The Recording Studio

Based on Biophilic Design And Multi-Sensory Architecture

MArch(Prof)

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ABSTRACT

This thesis investigates how biophilic design and multi-sensory architecture can inform the design of a music recording studio. The research examines how natural systems and sensory engagement can be integrated with professional acoustic requirements to support human health, user well-being, and creative practice. Utilising theories from environmental psychology, phenomenology, regenerative architecture, and acoustic ecology, the thesis establishes a theoretical and design-led framework for the reinvention of conventional recording studio typologies. The project engages with the cultural–ecological context of Aotearoa through mātauranga Māori and Te Aranga design principles, thereby grounding the studio in place. It argues that a regenerative, multi-sensory approach can transform the recording studio from a sealed technical container into an experiential environment that enhances creativity, reduces stress, and supports environmental performance.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person except where explicitly acknowledged. Artificial Intelligence tools were used solely for editorial assistance, including spelling, grammar, and sentence-structure refinement. All ideas, research, analysis, design work, and conclusions remain my original intellectual contribution.

Signed:

By: Ryno Veldtmann
On: 11/02/2026

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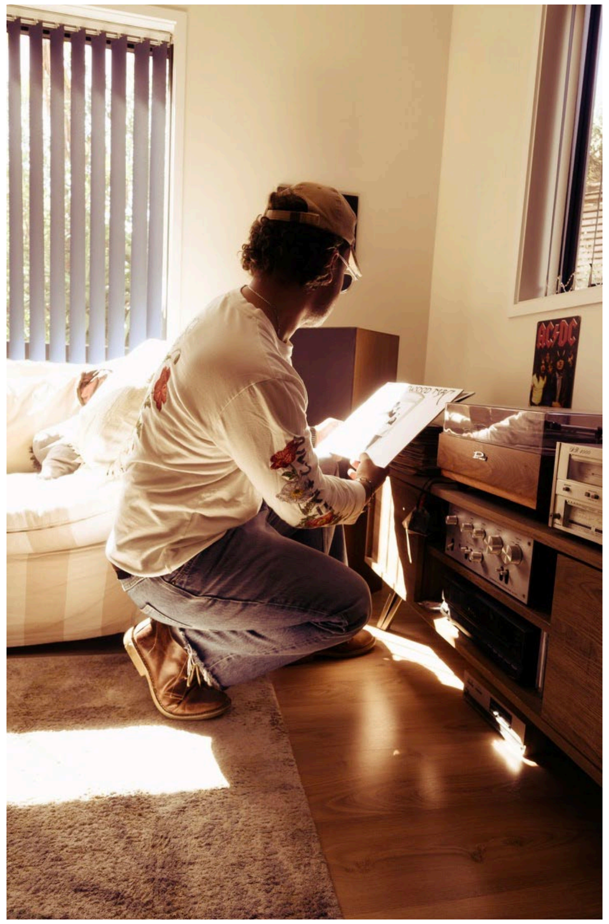


To my parents Louise Veldtmann and Theo Veldtmann, you have shown me strength, endurance, kindness and most importantly, love. Your sacrifices have not been overlooked, as it has led me to this moment.

To my brothers Wian Veldtmann and Brandon Veldtmann, for supporting me spiritually and believing in me.

To my friends. You have made me feel seen and held, supporting me through to the very end.

I love you all xx

Room for a poem

This room is a small planet tonight,
cups on the desk like sleepy moons,
the window breathing its cool glass air
into the collar of my shirt.

I sit with the hum of ordinary things—
fans, streetlight, the shy blue dot
on a speaker that blinks
like it knows a secret before I do.

Outside, someone laughs too loudly,
a car drags bass through the suburb,
and the night wears its loose jacket,
unzipped all the way down the coast.

I came in carrying a messy weather,
all the unsorted clouds of me,
but the room stayed patient,
kept its hands open.

Maybe a song is just a doorway
that forgets to close,
maybe it's the sound of staying
when leaving would be easier.

So I press my voice to the quiet
like a cheek to a warm window,
and the room, kind and ordinary,
learns my name again.

INTRODUCTION

Traditionally, recording studios are closed and acoustically isolated spaces that are optimised for the technological performance rather than an occupant's well-being. However, the advances in environmental psychology and regenerative architecture challenge this isolated thinking. Instead they advocate for design strategies which enhance engagement of the human senses and connection to nature.

Here, biophilic design and multi-sensory architecture have been examined, not just for aesthetics or passive features, but as essential components of the regenerative design approach.

The main goal of this project was to explore how these specific frameworks could be applied to the design of a music recording studio in Long Bay, to enhance the acoustical qualities, the human-centered performances, and the community engagement.

Central to this investigation is the recognition that recording studios operate within precise technical parameters — acoustic isolation, reverberation control, and spatial separation between recording and monitoring environments are non-negotiable requirements of professional practice (Newell, 2012; Everest & Pohlmann, 2015). This thesis does not position biophilic and multi-sensory strategies in opposition to these requirements, but asks how they might be pursued together — whether natural materials, passive environmental systems, and sensory sequencing can simultaneously serve acoustic performance and human well-being. The research question is developed in full in Chapter 3, where it is situated within the methodological and technical framework of the project.

"I don't know where I'm going from here, but I promise it won't be boring."

- David Bowie

CHAPTER 1

Contextual Review

Introduction

This chapter establishes the contextual foundation for the thesis by integrating theoretical literature with precedent analysis as complementary forms of architectural knowledge. Rather than treating built precedents as design outcomes, they are understood as situated texts—material investigations that embody ideas about atmosphere, acoustics, biophilia, and human experience. The chapter, therefore, brings together biophilic design, multi-sensory architecture, acoustic ecology, and regenerative practice through an analysis of relevant built works to define the conceptual territory within which the recording studio is developed.

Theoretical Position

Stephen Kellert's biophilic framework establishes how daylight, natural materials, and ecological connection support psychological well-being and creative focus. Juhani Pallasmaa and Peter Zumthor position architecture as an embodied experience, arguing that atmosphere emerges from materiality, sound, light, and spatial sequence rather than visual form alone. The acoustic dimension draws on R. Murray Schafer's acoustic ecology and Blesser and Salter's concept of aural architecture, which frame sound as an experiential condition. These perspectives are situated within regenerative thinking by Mang and Reed and informed by Te Aranga principles, positioning the studio as a sensory, ecological, and culturally grounded creative environment.

Biophilic Design

Biophilic design is a strategy that strengthens the human–nature relationship by integrating natural elements and processes into the built environment. The concept originates in Edward O. Wilson's Biophilia Hypothesis, which posits an innate affinity for nature (Wilson, 1984). Within architecture, this connection is achieved through direct experiences—such as daylight, water, airflow, and vegetation—and indirect experiences, including biomorphic forms, natural materials, sensory patterns, and colour (Kellert, 2018).

Kellert (2008) defined biophilic design as an approach that supports user health and well-being by encouraging both direct and indirect engagement with nature. This is highly relevant to recording studios, where ventilation, views, natural lighting, and materiality can reduce stress and enhance creativity—conditions essential for artistic production (Kellert, 2018). Drawing on Kellert's framework, this thesis adopts three categories:

1. Direct experience of nature—ventilation, vegetation, water, and daylight;
2. Indirect experience—wood, stone, and biomorphic forms;
3. Place-based relationships—engagement with local ecology, history, and culture.

Conventional recording studios are typically sealed and acoustically dense, prioritising technical performance over atmosphere (the holistic sensory and emotional character of a space, produced through the interplay of materiality, light, sound, temperature, and spatial proportion). Such environments can feel isolating, disconnecting users from natural rhythms of light, air, and material variation (Pallasmaa, 2012; Blesser & Salter, 2007) and introducing biophilic elements offsets this sensory deprivation by reintroducing natural stimulation, supporting stress reduction, and sustaining attention during prolonged sessions (Kellert, 2008; Ulrich, 1984). Research in environmental psychology further demonstrates that contact with natural materials and daylight improves cognitive restoration and emotional regulation (Joye & van den Berg, 2018). For a recording studio, biophilic design therefore reframes the space as restorative rather than merely technical, enabling creative focus without compromising acoustic integrity.

Multi-Sensory Architecture

Multi-sensory architecture is a design methodology that intentionally engages the senses of touch, sound, smell, proprioception, and sight. Rather than privileging sight alone, it recognises that spatial experience is embodied and shaped through the whole body (Pallasmaa, 2012). This approach understands architecture as a climatic and experiential condition that influences mood, behaviour, and memory, rather than as a purely visual composition.

Contemporary discourse has been shaped by Juhani Pallasmaa and Peter Zumthor, whose work reoriented architecture away from ocular-centrism toward embodied experience. Pallasmaa argued that modern architecture's dominance of vision has produced spaces detached from lived perception, advocating instead for tactile materials, acoustic presence, and thermal qualities that speak to the body (Pallasmaa, 2005). Zumthor similarly positioned atmosphere as a tangible reality generated through relationships among light, sound, material depth, and spatial sequencing (Zumthor, 2006). Scholars have since recognised his work as instrumental in legitimising atmosphere as a primary design driver rather than a subjective by-product (Hiss, 2010; Shields, 2023; Holl et al., 2006; Rasmussen, 1962).

These ideas are particularly significant for recording studios, where users spend long hours in acoustically controlled rooms. Sensory layering—through texture, light, and subtle sound—can reduce fatigue and increase emotional resonance (Blesser & Salter, 2007; Ulrich, 1984). In the proposed

Biophilic Design, Multi-Sensory Architecture in Recording Studio Environments

Evolving architectural discourse is increasing recognition of the building environment and of the need for it to do more than accommodate minimum functional requirements. The built environment must actively contribute to human well-being, sensory engagement, and ecological connections. This shift provides a conceptual basis for this research. I have watched and investigated how biophilic design and multi-sensory architecture can transform the atmosphere, performance, and experiential qualities of a recording studio.

This chapter synthesises the key ideas that have emerged across environmental psychologies, the biophilic series, acoustic qualities and ecologies, and regenerative design. Altogether, these bodies of literature have the potential to expose gaps in conventional and stereotypical recording-studio design and to establish the rationale for new integrations.

Sensory demands and human well-being in creative practice

Across architectural and psychological scholarship, sensory and environmental conditions are consistently shown to shape user well-being. Ulrich's research (1993) demonstrated that natural light, texture, colour, and airflow reduce stress and support cognitive recovery. More recent studies argue that sensory variety is essential for creativity, mental resilience, and emotional balance (Joye & van den Berg, 2018; Kellert, 2018). This is particularly relevant to music production, where artists and engineers work for extended, uninterrupted periods that require precision and sustained concentration.

Traditional recording studios prioritise acoustic control, often resulting in materially synthetic and atmospherically monotonous environments. While acoustically effective, such spaces can be psychologically taxing. Kellert (2018) notes that the absence of natural complexity contributes to cognitive fatigue, which manifests as reduced concentration, irritability, and impaired creative judgment. Within this thesis, user well-being is therefore positioned as a functional requirement rather than an optional enhancement.

This chapter positions sensory engagement as fundamental to creative performance. Creative environments must not only minimise distraction but also support emotional regulation and sensory grounding—qualities directly linked to artistic output and the capacity to sustain imaginative work over time.

Regenerative Architecture and Mātauranga Māori

Regenerative design constantly seeks to move beyond the sustainability of creative buildings that contribute positively to ecological and cultural systems. Mang and Reed (2012) have defined regenerative design as a "co-evolutionary process" in which the built environment is integrated into its living system.

In Aotearoa, regenerative practices must include indigenous knowledge systems. Te Aranga Māori Design Principles: Mana, Whakapapa, Taiao, Mauri Tu, Mahi Toi, Tohu, Ahi Kā offer a relational, site-based response to the design methodology rooted in mātauranga Māori (Roberts et al., 2004).

For instance:

- Taiao forces respect for the natural environment.
- Mauri Tu provides values and environmental health and well-being.
- Whakapapa requires acknowledgment of ancestral relationships to the site.

When systems such as these are applied to the design of a recording studio, the principal qualities manifest as a passive environmental system, local materials, landscape integration, and cultural symbolism, ensuring that the building is regenerative and contextually grounded.

Architectural acoustics ecologies

Alongside biophilic and multi-sensory frameworks, acoustic theory provides the technical foundation for a professional recording studio. Such spaces must balance two core conditions: precision—clarity, absorption, diffusion, and control of sound waves—and ambience—spatial identity, comfort, and emotional resonance. Where these intersect, biophilic and regenerative strategies add value beyond technical performance.

Schafer's (1977) concept of acoustic ecology reframes sound as a relationship between people and environment. His distinction between hi-fi soundscapes of clarity and lo-fi environments where noise merges with signal offers a tool for studio design. While studios require controlled hi-fi conditions, Schafer argued that environments should not become sterile; subtle natural sounds—such as wind through vegetation or ventilated openings—can coexist with isolation without disrupting recording.

Blesser and Salter (2007) propose aural architecture, asserting that acoustic environments are psychological and atmospheric rather than purely technical. Material decisions therefore shape emotional and social perception as well as reverberation. Timber, wool, and rammed earth can modulate frequencies while evoking warmth and familiarity, supporting comfort during long sessions.

Psychoacoustic research confirms that environmental qualities influence behaviour and concentration. Management of bass buildup, mid-frequency reflections, and diffusion reduces stress and supports focus (Pedersen, 2015). Everest and Pohlmann (2015) similarly show that effective studios integrate isolation, absorption, diffusion, and reflection rather than relying on a single strategy, with natural materials often performing effectively while adding sensory richness.

Together, these theories support expanding the studio's sensory scope without compromising standards. The recording environment is conceived not as an isolated void but as a responsive acoustic ecology that resonates with both sonic precision and human experience.

Precedent studies — selection and rationale

The following selection of precedence for the thesis is guided by the need to understand precisely how an architectural project is shaped to promote psychological comfort and sensory experience. This is due to recording studios demanding a balance between technical acoustics and experiential richness, which is important for successfully integrating the appropriate atmosphere, sensory modulation, material expression, and focus, with a focus on human well-being.

Each of these precedents embodies different aspects of sensory and perceptual design, and collectively, they provide a foundation for the thesis. The four precedents were therefore analysed in depth.

1. Maggie's Centres: Natural Lighting and Psychological Support

The Maggie's Centres network has been realised through commissions to leading international architects, with each building designed as a unique response to its local context. Influential examples include Maggie's Dundee by Frank Gehry (2003), Maggie's London by Rogers Stirk Harbour + Partners (2008), and Maggie's Gartnavel by OMA / Rem Koolhaas (2011), followed by Snøhetta's Aberdeen Centre (2013) and Foster + Partners' Manchester Centre (2016). Although architecturally diverse, the centres share a consistent ethos of domestic scale, tactile materiality, and daylight modulation aimed at supporting emotional resilience (Jencks, 2015; Sternberg, 2009).

Maggie's Centres (see figure 1) operate as non-institutional refuges adjacent to hospitals, intentionally contrasting the clinical character of conventional healthcare buildings (Jencks, 2015). Research in environmental psychology demonstrates that such environments—characterised by natural light, views to greenery, and legible spatial layouts—can measurably reduce stress and improve emotional regulation (Ulrich, 1984; Sternberg, 2009). Jencks (2015) describes this as a "special softness," achieved through material warmth, spatial intimacy, and informal planning that allows users to feel in control of their surroundings. Similar findings are supported by Pallasmaa (2012), who argues that tactile and atmospheric qualities enable architecture to be experienced as emotionally supportive rather than merely functional.

This approach is highly relevant to recording studio design, where users also endure prolonged cognitive focus and emotional vulnerability. Studies on creative workplaces indicate that glare, harsh lighting, and sensory monotony contribute to fatigue and reduced creative performance (Heschong, 2002; Joye & van den Berg, 2018). The thesis therefore adapts Maggie's principles through elevated window placement, indirect daylighting, and softer material palettes within control rooms—strategies aligned with evidence that daylight variability supports circadian regulation and concentration (Heschong, 2002; Kellert, 2018).

