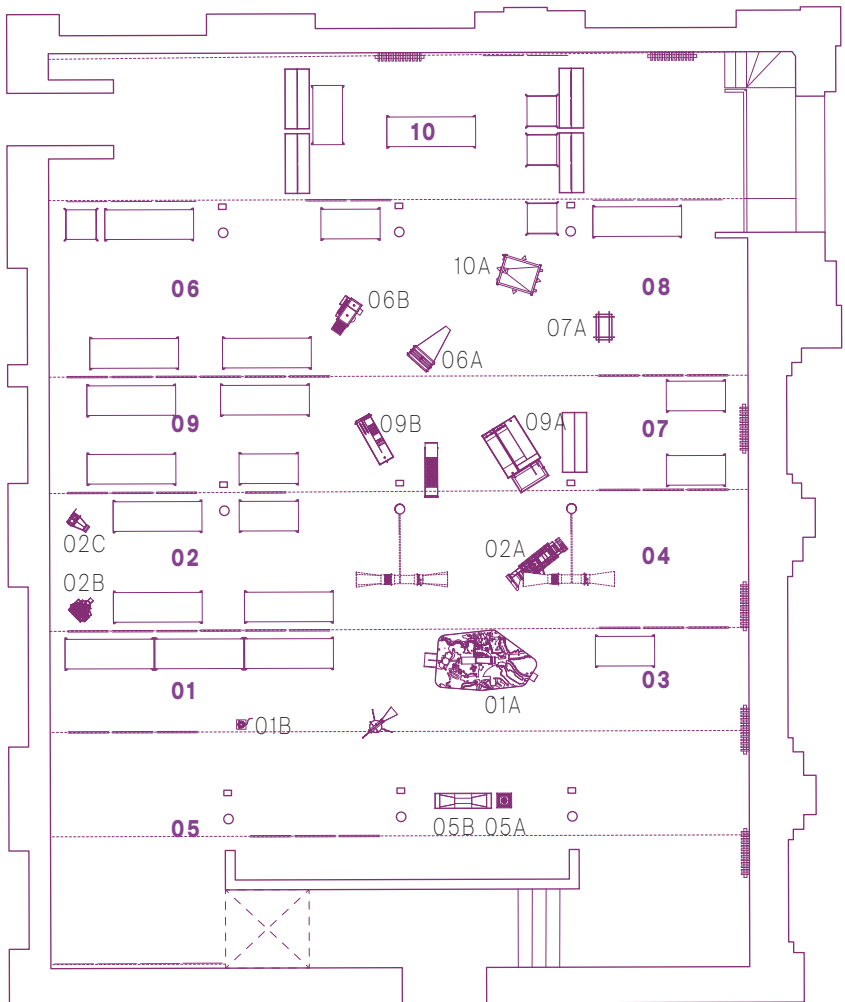




Bath Reconnaissance

February 2019 | Rachel Briglio, Camille Davison, and Naomi Wright





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IMAGE REFERENCES

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P1 | Svartsengi Power Station | October 2018 | Laura Haylock, Calum Rennie, Katy Sidwell

P5 | Water Table Reflections | April 2019 | Rachel Briglio and Naomi Wright

P7 | Wind Tunnel Smoke Visualisation | April 2019 | Bulat Gafurov

P9 | The Blue Lagoon | October 2018, Katy Sidwell

P19 | Wind Tunnel Prototype | November 2018, Kirstin Forsyth, Fritz Holtgrewe, and Jamie Wilson

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P117 | Bath Reconnaissance | February 2019 | Rachel Briglio, Camille Davison, and Naomi Wright

P125 | The urban stratigraphies of Bath | January 2019, Kirstin Forsyth

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