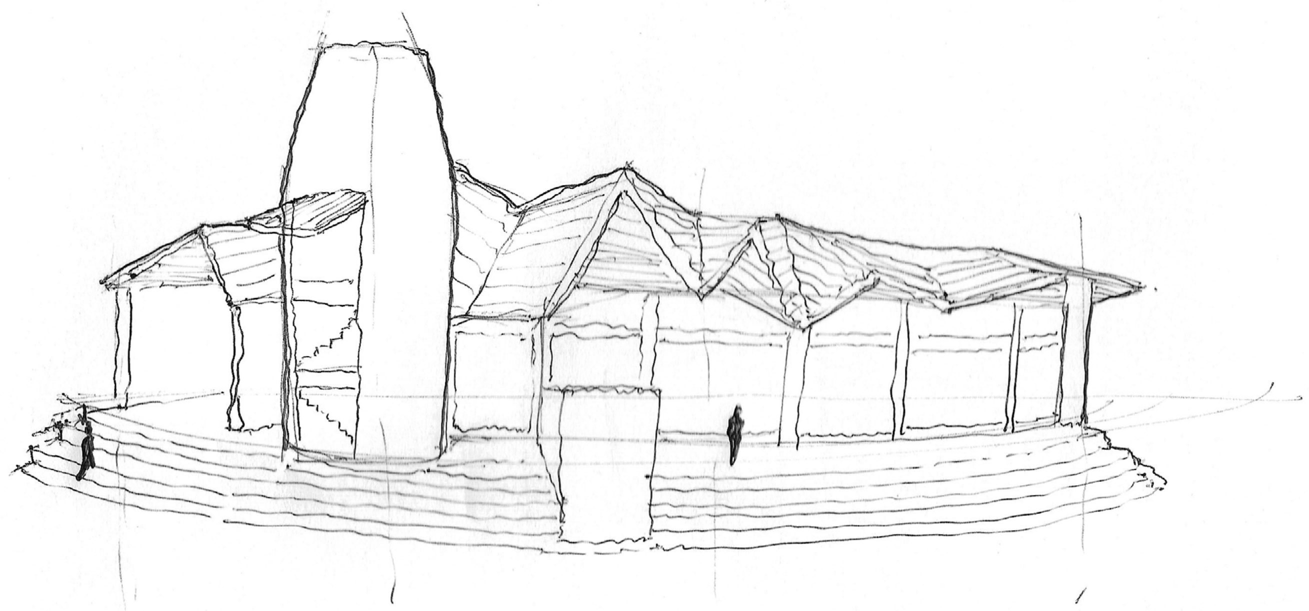


Figure 1: Maggie's Centre by Frank Gehry (2003).

2. Tippet Rise Art Centre: Landscape-Integrated Acoustics

Tippet Rise Art Centre (see figure 2) in Fishtail, Montana, opened in 2016 and was developed through collaborations with Ensamble Studio and Francis Kéré. The pavilions—such as Beartooth Portal and Xylem—merge construction with landscape, allowing topography, material mass, and weather to shape acoustic experience. This reflects what Blesser and Salter (2007) term aural architecture, in which spatial form mediates emotional and social perception through sound.

Schafer's (1977) theory of acoustic ecology reframes sound as an environmental resource rather than noise to be excluded. Tippet Rise exemplifies this by situating performance spaces within open landscapes where wind, timber, and stone create a living soundscape (Blesser & Salter, 2007; Schafer, 1977). Such approaches challenge the convention that acoustic quality requires total isolation. Instead, they suggest that curated permeability can enhance emotional resonance and place identity (Brown & Muhar, 2004).

For the thesis, this precedent informs the exploration of semi-permeable studio envelopes in which ventilation, rammed earth mass, and vegetated buffers modulate rather than eliminate external sound. Research indicates that moderate exposure to natural soundscapes can reduce stress and improve cognitive restoration (Alvarsson et al., 2010; Joye & van den Berg, 2018). The studio, therefore, adopts strategies that balance professional isolation with a perceptible sense of environmental presence.

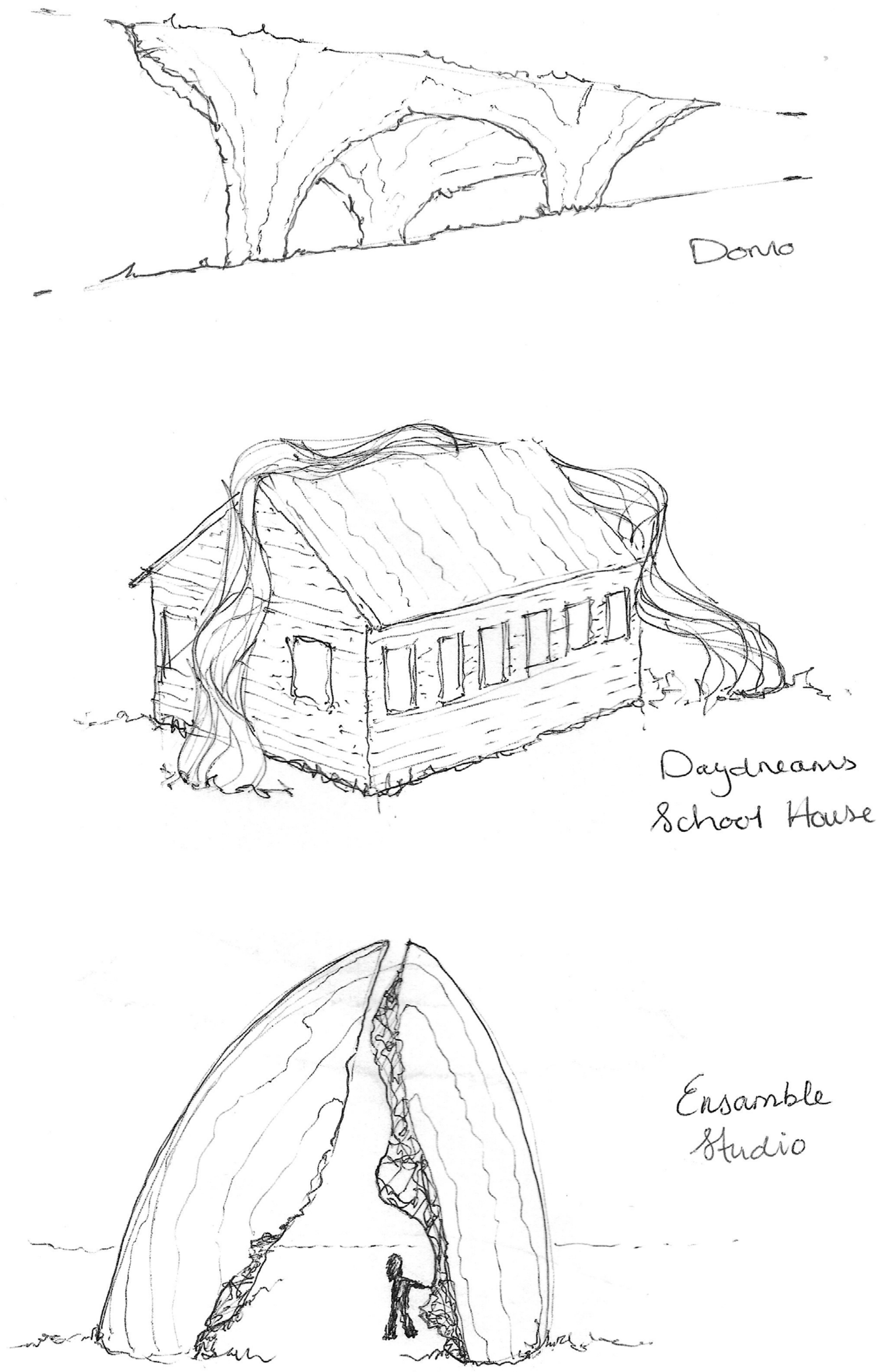


Figure 2: Tippet Rise Art Centre. Art work Domo, Daydreams School House and Ensamble Studio.

3. Amazon's The Spheres: Biophilic Atmospheres and Controlled Microclimates

Amazon's The Spheres in Seattle, designed by NBBJ and completed in 2018, house over 40,000 plants within a highly regulated microclimate. The project demonstrates how vegetation, humidity, and daylight can be integrated as spatial infrastructure rather than decoration (Beatley, 2017). Empirical studies link such environments to improved attention restoration, mood, and creative ideation (Kellert, 2018; Joye, 2007).

Beatley (2017) positions The Spheres as a model of biophilic urban interiorism, where scent, texture, and seasonal change become part of everyday experience. These sensory variables correspond with findings that olfactory and tactile cues strengthen place attachment and memory (Spence, 2020; Pallasmaa, 2012). For creative workers, access to restorative zones has been shown to mitigate cognitive overload and support divergent thinking (McCoy & Evans, 2002).

The thesis translates these lessons into studio lounges and circulation spaces enriched with vegetation such as kawakawa and mānuka, combined with passive humidity regulation. Such strategies align with evidence that indoor planting can stabilise humidity, reduce perceived stress, and improve acoustic absorption (Doxey et al., 2009; Kellert, 2018). These areas function as decompression thresholds, preparing artists to re-enter acoustically intense rooms.

Figure 3: Amazon's The Spheres designed by NBBJ and completed in 2018.

Recording Studio Precedents

Real World Studios — Peter Gabriel, Box, Wiltshire (1987)

Real World Studios represents one of the most compelling examples of a professional recording facility designed in deliberate relationship with its natural surroundings. Converted from a mill complex on the River Avon, the studio integrates stone walls, timber structures, and direct visual and acoustic connection to flowing water within a working commercial facility. The main recording space features a glazed roof that floods the live room with natural light, while a water feature runs beneath the recording floor — introducing controlled natural sound rather than eliminating it. Real World demonstrates that curated permeability, where natural sound, light, and material presence are selectively admitted, can coexist with professional recording standards (Newell, 2012), providing direct precedent for this thesis's approach to semi-permeable acoustic envelopes and natural material systems.

Blackbird Studio — Nashville, Tennessee (2002)

Blackbird Studio, designed with acoustic consultant Russ Berger, demonstrates how spatial variety and natural materials can produce a commercially successful multi-room complex that prioritises acoustic character alongside technical precision. Exposed timber, brick, and stone surfaces are employed across recording rooms, each tuned to a different acoustic signature. The use of natural materials is functional rather than decorative: timber diffusion panels, masonry mass walls, and varied ceiling heights contribute directly to acoustic performance (Newell, 2012). This reinforces the thesis argument that biophilic material choices and acoustic performance can be designed as mutually reinforcing systems rather than competing priorities (Kellert & Calabrese, 2015).

Design Standards for Recording Studios

Professional recording studio design is governed by established acoustic criteria that define minimum performance requirements. The Noise Criteria (NC) rating system measures ambient noise levels; professional control rooms typically target NC-20 or below, requiring careful attention to the building envelope, mechanical systems, and acoustic separation from public zones (Everest & Pohlmann, 2015). Sound Transmission Class ratings quantify airborne sound isolation between spaces, with professional studios typically requiring high levels of isolation between live rooms and control rooms — achieved through mass, decoupling, and absorption strategies that align with the rammed-earth and timber construction explored in this thesis (Newell, 2012).

Reverberation time (RT60) - the duration for sound to decay by 60 dB - is a primary design parameter. Control rooms typically target RT60 values between 0.2 and 0.4 seconds across mid-frequencies. Natural materials such as timber and moss contribute to absorption and diffusion, influencing RT60 in ways that can be tuned through surface area, thickness, and placement (Everest & Pohlmann, 2015). Industry guidance consistently identifies the separation of live recording, monitoring, and communal functions as fundamental, with visual connection between control room and live room maintained through double-glazed observation windows (Newell, 2012). These standards establish the technical framework within which the biophilic and multi-sensory strategies of this thesis are developed - not as constraints limiting design ambition, but as performance criteria that challenge the research to demonstrate how ecological, sensory, and technical objectives can operate as a coherent integrated system (Blesser & Salter, 2007).

Comparative Discussion and Conclusion: Precedents as Design Framework

Collectively, the selected precedents have shaped the thesis by establishing a coherent framework that links landscape relationships, acoustic behaviour, sensory atmosphere, and user well-being to the design of a music recording studio. Rather than functioning as isolated references, these projects demonstrate how highly constrained typologies can be reimagined through sensory-led, biophilic, and environmentally responsive strategies. They reveal that atmosphere, materiality, and environmental integration are not secondary to technical performance, but fundamental to it.

Each precedent contributes complementary insights. Maggie's Centres demonstrate how natural lighting, material tactility, and spatial softness can reduce psychological stress within demanding environments. This reframing of a healthcare typology informs the thesis approach to control rooms and workspaces, where prolonged focus requires calming rather than sterile conditions. Tippet Rise Art Centre extends this by illustrating how sound can be treated as an environmental condition rather than solely a technical parameter. Its landscape integration and material resonance inform the thesis's exploration of acoustic mass, rammed-earth construction, and semi-permeable ventilation. Amazon's The Spheres demonstrate how interior vegetation and controlled microclimates can support cognitive restoration within artificial environments, informing the design of transitional and communal studio spaces that are essential to creative production.

Together, these precedents provide transferable strategies: integrating natural materials and vegetation, prioritising passive ventilation that balances environmental and acoustical conditions, creating sensory gradients across programmatic zones, and modulating daylight to support precision and well-being. They demonstrate that studios need not be sealed, sensory-deprived spaces, but can remain technically rigorous while being ecologically responsive and psychologically supportive.

Materiality emerges as a primary design driver. Three objectives guided selection: authentic biophilic connection; multi-sensory performance through tactile and thermal engagement; and regenerative strategies prioritising low embodied carbon. These are grounded in established theory, including biophilic material connections (Kellert & Calabrese, 2015), the atmospheric role of materiality (Pallasmaa, 2012), and practical environmental performance (Lechner, 2014; Minke, 2012).

In conclusion, the precedents reinforce the thesis's central argument that recording studios can be reconceived as environments where technical performance, sensory experience, ecological integration, and creative well-being are mutually reinforcing. The lessons derived have directly shaped the thesis's conceptual direction and material strategies, providing a foundation for subsequent design development and fabrication.

Integrating Precedents into the Studio Concept — Design Syntheses

The design synthesis translates lessons from the precedents into four integrated strategies governed by performance logic. Rather than layering materials arbitrarily, the studio adopts a hierarchical material system in which each layer performs acoustic, environmental, and sensory roles. This reflects theory that positions material mass, geometry, and porosity as key determinants of sound behaviour and atmosphere (Blesser & Salter, 2007; Rasmussen, 1962; Pallasmaa, 2012).

Layered materials: Material organisation moves from mass to softness. Rammed earth forms the primary layer, providing structural stability, thermal inertia, and low-frequency acoustic mass (Minke, 2012; Lechner, 2014). Timber acts as a secondary layer, offering diffusion, tactile warmth, and visual comfort (Day & Midbjer, 2007; Pallasmaa, 2012). Softer biophilic layers—moss, planting, and textile absorbers—target mid- to high-frequency control while supporting humidity regulation and sensory richness (Ryan et al., 2014; Kellert & Calabrese, 2015).

Controlled biophilic apertures: Openings are positioned to frame landscape views and admit indirect daylight without compromising acoustics. Such modulation supports emotional regulation and circadian alignment while maintaining technical function (Heschong, 2002; Ulrich, 1984; Lechner, 2014).

Hybrid acoustic and vegetation elements: Vegetation operates as an acoustic and environmental modifier rather than decoration. Green systems in lounges and thresholds absorb background noise, support air quality, and aid sensory recovery (Beatley, 2017; Joye & van den Berg, 2018).

Site-tuned massing: Building mass responds to wind paths and topography, using landscape to buffer sound and stabilise atmosphere without mechanical reliance (Schafer, 1977; Mang & Reed, 2012).

Together, these strategies balance isolation with sensory openness. The primary envelope maintains acoustic containment, while adjacent spaces allow controlled contact with light, air, and landscape, supporting sustained creative engagement (Pallasmaa, 2012; Kellert, 2018).

Conclusion

This chapter has established the contextual foundation for the thesis by integrating literature and precedent analysis as complementary forms of architectural knowledge. The review demonstrates that creative environments are shaped not only by technical performance but also by sensory, psychological, and ecological conditions. Biophilic theory posits that connection to nature is essential to well-being. At the same time, multi-sensory and phenomenological perspectives confirm that architecture is experienced through touch, sound, light, and atmosphere rather than vision alone. Acoustic ecology further reframes the recording studio as an environmental system in which sound and materiality act as spatial agents rather than isolated technologies.

The examined precedents translate these ideas into built form. Maggie's Centres reveal the therapeutic value of daylight and material softness; Tippet Rise shows how curated soundscapes can coexist with acoustic control; and The Spheres demonstrate how vegetation and microclimate can structure creative workplaces. Together, they confirm that atmosphere and performance can be mutually reinforcing.

From this review, guiding propositions emerge: studios can be biophilic rather than sealed, materials can be both acoustic and sensory, and regenerative frameworks can embed creative spaces within ecological and cultural contexts. Chapter 2, therefore, outlines a design-led methodology through which these contextual insights are tested, translated, and materialised within the proposed recording studio.

"The moment you stop questioning yourself is the moment you stop growing."

- Thom Yorke (Radiohead)

CHAPTER 2

Theoretical Framework

Introduction

This chapter lays the theoretical foundations for the thesis by drawing on literature on biophilic design, multi-sensory and phenomenological architecture, regenerative design, and acoustic ecology (Wilson,1984; Kellert, 2008, 2018; Pallasmaa, 2012; Mang & Reed, 2012; Schafer, 1977; Blesser & Salter, 2007). Instead of reviewing these texts separately, extracts were utilised as key concepts from each body to synthesise an integrated view through a recording studio, which can be reimagined (Groat & Wang, 2013; Schön, 1983).

Theoretical frames of biophilic design play a vital role in nature to support human well-being andemotional regulation (Kellert, 2008; Ulrich, 1984), multi-sensory and phenomenological architecture, positioning the atmospheric and spatial experience as an embodied and regenerative design frame (Pallasmaa, 2005, 2012; Holl et al., 2006; Rasmussen, 1962); a building as a living and regenerative system interwoven with an ecological context and acoustic ecology expansion from a technical problem to an experiential condition (Mang & Reed, 2012; Roberts et al., 2004). Both theoretical positions advance the design of a recording studio toward a technically rigorous, immersive, and ecologically responsive architectural design (Kellert, 2018; Zumthor, 2006; Joye & van den Berg, 2018).

This repositioning of theories addresses the limitations of traditional recording studios. Typically, they are assumed to be sealed, acoustically controlled, and technologically driven, at the expense of sensory richness and ecological connection. Throughout the reconsideration of biophilic and multi-sensory architecture, artists are afforded psychological restoration, creative immersion, and embodied engagement through improved design. Music production involves factors deeply embedded within, as well as artistic conditions that involve experimentation (Ulrich, 1984; Pallasmaa, 2012; Kellert, 2018).

Connecting architecture with music and ecologies, the research situates the recording studio not as a site of sound capture but as an active, creative instrument that shapes the emotional atmosphere and the character of the work produced (Blesser & Salter, 2007; Schafer, 1977).

Spatial Zoning Through Sensory Hierarchies

A recording studio comprises various studio spaces, including a control room, a lounge, outdoor areas, and, of course, the recording room (live room). The following zoning ideas (see table 1) align with Pallasmaa’s emphasis on haptic perception, which enables users to transition between sensory experiences throughout the studio.

Materiality and Atmosphere

Phenomenological architecture places materiality at the centre of spatial meaning. Pallasmaa (2012) argues that materials mediate between the body and space, shaping how architecture is touched, heard, and emotionally registered. Zumthor (2006) similarly frames material presence, acoustic softness, surface depth, and thermal qualities as primary generators of atmosphere, capable of evoking memory, intimacy, and emotional resonance. From this position, material choice is not merely a technical decision but an atmospheric and psychological one.

In biophilic design theory, natural materials are understood to strengthen human–nature relationships through tactile engagement, visual complexity, and sensory familiarity, contributing to stress reduction and perceptual comfort (Kellert, 2008; Kellert, 2018). When combined with regenerative thinking, materials further become ecological participants, embedding resource cycles, locality, and environmental performance within architectural expression (Mang & Reed, 2012).

Framed by these positions, the use of acoustically functional timber cladding, rammed-earth walls, and locally sourced wool insulation is understood as both technical and phenomenological. Timber surfaces provide warmth, texture, and acoustic modulation; earth construction offers thermal mass, acoustic depth, and material gravity; and wool insulation supports absorption while introducing a soft, bio-based tactile layer. Together, these materials contribute simultaneously to sound performance, environmental regulation, and the atmospheric qualities that evoke memory, sensory grounding, and cultural resonance (Zumthor, 2006; Pallasmaa, 2012).

Programme / Space	Primary Function	Biophilic & Multi-Sensory Opportunities
Recording / Live Room	Highly controlled sound environment for performance and recording. Monitoring, production mixing, and extended cognitive work. Rest, collaboration, and creative recovery. Movement between technical and social zones.	- Acoustic timber panelling. - Adaptive surfaces. - Biophilic wall treatments such as moss or integrated vegetation. - Filtered daylight. - Material tactility. - Controlled natural ventilation systems with acoustic baffling to support air movement without compromising sound isolation.
Control Room	Monitoring, production mixing, and extended cognitive work.	- Minimalist spatial composition. - Warm tactile finishes. - Dimmable and circadian lighting. - Framed views of vegetation. - Natural materials that reduce stress and visual fatigue. - Acoustically absorbent and diffusive surfaces that also contribute to atmospheric quality.
Loung / Com-munal Spaces	Rest, collaboration, and creative recovery.	- High sensory engagement zones. - Visual connection to landscape. - Indoor planting. - Scent-based vegetation such as kawakawa. - Abundant natural daylight. - Textured flooring. - Informal spatial configurations - Auditory softness and natural sound infiltration.
Transitional / Circulation Spaces	Movement between technical and social zones.	- Sensory modulation zones - Gradual shifts in light, sound, and materiality. - Views to exterior ecologies. - Ventilation corridors. - Filtered acoustic thresholds. - Opportunities for visual relief and psychological decompression.

Table 1: Spatial Zoning Through Sensory Hierarchies.

Discussion

The combination of biophilic and multi-sensory design principles within a music recording studio presents unique opportunities and challenges. On the one hand, the technical constraints of a recording studio's acoustics limit the naturalness of connections. On the other hand, they provide creative ways to stimulate or interpret these connections within a space.

Reduction of operational energy through passive systems aligns the studio with regenerative architecture. By utilising passive ventilation, daylight modulation, and thermal mass, reliance on mechanical systems can be reduced while maintaining acoustic performance. Strategies such as operable acoustic elements and earth-based construction enable the building to regulate temperature and air quality more naturally, embedding sustainability within spatial design rather than as an added technology.

Supporting well-being through sensory engagement recognises that creative work depends on emotional and psychological states. Orchestrated textures, acoustic softness, and natural light can transform the studio from a neutral container into a restorative environment, demonstrating that emotional resonance is part of creative infrastructure rather than a distraction from it.

Restoring local ecologies through native landscaping extends the studio's role beyond its interior. Indigenous planting and water-sensitive design contribute to biodiversity, microclimate regulation, and acoustic buffering, positioning the building as an ecological participant that reconnects users with seasonal rhythms.

Embedding cultural narratives through Te Aranga principles situates the project within its specific context. Orientation, material selection, and landscape strategies become expressions of whakapapa and taiao, ensuring that regenerative design addresses social and cultural relationships as well as environmental performance.

This design model promotes not only low-energy performance but also a high-quality environment, a critical factor in spaces intended for artistry such as this.

Conclusion

In this chapter, the theoretical foundations have been established and applied to the integration of biophilic design and multi-sensory architecture into a music recording studio.

Utilising environmental psychology, existing indigenous knowledge systems, phenomenology and acoustical ecologies, which reimagined the approach for a studio as a living system, a space that promotes creativity, regenerates the environment and honours its cultural and ecological place.

As the industry moves towards more sustainable and human-centred creative spaces, the proposed framework explored here provides a compelling blueprint for the future of recording studios in architecture.

"There is a crack in everything. That's how the light gets in."

- Leonard Cohen

CHAPTER 3

Methodology

Introduction

This chapter outlines the research methodology adopted to explore how biophilic design and multi-sensory architecture can be integrated into a music recording studio.

It describes the research design, methods, data collection, and processes used to explore how these frameworks have supported human well-being, user sensory engagement, and design outcomes (Kellert, 2008; Pallasmaa, 2012; Ulrich, 1984). The methodology adopts a qualitative, design-led research approach appropriate for architectural exploration and is grounded in constructivist principles, which acknowledge the subjective, contextual nature of architectural knowledge (Groat & Wang, 2013; Bogdan & Biklen, 2016).

To strengthen the validity of the qualitative approach, a triangulation strategy has been utilised to combine multiple sources of findings and evidence to examine the research question from different perspectives (Denzin, 1978; Creswell & Poth, 2018). The triangulation strategy is achieved through integration of a literature-based theoretical framework and physical and digital design practice. This approach allows design decisions to be informed by contextual data and established theory, reducing reliance on a single interpretive lens and ensuring the outcome remains grounded in material, experiential, and spatial realities (Groat & Wang, 2013; Salura, 2024).

It provides the rationale for selecting these methods and explains how they align with the broader research outlined previously (Schön, 1983; Mang & Reed, 2012).

Research Approach

This research utilises a design-led methodology. This approach is an iterative and creative process that generates new knowledge throughout the design process itself (Schön, 1983; Groat & Wang, 2013). Rather than seeking objective and generalisable truths, this methodology prioritises experimental, contextual, and spatial knowledge, making it well-suited to the architectural investigation of atmosphere, human perception, and sensory experiences (Pallasmaa, 2012; Zumthor, 2006; Bogdan & Biklen, 2016).

This study is structured into the following stages:

1. Precedent and case study analysis: Researching existing projects that provide exemplified sensory and ecological designs.
2. Site analysis: The investigation of existing environmental, cultural and ecological conditions of Long Bay, Auckland.
3. Design development: The application of biophilic and multi-sensory strategies in a recording studio.
4. Materials and sensory testing: The exploration of materials that provide light, sound and spatial qualities throughout the model making, sketches and diagramming.
5. Reflective practices: The design is critically evaluated through ongoing feedback and analysis throughout the research.

Precedent & Case Study Analysis

This stage of the project involved an analysis of case studies of architectural projects that embody multi-sensory and nature-integrated qualities. These precedents were examined to develop a deeper understanding of how such design approaches operate beyond the building's physical form, including how spatial, material, environmental, and sensory strategies contribute to user experience and meaning.

As Purnama Salura (2024) notes, "The understanding of the 'case' does not only focus on architectural works as physical objects to be observed and copied but also on 'important aspects that could be learned from the architectural work'. The architectural case study approach is not only positioned to answer what influences these important aspects but also to explicate how these important aspects are produced."

In this research, the "important aspects" of each precedent are delineated through a set of analytical criteria derived from the theoretical framework, including: the degree of multi-sensory engagement, the integration of natural systems, material and atmospheric strategies, environmental performance, and the impact of these factors on human wellbeing and creative experience. By evaluating each case against these criteria, the analysis moves beyond descriptive comparison toward an interpretive understanding of how biophilic and multi-sensory principles are translated into built form.

The three case studies were chosen because each demonstrates a distinct approach to multi-sensory design and human–nature relationships. Analysing these projects enabled the research to move beyond abstract theory by examining how biophilic and multi-sensory concepts are realised as architectural outcomes, informing the design logic and decision-making process of the proposed recording studio.

The case studies are:

1. The Forest Studio by Invisible Studio (UK)
2. Te Kura Whare (Tūhoe HQ, NZ)
3. Studio Aisslinger (Germany)

The Forest Studio provided a precedent for materiality-driven construction grounded in minimal intervention and ecological sensitivity. The building employs predominantly untreated or lightly treated locally sourced timber, with durability achieved through careful detailing, elevated construction, and protection from direct ground moisture, rather than chemical treatment alone (Invisible Studio, 2016). This approach demonstrates how material longevity can be addressed through architectural strategy rather than surface finishes, aligning material choice with environmental responsibility.

This strategy directly influenced the thesis's focus on textured material choices by highlighting how exposed, minimally processed materials can simultaneously perform structurally, acoustically, and atmospherically. In the proposed studio, timber structures and rammed-earth elements are explored not as decorative features, but as primary spatial and acoustic materials capable of shaping warmth, reverberation, and tactile presence within recording environments. The use of these materials reflects the Forest Studio's emphasis on material honesty, in which surfaces remain perceptible to the touch and to time, rather than being concealed behind synthetic finishes.

The project further illustrates how tactile and olfactory engagement emerges through direct bodily interaction with natural materials. The scent of timber, the texture of unfinished surfaces, and the visual grain of wood contribute to an embodied sensory experience that supports emotional comfort and sustained creative focus. As Hiss (2010) argues, the atmosphere of a place is produced through the interaction of multiple sensory cues—touch, smell, sound, and visual depth—which together shape emotional response and behavioural engagement. In this thesis, this understanding informs material decisions intended to support creative immersion within the recording studio rather than treating materiality as a purely technical or aesthetic consideration.

Te Kura Whare was designed in accordance with Tūhoe values, positioning architecture as a cultural and environmental expression grounded in place and identity. The principle of whakapapa is articulated through the building's strong relationship to land and ancestry, expressed in its integration with the surrounding landscape, use of locally sourced materials, and collective spatial organisation. Rather than imposing form, the architecture emerges from the ecological and cultural context.

Mauri tū is enacted through the building's environmental and sensory performance. Passive insulation, earth-based construction, natural acoustics, and controlled daylight create a stable, balanced interior that supports human wellbeing while minimising reliance on mechanical systems. These strategies demonstrate how environmental performance and sensory experience operate as interconnected outcomes.

The principle of taiao is expressed through regenerative design strategies that prioritise ecological respect, low-impact construction, and climatic responsiveness. Materiality, acoustics, and atmosphere are shaped by environmental conditions rather than applied as aesthetic gestures.

This case study informed the thesis by demonstrating how mātauranga Māori can inform site integration, responsive insulation systems, and sensory-led design, thereby reinforcing architecture's role as a vessel that connects biophilic principles, multi-sensory experience, and place-based identity.

Finally, Studio Aisslinger demonstrated to me that contemporary, experimental interiors can influence emotional states. This is done through modulation, curated atmosphere, and spatial rhythms (Studio Aisslinger, 2019). This third case study has guided the thesis toward layering multi-sensory strategies, considering acoustical tactility, the thermal gradient, visual softness, and smell as part of the recording studio's identity.

Overall, these case studies have informed the theoretical argument and shaped my trajectory of design development, guiding my decisions on material selection, spatial design, and environmental systems toward the final recording studio.

Site Analysis and Integration: Long Bay, Auckland, New Zealand

The site in Long Bay, Auckland, was investigated as a methodological foundation for the design-led research process. Rather than treating the location as a neutral backdrop, the study approached the site as an active generator of architectural decisions. The coastal suburban setting—adjacent to wetlands, native bush, and Long Bay Regional Park—provided ecological, sensory, and social conditions in which biophilic and multi-sensory design principles could be tested in a real-world context.

The analysis combined qualitative observation with environmental mapping to understand how natural systems might inform spatial and material strategies. Topographic studies were undertaken to identify opportunities for passive thermal regulation, spatial buffering, and acoustic separation, particularly for the semi-subterranean studio zones. Sun-path mapping and daylight analysis were used to evaluate how circadian-supportive lighting could be introduced without compromising visual comfort in control rooms. Prevailing wind directions were documented to inform passive ventilation approaches appropriate to the coastal climate, while an initial soundscape survey distinguished between desirable ambient sounds and intrusive suburban noise.

Biodiversity and existing vegetation were examined to explore how native planting could be integrated into the building fabric and landscape design. This component of the methodology sought to align ecological restoration with sensory experience, treating vegetation as both environmental infrastructure and experiential material. Data was gathered through repeated site visits, on-site measurements, consultation of Auckland Council databases, and photographic documentation, allowing iterative testing between observation and design response.

Social context formed an additional methodological layer. Long Bay is primarily residential, populated by families, young people, and commuters, yet it offers limited creative or cultural infrastructure. Identifying this gap framed the studio not only as an architectural experiment but as a potential community resource responding to local needs (Auckland Council, 2025). Understanding patterns of movement, recreational use, and community identity informed decisions regarding the placement of communal and publicly accessible zones within the proposal.

Throughout the process, the Te Aranga Māori Design Principles guided the interpretation of the site as a culturally embedded landscape (Roberts et al., 2004). Concepts such as Mauri Tū and Taiao were used as evaluative lenses for orientation, material selection, and landscape relationships, ensuring that environmental analysis was integrated with relational and cultural considerations.

This site-based methodology positioned Long Bay as a living system rather than a fixed setting. By combining environmental mapping, sensory observation, and cultural frameworks, the research established a grounded platform from which subsequent design development, material testing, and spatial experimentation could proceed.

Passive Ventilation and Natural Sound

The integration of passive ventilation systems was treated as a methodological strategy for testing how environmental processes could coexist with the acoustic demands of a recording studio. Cross-ventilation corridors, operable acoustically treated openings, and wind chimneys were explored as mechanisms to reduce reliance on HVAC systems while maintaining interior air quality. These systems required acoustic moderation via baffles and silencers to admit fresh air without introducing disruptive noise into recording spaces.

This approach was informed by regenerative architectural theory, which understands buildings as living systems in which airflow, thermal exchange, and resource cycles are integral to spatial experience rather than concealed services (Mang & Reed, 2012). Biophilic theory further posits that natural ventilation and sensory variability support psychological well-being and emotional regulation (Kellert, 2008; Ulrich, 1984). These perspectives were used as evaluative criteria when considering how environmental systems might operate as experiential components of the studio rather than purely technical infrastructure.

Acoustic ecology provided an additional methodological lens. Schafer's concept of sound as an environmental condition, and Blesser and Salter's framing of aural experience as architectural material, guided the investigation into how airflow and subtle exterior sounds might be curated rather than entirely excluded (Schafer, 1977; Blesser & Salter, 2007). In the design process, this led to testing semi-permeable ventilation strategies that balanced acoustic control with perceptible environmental presence.

Within this framework, passive ventilation was assessed not only for energy performance but for its contribution to sensory atmosphere. Design iterations examined how moderated airflow could function as both a regenerative strategy and a subtle experiential layer, allowing the studio to remain technically precise while avoiding the sensory deprivation typical of sealed interiors.

Figure 4: Photo taken on project proposed site in Long Bay, Auckland. Looking at the residential area surrounding site.

Figure 5: Photo taken on project proposed site in Long Bay, Auckland. Looking at the residential area surrounding site.

Figure 6: Photo taken on project proposed site in Long Bay, Auckland. Looking at a current residential development site.

Figure 7: Photo taken outside the project proposed site in Long Bay, Auckland. Looking at the local businesses and the bridge, connecting the site to them.

Figure 8: Photo taken on the project proposed site in Long Bay, Auckland. Looking North-West at the native bush surrounding the site.

Figure 9: Photo taken on the project proposed site in Long Bay, Auckland. Looking North-West at the native bush surrounding the site.

Figure 10: Photo taken on the project proposed site in Long Bay, Auckland. Looking deeper into the native bush surrounding the site. Showing the density and scale of the vegetation.

Figure 11: Photo taken on the project proposed site in Long Bay, Auckland. Looking deeper into the native bush surrounding the site. Showing the density and scale of the vegetation.

Design Exploration and Iterations

The design exploration focused on developing a recording studio using sketching (see figure 14 - 18), physical and digital model-making, and physical and digital material collages as prototyping methods. These methods allowed me to develop spatial form iteratively, utilise the playful art of light and shadows, and incorporate acoustic zoning and biophilic layering.

The design process focused on:

1. Zoning spaces (see figure 12 - 13) according to the expected sensory and acoustic needs.
2. Testing natural lighting and shadow casting via simulation of digital and physical model making.
3. Material testing digitally and physically to study the textures, acoustics, temperatures, and even smell.
4. Developing biophilic patterns, creating refuge and prospect conditions.

Each of these iterations and processes was evaluated against the research questions, resulting in a spatial system that emphasised atmosphere, comfort, sensory variation, and environmental responsiveness.

Application of Te Aranga Principles

This research engaged with Te Aranga Māori Design Principles as a conceptual and ethical framework rather than through direct consultation with mana whenua. The project draws on published iwi planning documents and established interpretations of mātauranga Māori within architectural scholarship (Roberts et al., 2004; Mang & Reed, 2012). This approach recognises that authentic partnership requires time, relationships, and formal processes that were beyond the scope and resourcing of this thesis. The study therefore adopts what Hoskins and Jones (2017) describe as a principle-led engagement, in which Indigenous values guide early design thinking without claiming cultural authority.

Te Aranga principles were used as interpretive lenses shaping spatial and environmental decisions. Whakapapa informed the studio's siting in relation to landforms and coastal ecologies, encouraging a design that occupies the hillside rather than dominating it (Roberts et al., 2004). Taiao-guided strategies for native planting, passive ventilation, and water-sensitive design align with regenerative frameworks that position buildings as participants in living systems (Mang & Reed, 2012). Mauri Tū influenced material selection toward timber and earth to express environmental well-being, while Ahi Kā informed the inclusion of a communal forecourt to support local creative activity (Kiddle et al., 2020).

This approach is acknowledged as provisional. Future development would require formal engagement with mana whenua to test assumptions and ensure the design reflects local values and aspirations (Hoskins & Jones, 2017).

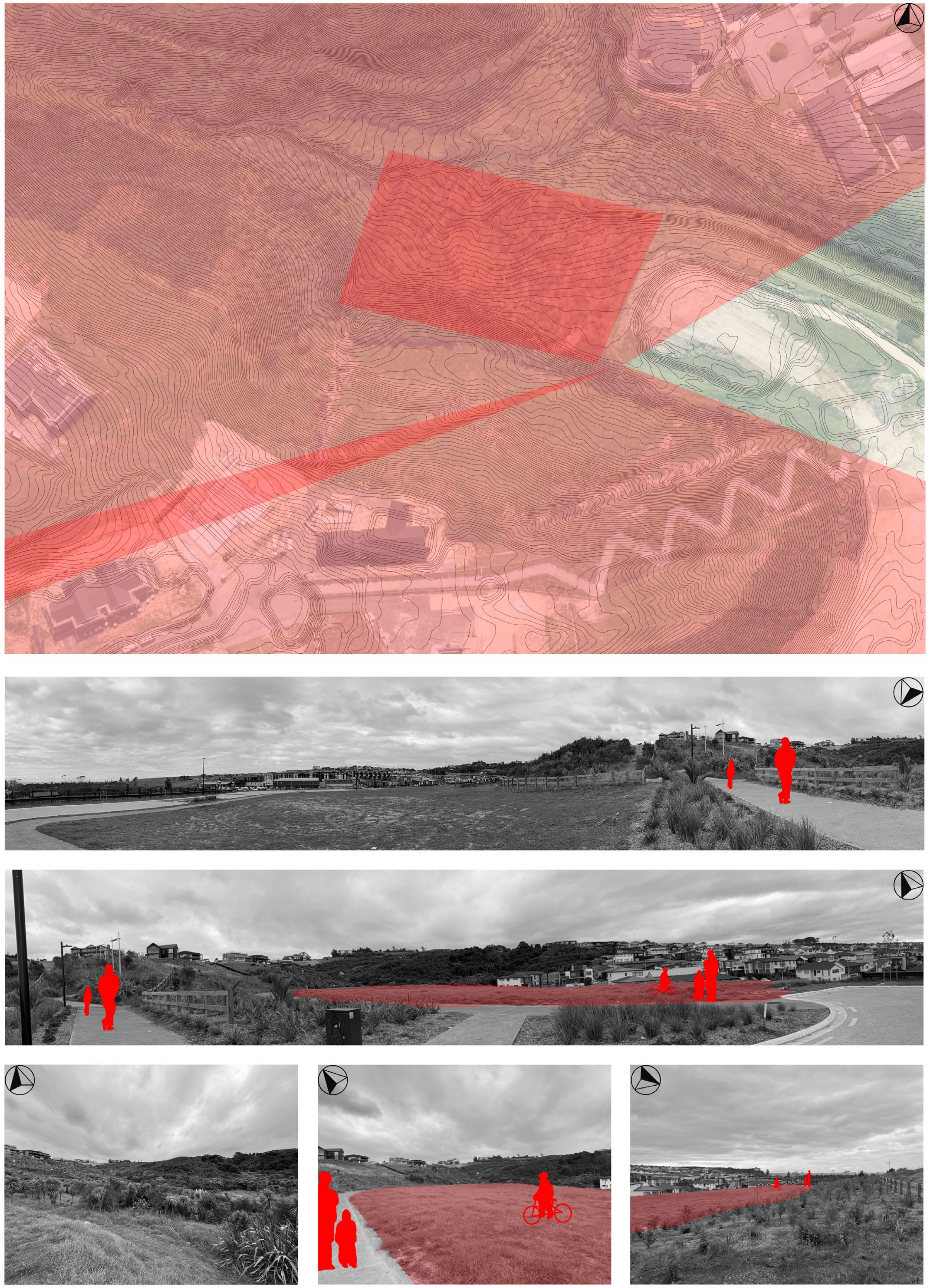


Figure 12: Photos taken on the project proposed site in Long Bay, Auckland. Analysing the site and surrounding spaces through zoning.

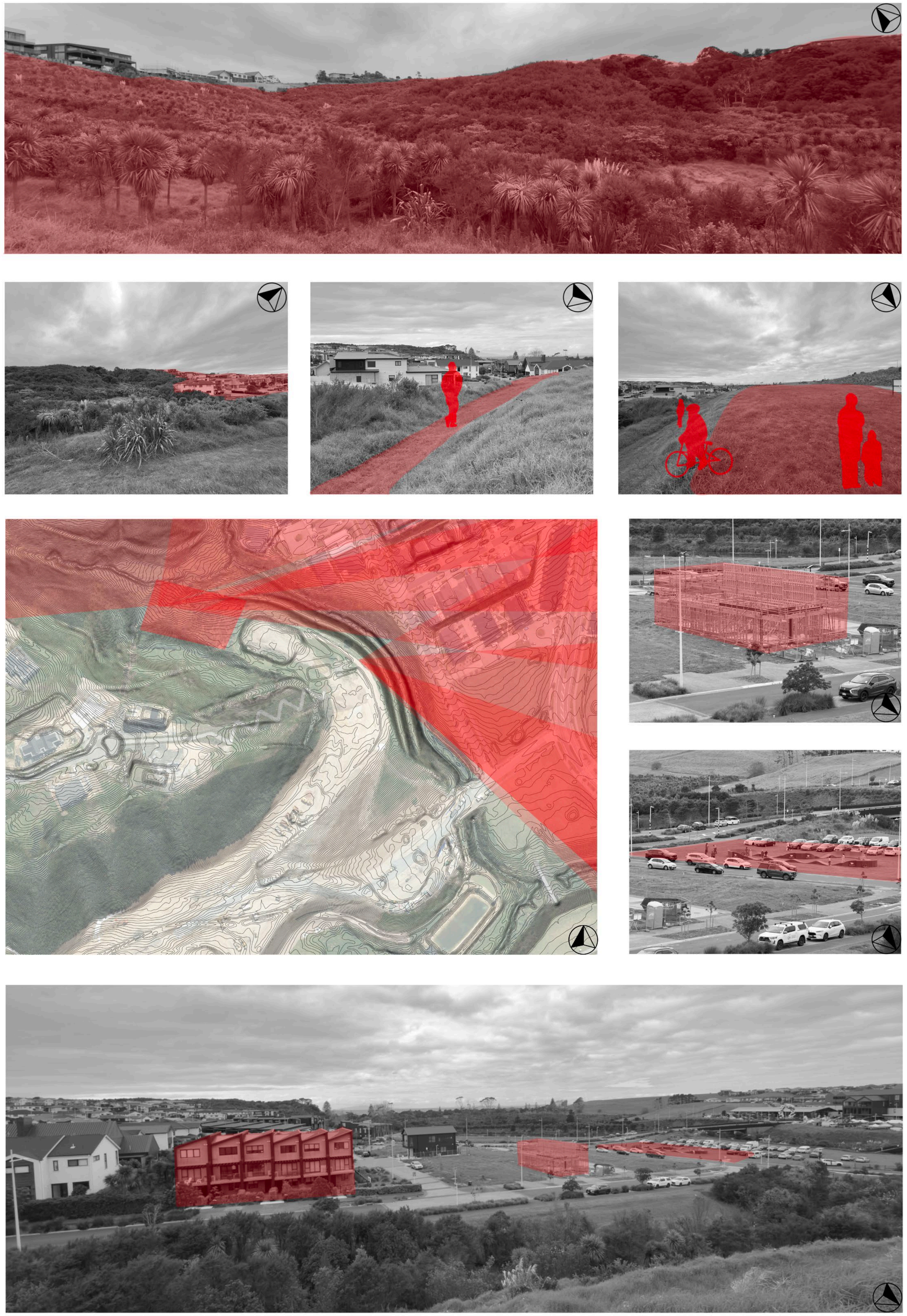


Figure 13: Photos taken on the project proposed site in Long Bay, Auckland. Analysing the site and surrounding spaces through zoning.

Figure 14: Hand-drawn sketches. Mimicking nature through site exploration.

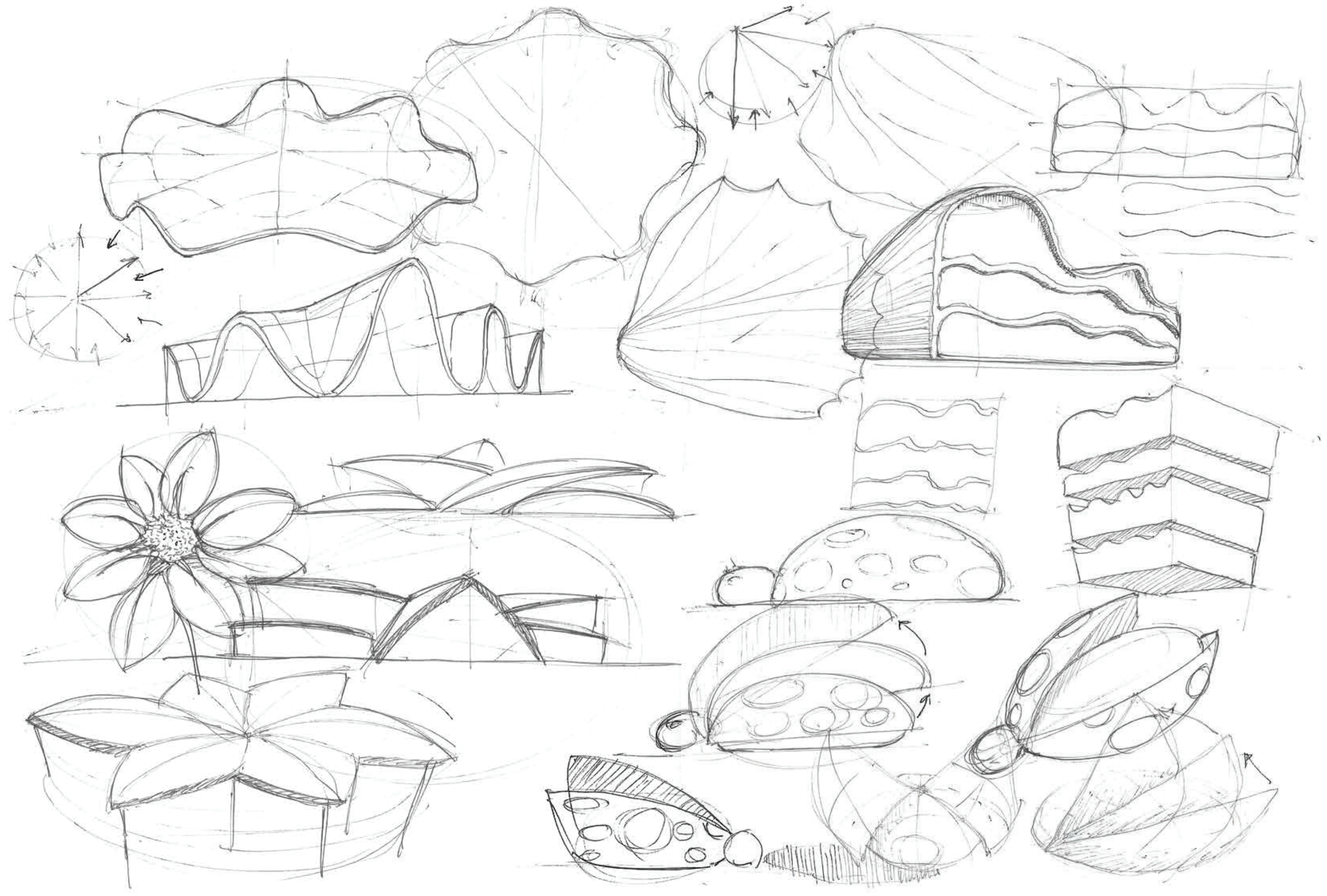


Figure 15: Hand-drawn sketches. Mimicking nature through site exploration.

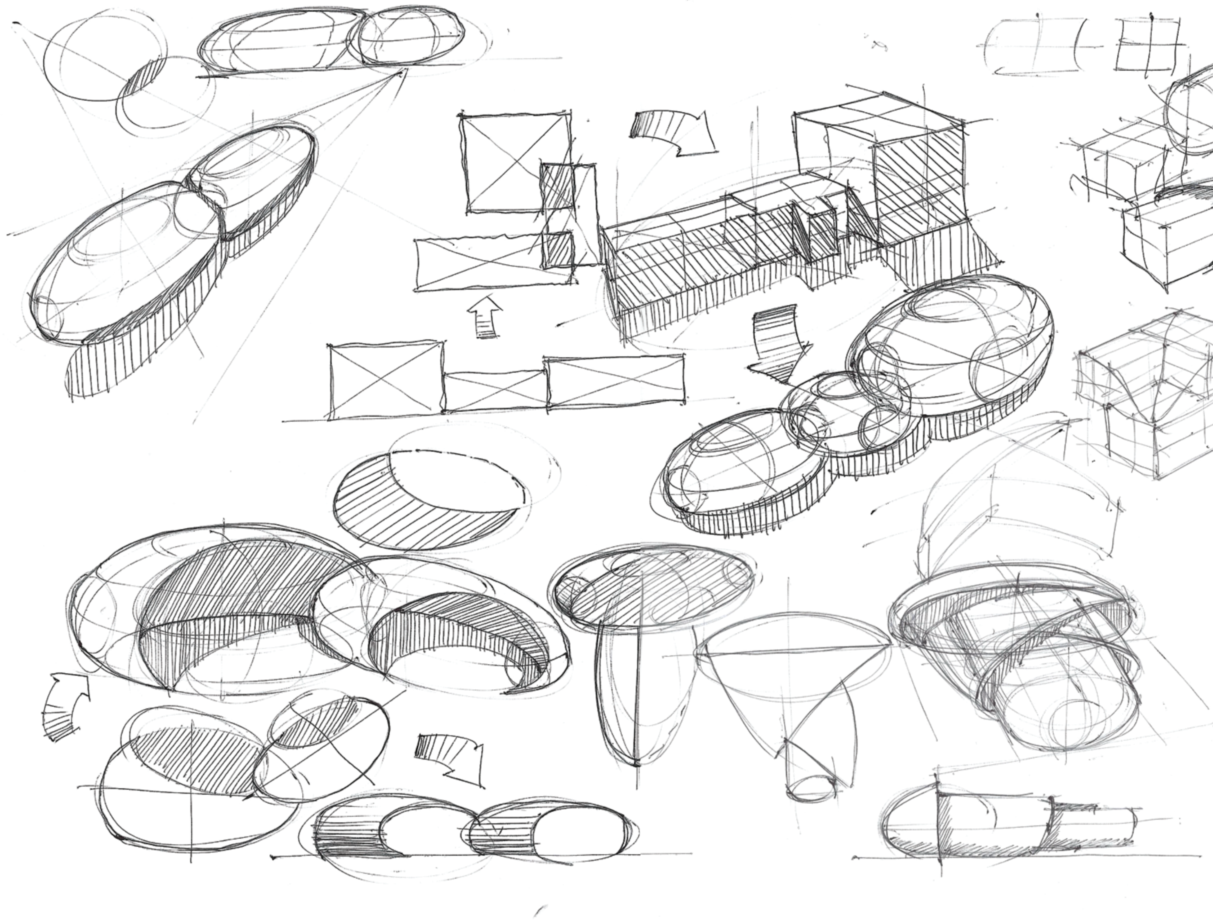


Figure 16: Developing ideas through hand-drawn sketches.

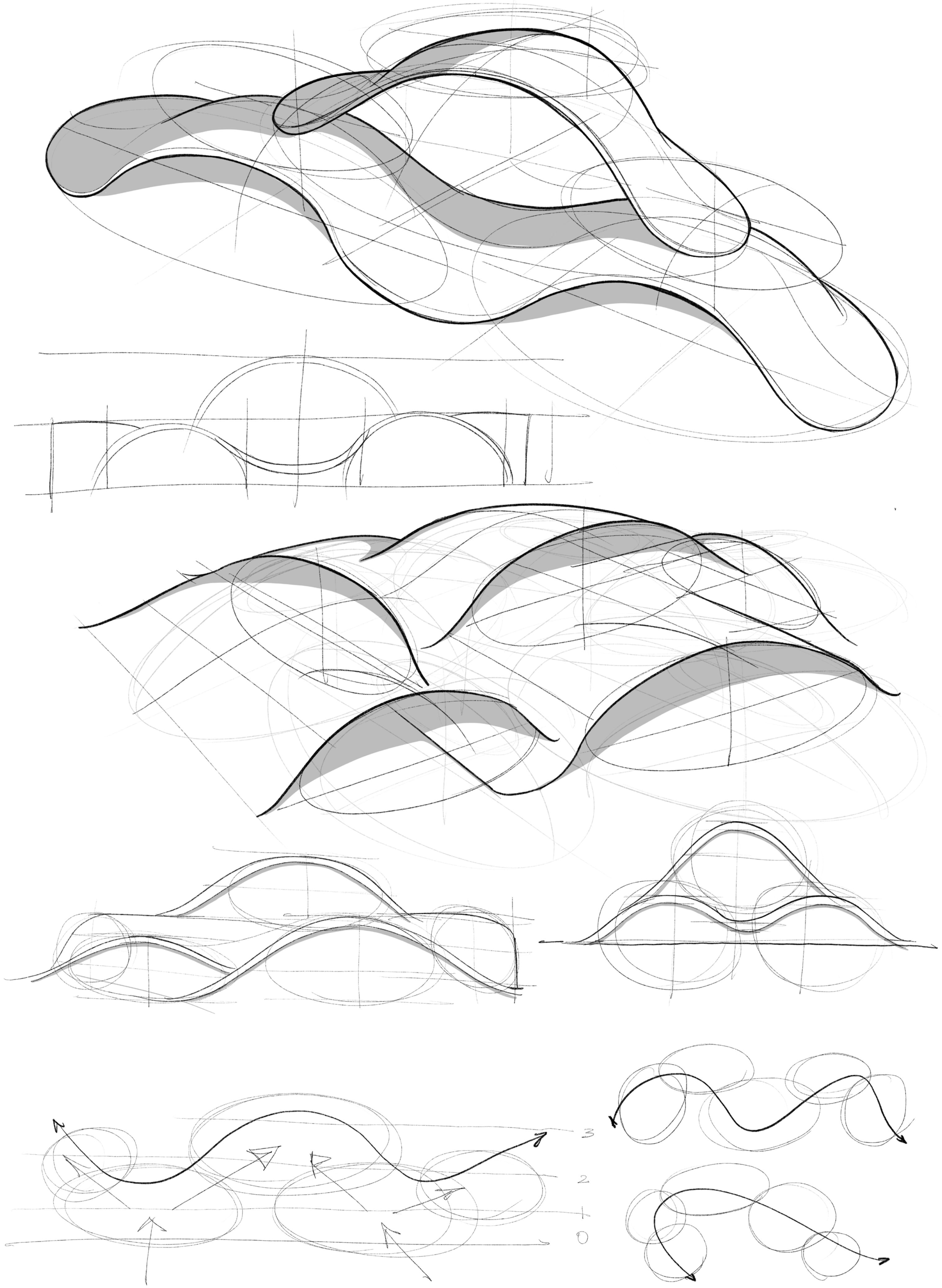


Figure 17: Inspired by flow through hand-drawn sketches.

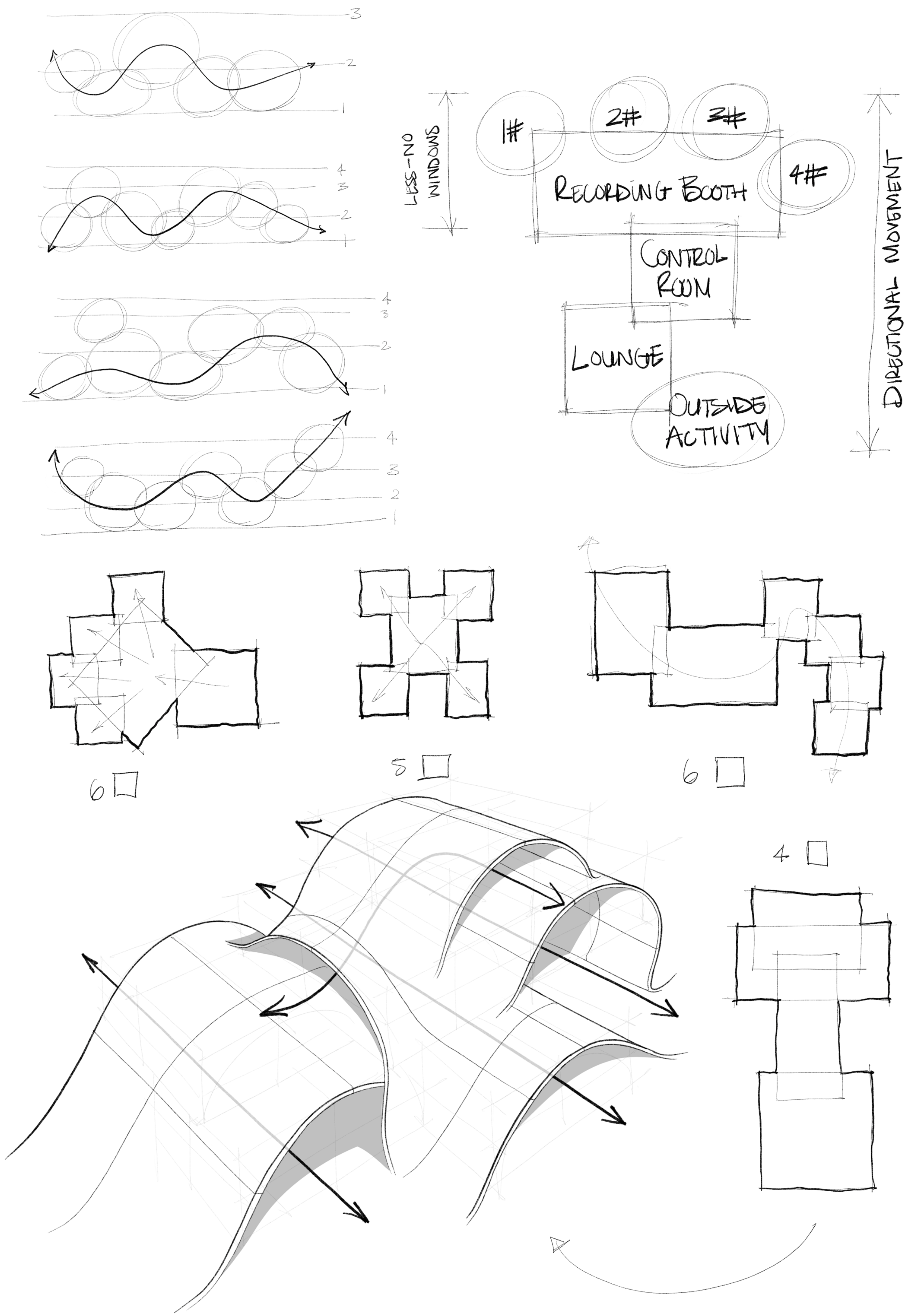


Figure 18: Broad thinking and mapping through hand-drawn sketches.

Material Testing

I conducted two tests for different materials. The first included physical material exploration, which involved selecting and testing many materials for their ecological performance properties. Secondly, I analysed materials using prior studies; these are discussed further in Chapter Four.

Evaluation of physical materials selected for further utilisation included:

1. Acoustic absorption and diffusion: Timber slats and wool insulation.
2. Tactile qualities: Rammed earth.
3. Massing and breathability: Earth plaster and untreated timber

The exploration included experiments with mockups, drawings, and simulations that examined how these materials would behave in control rooms, recording rooms, and lounge areas. The exploration highlighted the connection between material and embodied user experience.

Reflective Practice and Feedback

Constant reflection is key to design-led research. Throughout this design process and critical self-reflection, I was using a design journal. The feedback from tutors and peers gathered during informal critiques was integrated into subsequent iterations.

My reflections focus on:

1. How well the design meets with biophilic and multi-sensory principles.
2. Addressing the tension between acoustic isolation and sensory openness.
3. Different strategies on how to reconcile cultural, technical and environmental goals within the design.

This constant ongoing dialogue between the design's actions and reflective ideation supports the emergence of new insights and hypotheses.

Reflection and Analysis

Design analysis was conducted through a combination of spatial and technical evaluations, including multi-sensory assessments.

The key tools have included:

1. Sensory mapping: Diagramming that provides a gradient of light, airflows, sounds and textures across the recording studio.
2. Acoustical zoning: Planning that highlights the management of sound reverberation, isolation and resonance in different areas.
3. Light studies: A time-based simulation that assesses the circadian lighting effects.
4. Material metrics: Produced charts that compared materials based on sensory, ecological and acoustic performances.

This data was not used in a conventional scientific sense but was reflected upon to inform design intentions, the user experience of the space and the architectural atmosphere. This less quantitative, more qualitative analysis indicated how materials and spaces might be experienced, rather than focusing solely on technical performance.

Methodological Rationale and Critical Reflection

Architecture is inherently experiential and embodied, operating through the body's perception and its senses rather than through abstract or purely technical measures (Pallasmaa, 2012; Shields, 2023). For this reason, a design-led, qualitative research methodology is particularly appropriate for this thesis, as it enables deeper engagement with how architectural space is felt, inhabited, and interpreted by users (Smith, 2018; Shields, 2023). This approach moves beyond generic technical checklists by embracing complexity, ambiguity, and creative exploration—qualities essential to investigating multi-sensory and biophilic environments. Through iterative design processes, architecture becomes both the method and the outcome of inquiry, allowing spatial, material, and sensory questions to be explored simultaneously.

The research question: How can biophilic design and multi-sensory architecture be utilised in the design of a music recording studio?—is inherently experiential and relational. It seeks to understand how environmental integration, sensory engagement, and well-being can be supported within a highly controlled architectural typology. Such questions are best addressed through an iterative and reflective design process rather than detached quantitative measurements. Site analysis, model making, and continual design reflection form the primary methods through which the research question is explored, grounding theoretical concepts in real spatial, material, and environmental conditions.

The engagement with regenerative design frameworks and Te Aranga Māori design principles further strengthens the methodological approach by embedding cultural, ecological, and relational thinking into the design process. These principles support a site-based and iterative methodology in which architecture responds to place, whakapapa, and environmental systems rather than imposing universal solutions. This aligns with Mang and Reed's (2012) assertion that regenerative design must be adaptive, reflective, and evolutionary, requiring ongoing feedback between design decisions, ecological processes, and human experience. Through this framework, cultural narratives, environmental performance, and sensory experience are treated as interconnected rather than separate considerations.

While this methodology offers depth and nuance, it also presents inherent challenges. Design-led and reflective research is necessarily subjective, as the designer's perspective shapes interpretations of space, atmosphere, and sensory experience. Additionally, the use of drawings, models, and simulations cannot fully predict how users will experience the completed environment over time. Practical constraints, including limited time and resources, also restrict opportunities for full-scale material testing or extensive user engagement. These limitations are acknowledged as part of the research process. They are addressed through triangulation, whereby insights from site analysis, literature, and physical experimentation are cross-referenced to strengthen the validity and contextual grounding of the research outcomes.

The current research has produced a conceptual design proposal grounded in qualitative material testing, sensory evaluation, and design iteration. What remains for future development includes: full-scale acoustic chamber testing of proposed material assemblies against NC and RT60 benchmarks; structural engineering assessment of rammed-earth and semi-subterranean construction in a coastal context; formal engagement with mana whenua to test Te Aranga principles against local values; and post-occupancy evaluation of user well-being within a completed biophilic studio environment (Hoskins & Jones, 2017; Mang & Reed, 2012). This thesis therefore positions itself as Phase One of a longer research and design process — one that has established the theoretical, spatial, and material logic for a biophilic recording studio requiring subsequent technical development and empirical validation (Groat & Wang, 2013).

Conclusion

The chapter outlines the design-led, qualitative research methodology used to investigate the integration of Biophilic and multi-sensory architecture in the design of a recording studio. Through literature review, case study and precedent analysis, site exploration, physical and digital model testing, material testing, and reflective design practices, the methodology provides a qualitative, iterative, and place-based approach to architectural research. It is specifically suited to exploring human well-being, atmospheric qualities, and ecological responsiveness in architectural design.

In the next chapter, these methods will be applied to the site and design development within Long Bay. They will demonstrate how these theoretical ideas and methodological processes manifest in the built environment.

"If you feel safe in the area you're working in, you're not working in the right area."

- David Bowie

CHAPTER

4

Material Testing

Introduction

Chapter Four documents the experimental material process through which the theoretical principles established earlier were translated into architectural form. Building on the contextual and precedent analysis in Chapter One, this chapter focuses on the design exploration and qualitative evaluation of material assemblies for a biophilic, multi-sensory recording studio. Materiality is treated simultaneously as a technical system—shaping acoustics, thermal behaviour, and environmental performance—and as an experiential medium that influences atmosphere, creativity, and well-being (Ryan et al., 2014). The chapter traces an iterative progression from small conceptual mock-ups to comparative assemblies, demonstrating how sensory judgement was combined with architectural reasoning to inform design decisions.

Materials investigated and testing regime

This material inquiry was undertaken as a practice-led and exploratory design investigation rather than as empirical acoustic testing. No calibrated instrumentation or formal reverberation measurements were used; evaluations were based on comparative sensory observation, reflective judgement, and iterative making, consistent with architectural design research methodologies. The purpose of the mock-ups was to inform design decisions—such as the perceived softness of moss systems relative to timber diffusion or the atmospheric weight of rammed earth—rather than to generate quantitative performance data. The findings should therefore be understood as indicative and directional, guiding spatial and material strategy rather than providing scientific verification of acoustic coefficients.

The testing regime explored how biophilic and natural material systems might operate as performative acoustic elements within a recording studio, in contrast to conventional studio construction that relies predominantly on synthetic absorptive panels and concealed technical layers. Materials were selected according to three criteria:

1. acoustic functionality appropriate to professional recording,
2. biophilic and sensory contribution to user experience, and
3. regenerative considerations such as low embodied carbon and local availability.

These criteria sought to balance technical rigour with atmospheric and ecological value.

Moss and green-wall systems were explored as hybrid acoustic and biophilic elements. Increased surface porosity and thickness were perceived to soften reverberant qualities in vocal booth mock-ups while also enhancing tactile richness and visual calm. These assemblies appeared to offer psycho-physiological benefits through background sound dampening and sensory grounding, consistent with biophilic principles (Ryan et al., 2014).

Timber (untreated, local species) was investigated for its tactile warmth and potential for sound diffusion. Layered timber panels with air cavities were used to examine how thickness and spacing might influence acoustic properties without relying on synthetic finishes. This reflected timber's dual role as both sensory and acoustic material (Day & Midbjer, 2007).

Composite acoustic panels (fabric-faced) were employed as a reference to conventional studio approaches. Variations in fabric layering were compared to assess perceived differences in absorption and surface softness, drawing on reverberation management concepts described by Blesser and Salter (2007).

Rammed earth was examined for its potential low-frequency absorption, thermal mass, and visual grounding. Small sectional mock-ups were used to consider how earth-based assemblies might contribute to acoustic stability while conveying material weight and permanence, and how they could be combined with timber and linings (Minke, 2012).

Across all tests, evaluation relied on experiential comparison—changes in perceived reverberation, tactile quality, visual character, and interaction with daylight and airflow. The process sought to understand how different assemblies might support the project's dual aims: maintaining the qualitative conditions associated with professional recording while enhancing biophilic engagement and psychological comfort.

Results — acoustic and sensory findings

The timber and moss/green-wall assemblies exhibited effective mid- to high-frequency diffusion and absorption, consistent with the design intentions. This combination supported vocal clarity while retaining a sense of material warmth within the mock-ups. Rammed earth assemblies showed potential for beneficial low-frequency damping when used as wall mass, consistent with observations on earthen construction (Lechner, 2014). Composite timber panels demonstrated relative improvements in perceived absorption when paired with variable cavity depths, informing later detailing.

Daylighting studies indicated that north-facing openings could deliver even, glare-free illumination suitable for screen-based tasks. These observations suggest potential support for circadian comfort in control rooms. Turrell-inspired light slots appeared to enhance atmospheric quality through subtle temporal variation (Holl, 2006).

Tactile evaluation indicated a preference for untreated timber and vegetated surfaces. Moss panels were perceived to contribute softness and sensory grounding, accompanied by a subtle natural scent that appeared to enrich enclosure without creating acoustic deadness (Ryan et al., 2014). Landscape views and indoor vegetation appeared to be associated with more positive impressions of creativity and relaxation, consistent with research on restorative interiors (Ulrich, 1984; Joye & van den Berg, 2018). No problematic echo effects were perceived, supporting the suitability of these assemblies for the intended program.

Discussion — implications for practice and research

The investigations suggest that biophilic and multi-sensory objectives can be pursued without undermining professional studio requirements. Acoustic performance and experiential quality appeared capable of operating as mutually reinforcing aspects of a single architectural system rather than as competing priorities. Integrating natural materials with conventional acoustic strategies indicated a pathway toward environments that support both sonic precision and psychological comfort.

The study also highlights the conceptual nature of the testing approach. Because models were small-scale and assessed qualitatively, the findings cannot substitute for full-scale acoustic measurement. Future applications would require room-scale prototypes, calibrated equipment, and quantitative analysis to confirm the effectiveness of the proposed assemblies.

Material selection for creative environments emerges as a multi-criteria process in which acoustic behaviour, tactile and olfactory experience, embodied carbon, and sourcing must be considered together (Lehmann, 2013; Roberts et al., 2004). Precedents from healthcare and gallery contexts suggest that restorative strategies are directly relevant to studios where emotional states shape creative outcomes (Jencks, 2015; Holl, 2006). The research was constrained by limited access to full-scale testing and acoustic chambers; nevertheless, the integration of sensory evaluation with architectural reasoning generated a coherent design direction aligned with the thesis aims.

Conclusion

This chapter translates theoretical principles into material strategies for a biophilic, multi-sensory recording studio. The investigations indicated that timber, rammed earth, and vegetated systems can be combined to pursue both acoustic precision and atmospheric richness, suggesting that technical performance and sensory experience can develop in parallel. The analysis reinforced the value of landscape-aware and materially grounded approaches, positioning the studio as an ecological and experiential setting rather than a sealed technical container. These outcomes establish the foundation for subsequent design development, where the material logics explored here inform spatial organisation and architectural resolution across the recording booths, control rooms, and communal areas.

From Experimentation to Resolution: Design Transition

The transition from experimental material testing to resolved design development represents a critical threshold in the research. The fabrication investigations were deliberately open-ended — small-scale, tactile, and exploratory — prioritising sensory knowledge over spatial precision (Schön, 1983). The primary method of translation was photography and annotation: physical models and material samples were photographed under varying light conditions, and drawings were made directly onto printed images to test spatial relationships and acoustic thresholds. This process allowed design decisions to emerge from observed material behaviour rather than being imposed abstractly (Pallasmaa, 2012).
From this experimental stage, the following elements were carried forward into design development:

1. The hierarchical material system from mass to softness, confirmed through tactile comparison of rammed earth, timber, and moss assemblies.
2. The acoustic gradient between underground and above-ground zones, informed by observed differences in enclosure between dense and lightweight mock-ups.
3. The placement of vegetated surfaces at threshold zones, validated by the softening effect of moss panels on perceived sound and atmosphere.
4. North-facing apertures as the primary daylighting strategy, tested through shadow-casting models (Heschong, 2002)
5. The sequencing of spatial compression to separate communal and recording zones.

These choices involved acknowledged compromises — particularly around passive ventilation and acoustic containment — where the degree of environmental openness originally envisaged was moderated by professional studio requirements (Everest & Pohlmann, 2015).

“One good thing about music, when it hits you, you feel no pain.”

- Bob Marley

CHAPTER 5

Fabrication

Introduction

Building on the precedent studies in Chapter 4, this stage has refined massing, spatial placement, and material assembly throughout the site and within the functions of each space through hand-sketches (see figure 19 - 30) and interactive modelling (see figure 31 - 52). Unlike traditional schematic design strategies, this development is focused heavily on spatial precision, the complete user experience, and the integration of existing site and environmental systems.

Design Drivers

The final design is structured around three interrelated principles derived from the theoretical frameworks established earlier in the thesis. Rather than operating independently, these drivers function as a layered system in which environmental performance enables biophilic connection, and biophilic integration is experienced through multi-sensory sequencing.

Biophilic integration forms the foundational layer of the design, establishing visual, tactile, and material connections between the studio and its surrounding landscape. Natural materials, framed views, and vegetated elements provide the primary means through which users experience a relationship with nature, aligning with biophilic design theory outlined by Kellert and Calabrese (2015) and Beatley (2017). This connection sets the emotional and psychological tone of the studio environment.

Multi-sensory sequencing operates as the experiential mechanism through which biophilic elements are perceived and interpreted. Changes in light quality, acoustic character, material texture, and olfactory cues guide users through the studio's programmatic zones, shaping transitions between focus, collaboration, and restoration. As argued by Pallasmaa (2012) and Holl (2006), architectural experience unfolds through the body over time, and sensory modulation allows biophilic connections to be felt rather than merely observed.

Environmental response underpins both of the above drivers by providing the technical and climatic conditions that make biophilic and sensory strategies viable. Passive insulation, site-responsive orientation, and controlled natural lighting support thermal comfort, acoustic stability, and energy efficiency, ensuring that sensory richness does not compromise performance. In this way, environmental response serves as an enabling infrastructure that allows biophilic integration and multi-sensory sequencing to coexist with the technical demands of a recording studio.

Together, these drivers operate as a reciprocal system: environmental performance supports sensory comfort; sensory sequencing deepens biophilic engagement; and biophilic integration enhances well-being and creative focus. This interdependence ensures that the final design functions as a cohesive architectural environment rather than a collection of isolated strategies.

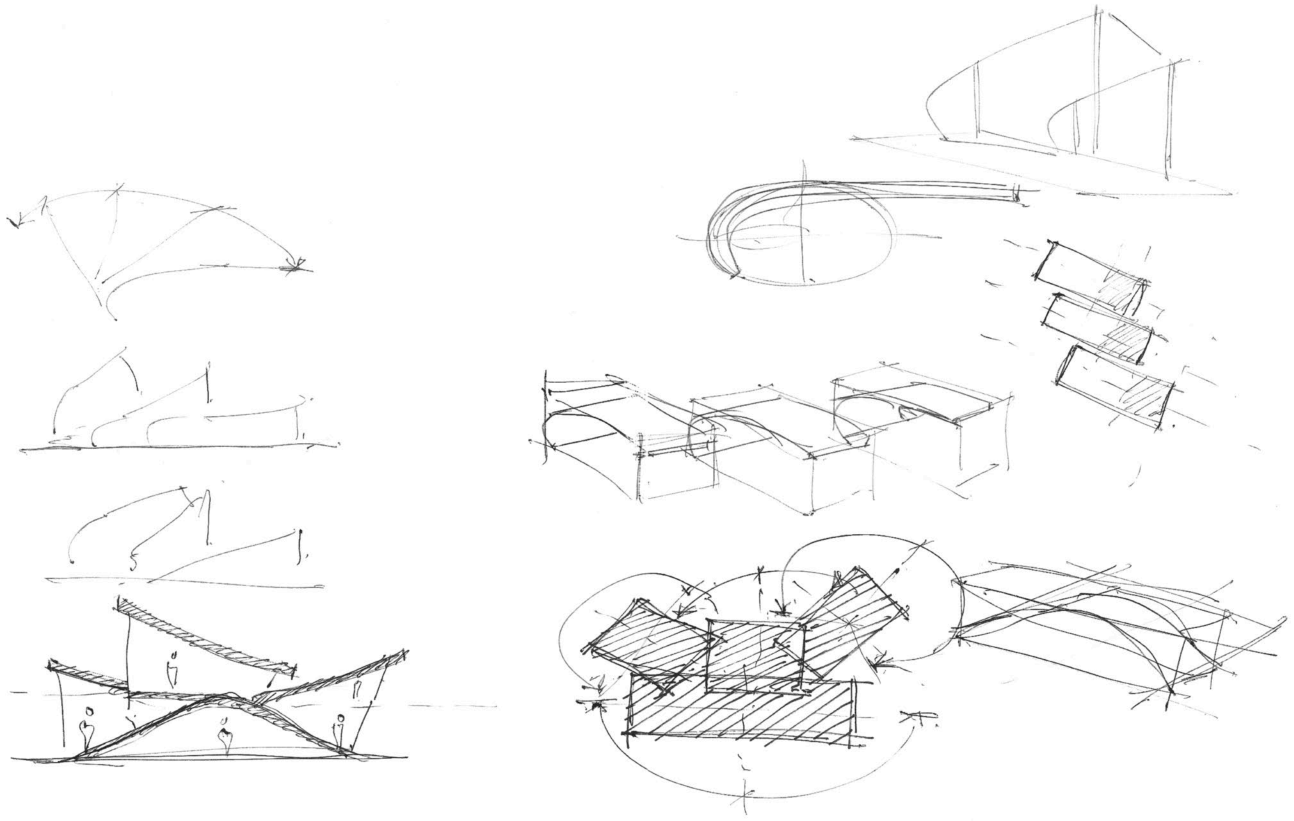


Figure 19: Exterior and broad ideas through hand-drawn sketches.

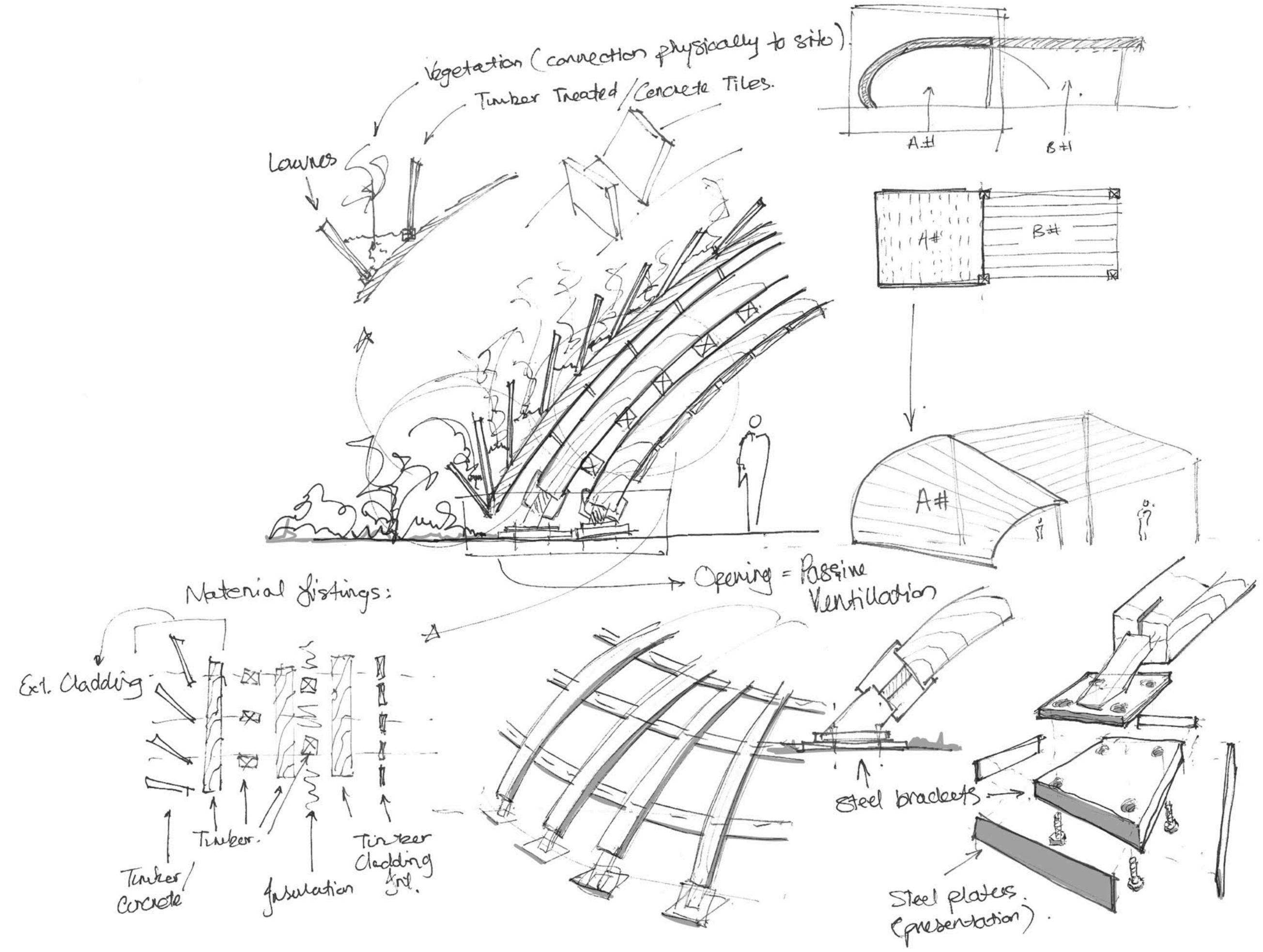


Figure 20: Developing structural ideas through hand-drawn sketches.

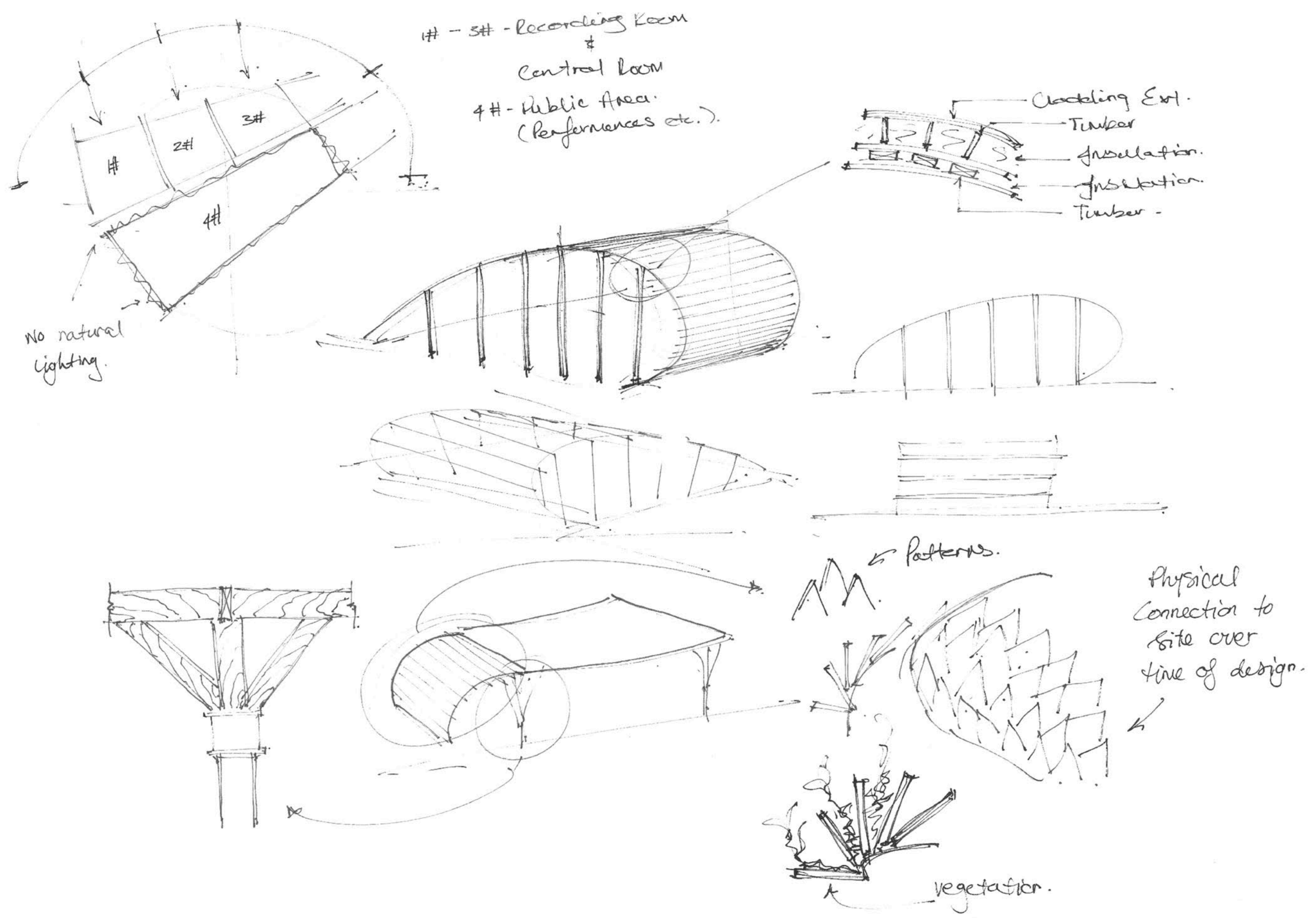


Figure 21: Structural and overall ideas through hand-drawn sketches.

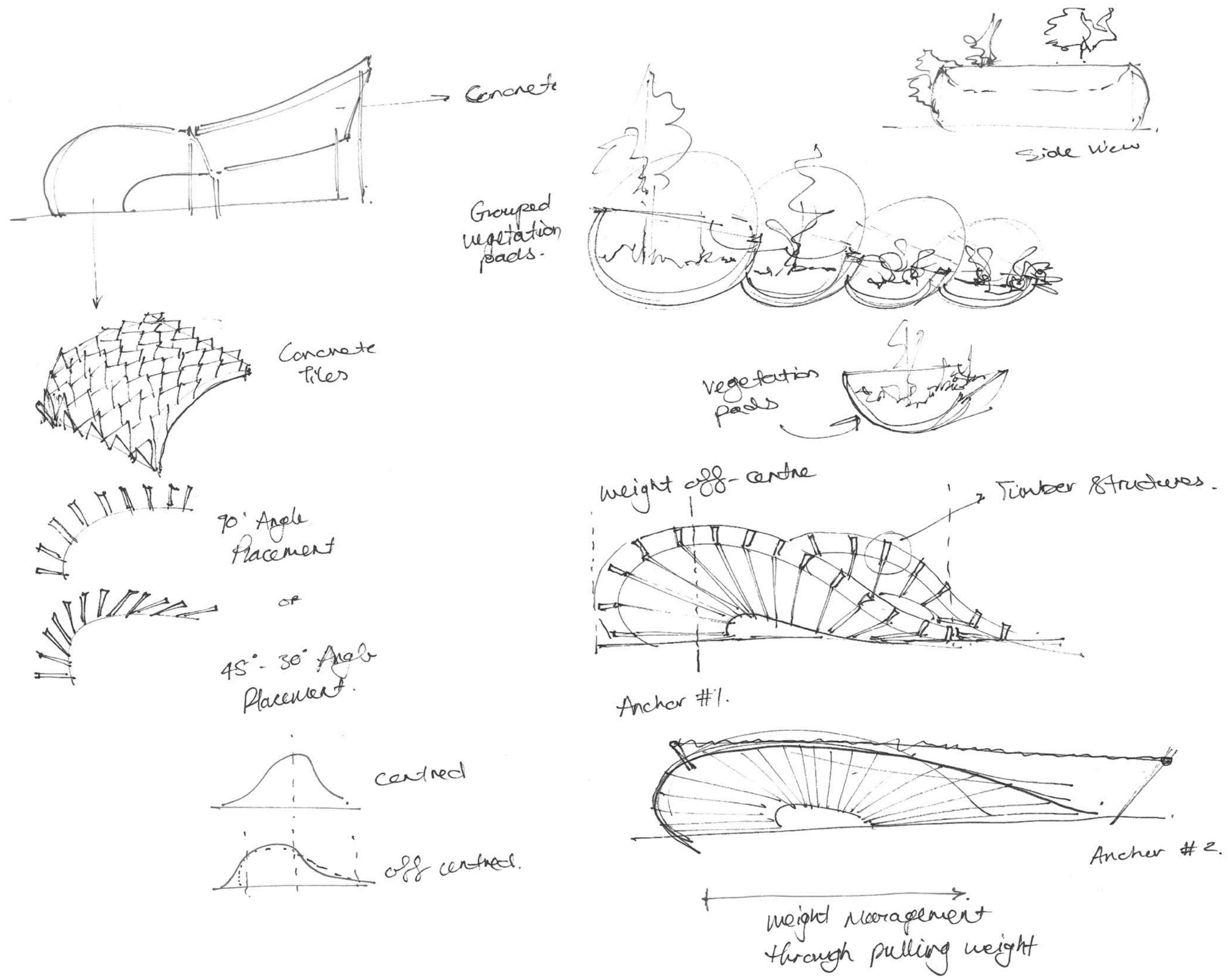


Figure 22: Facade details and exterior concepts through hand-drawn sketches.

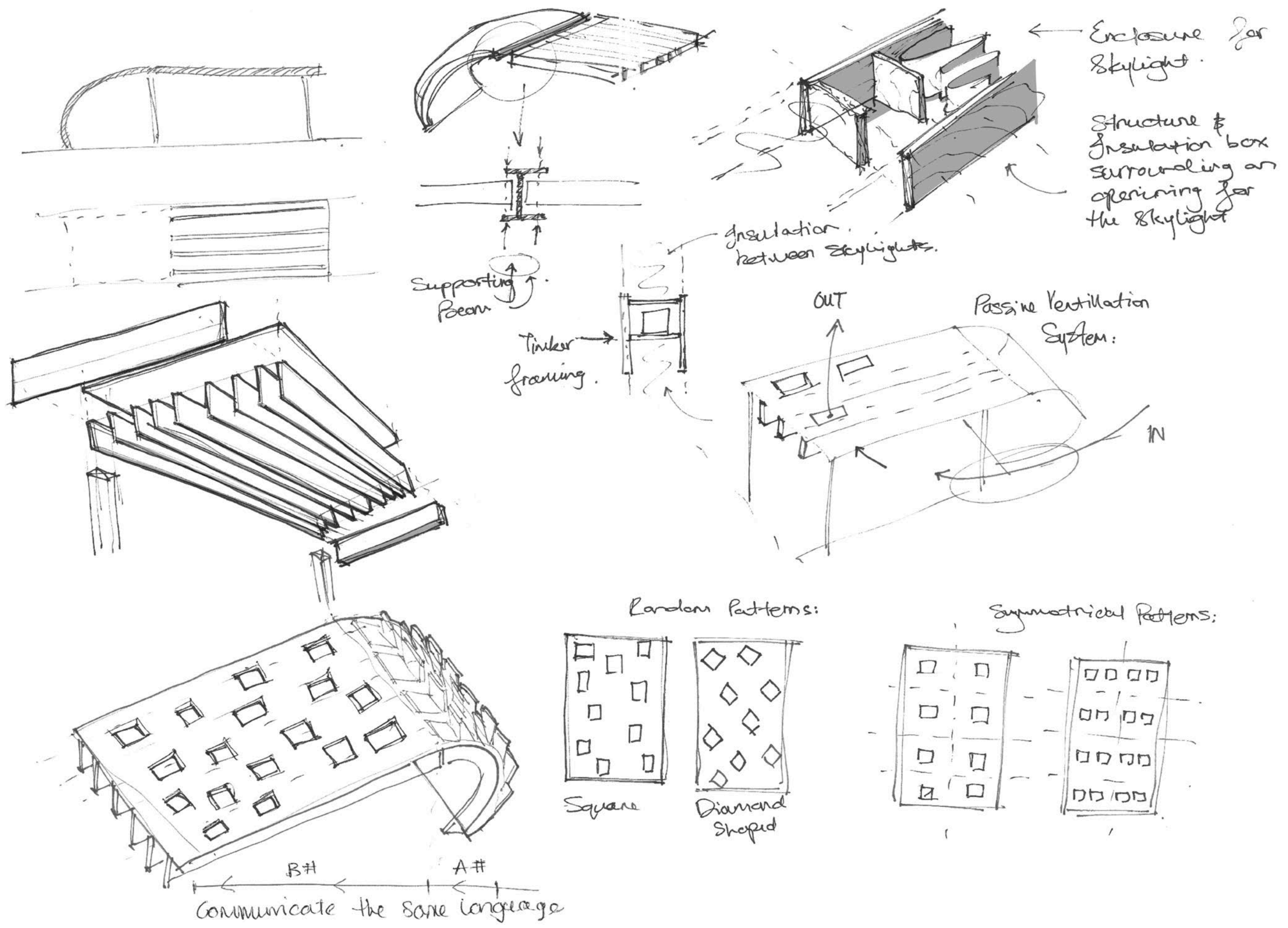


Figure 23: Facade details and exterior concepts through hand-drawn sketches.

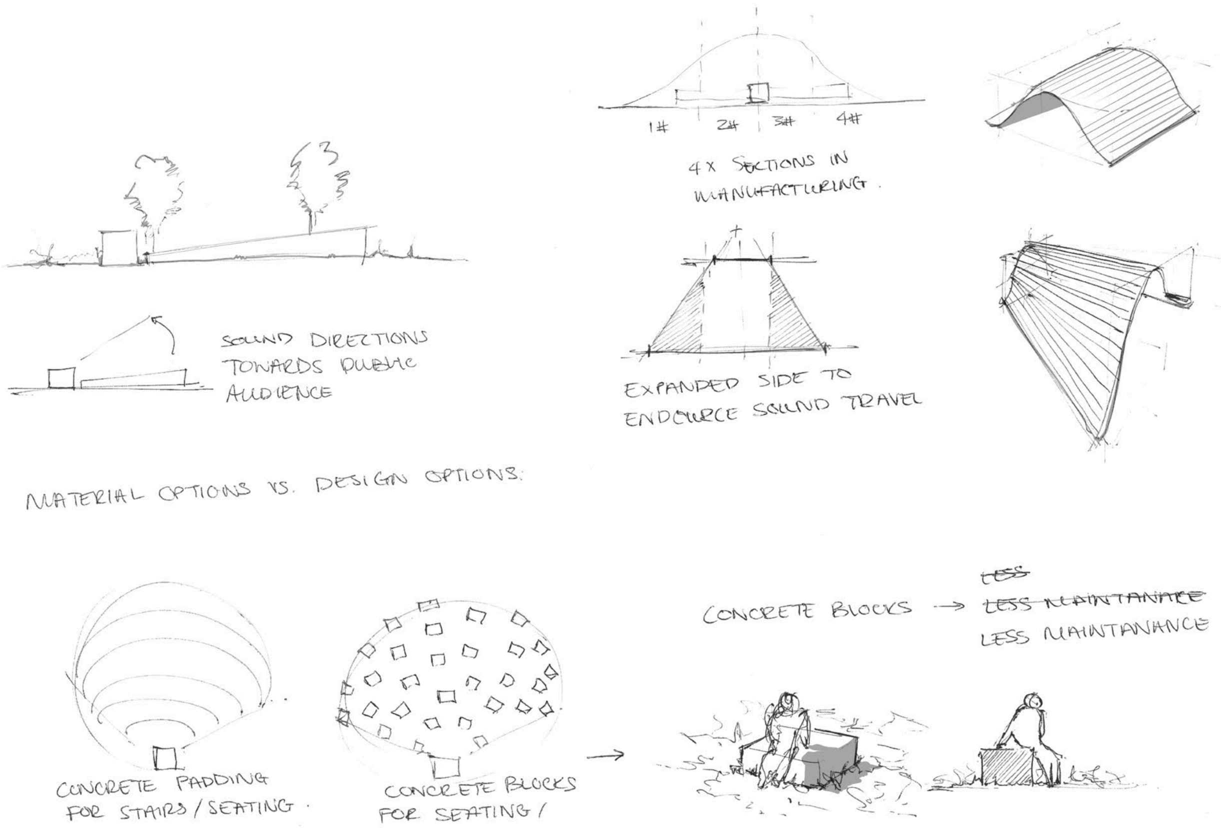


Figure 24: Structural and overall ideas through hand-drawn sketches.

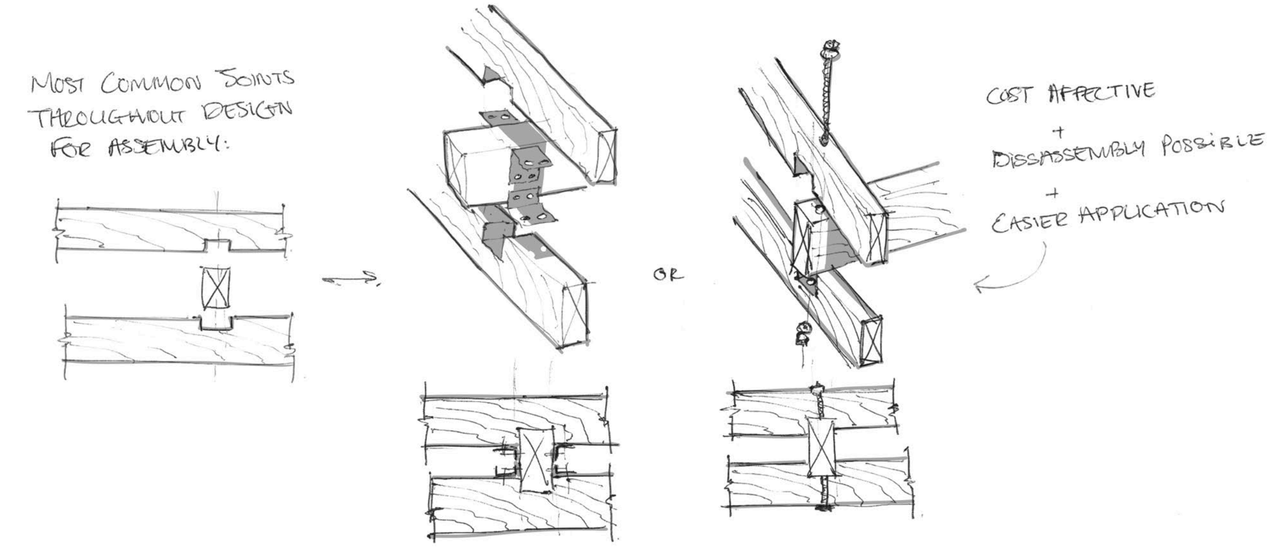


Figure 25: Structural detail ideation through hand-drawn sketches.

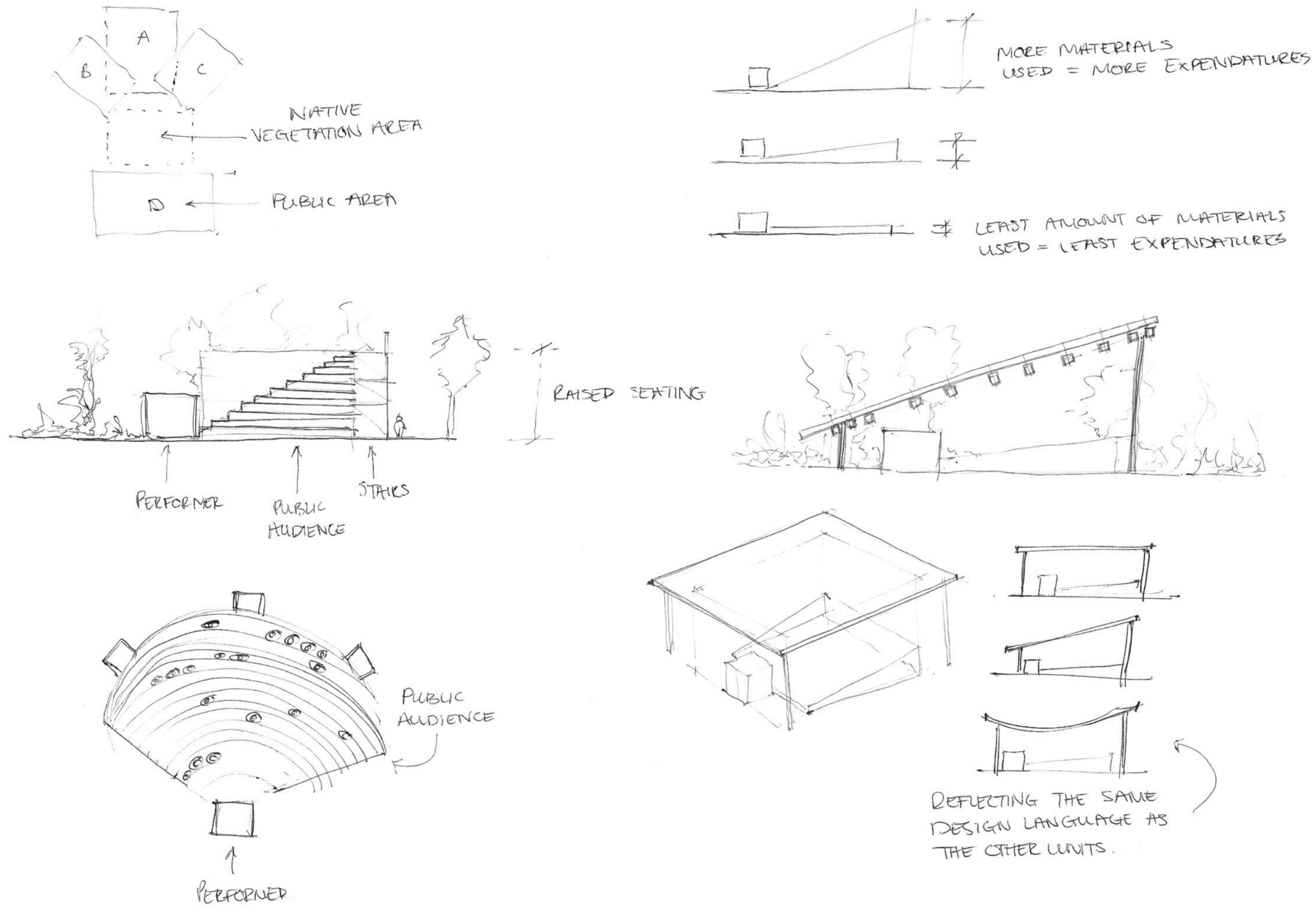


Figure 26: Exterior ideation sketching for communal use.

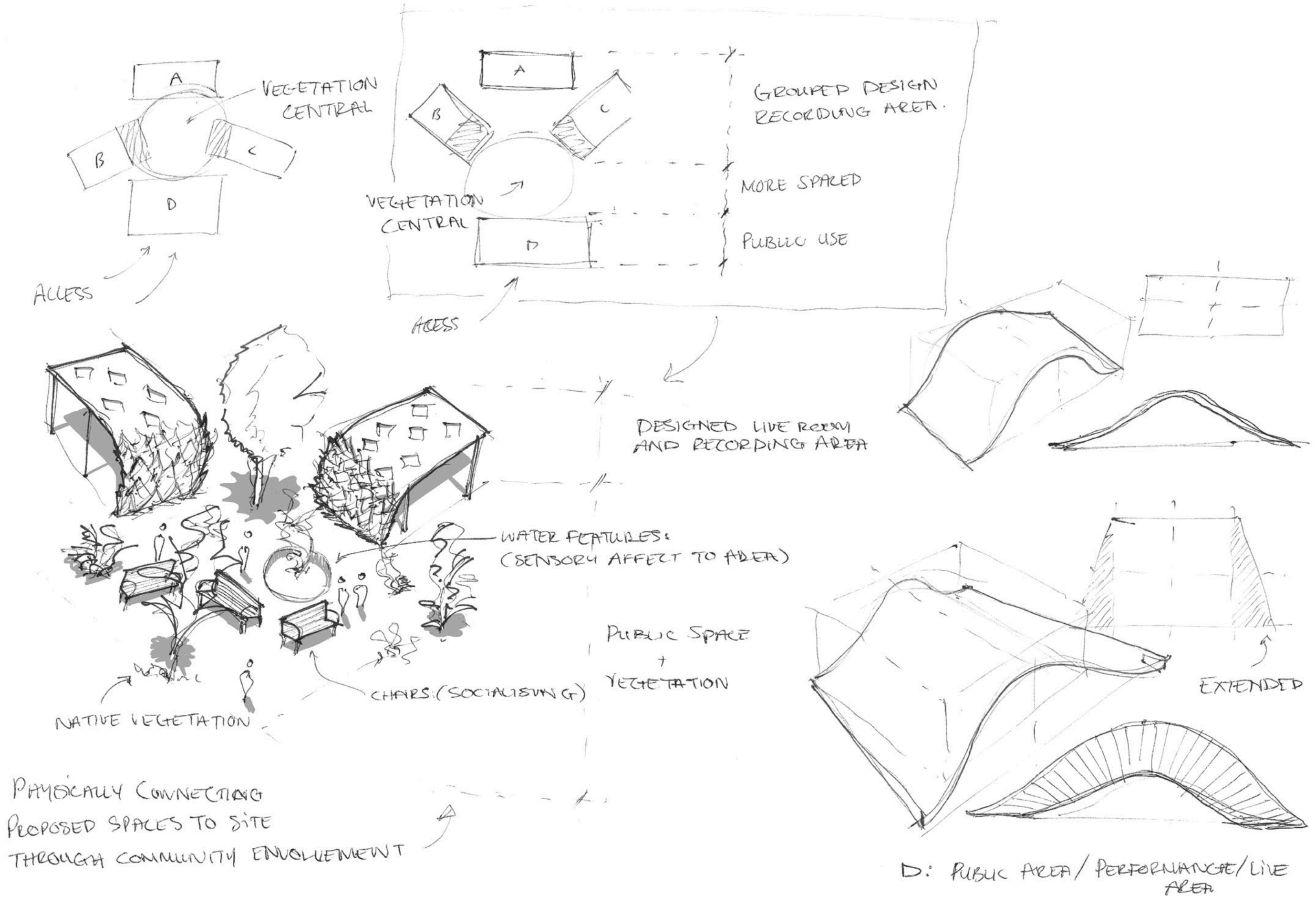


Figure 27: Developing sketches and planning.

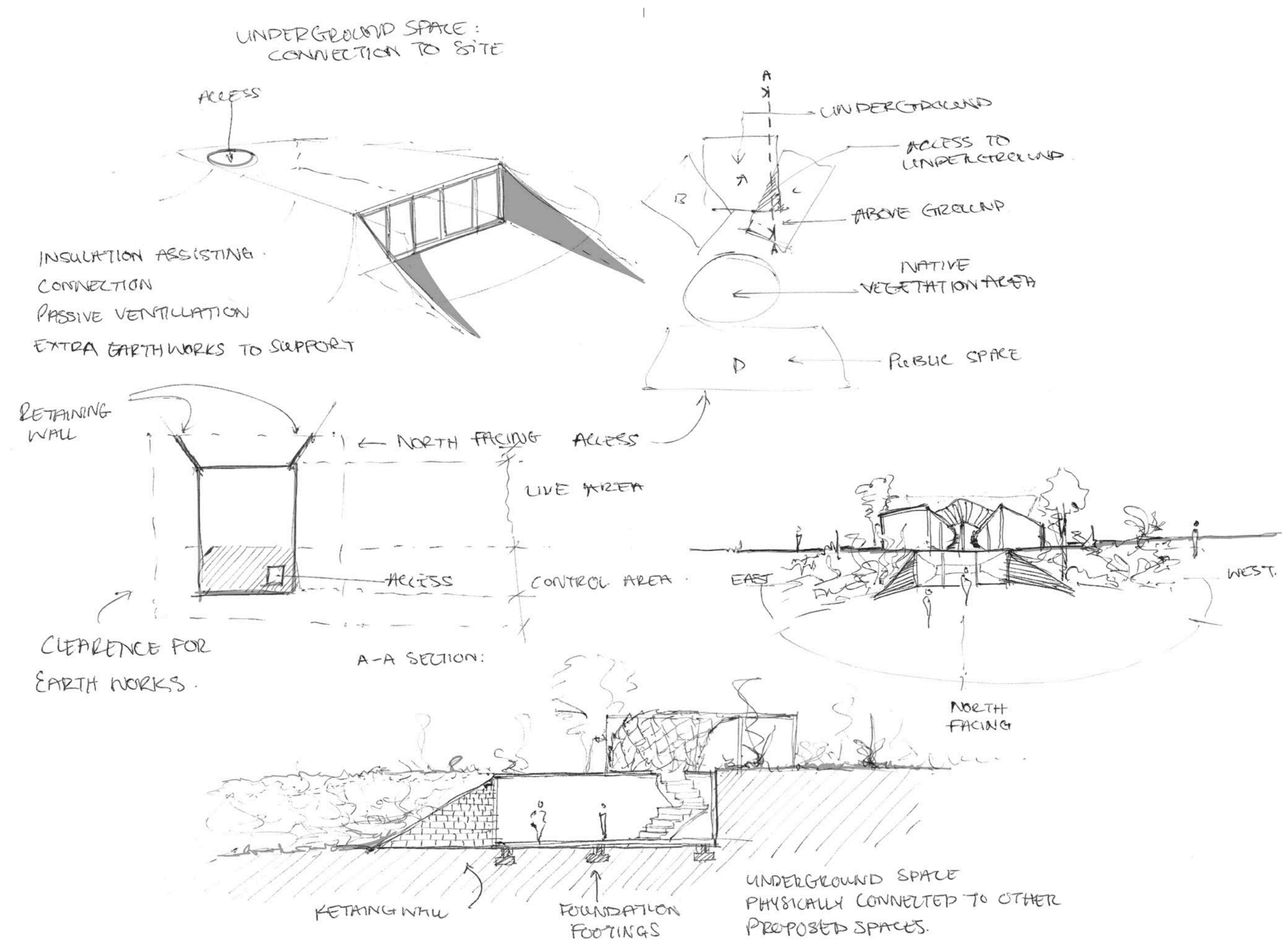


Figure 28: Developing sketches and planning of underground spaces.

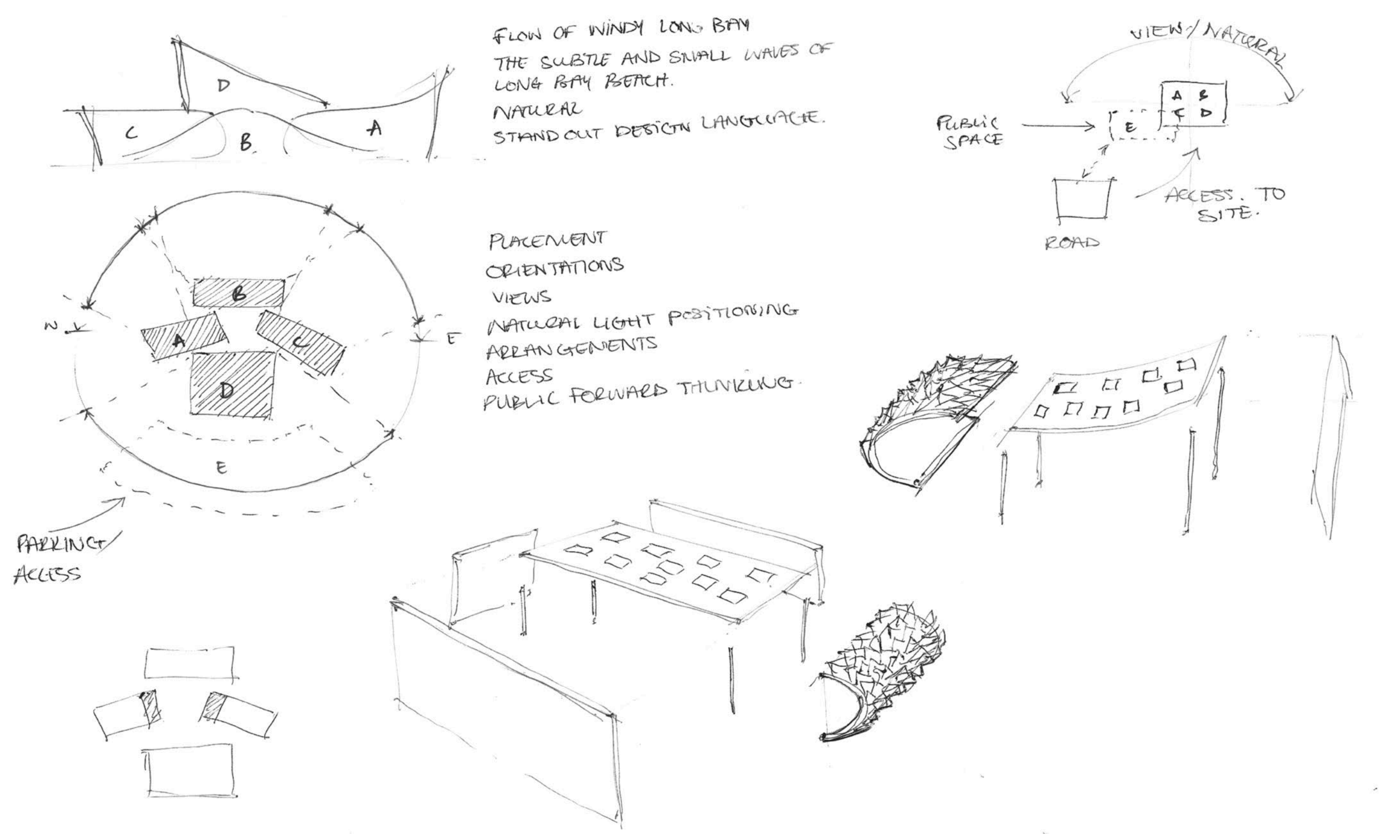


Figure 29: Mapping spaces and layout planning.

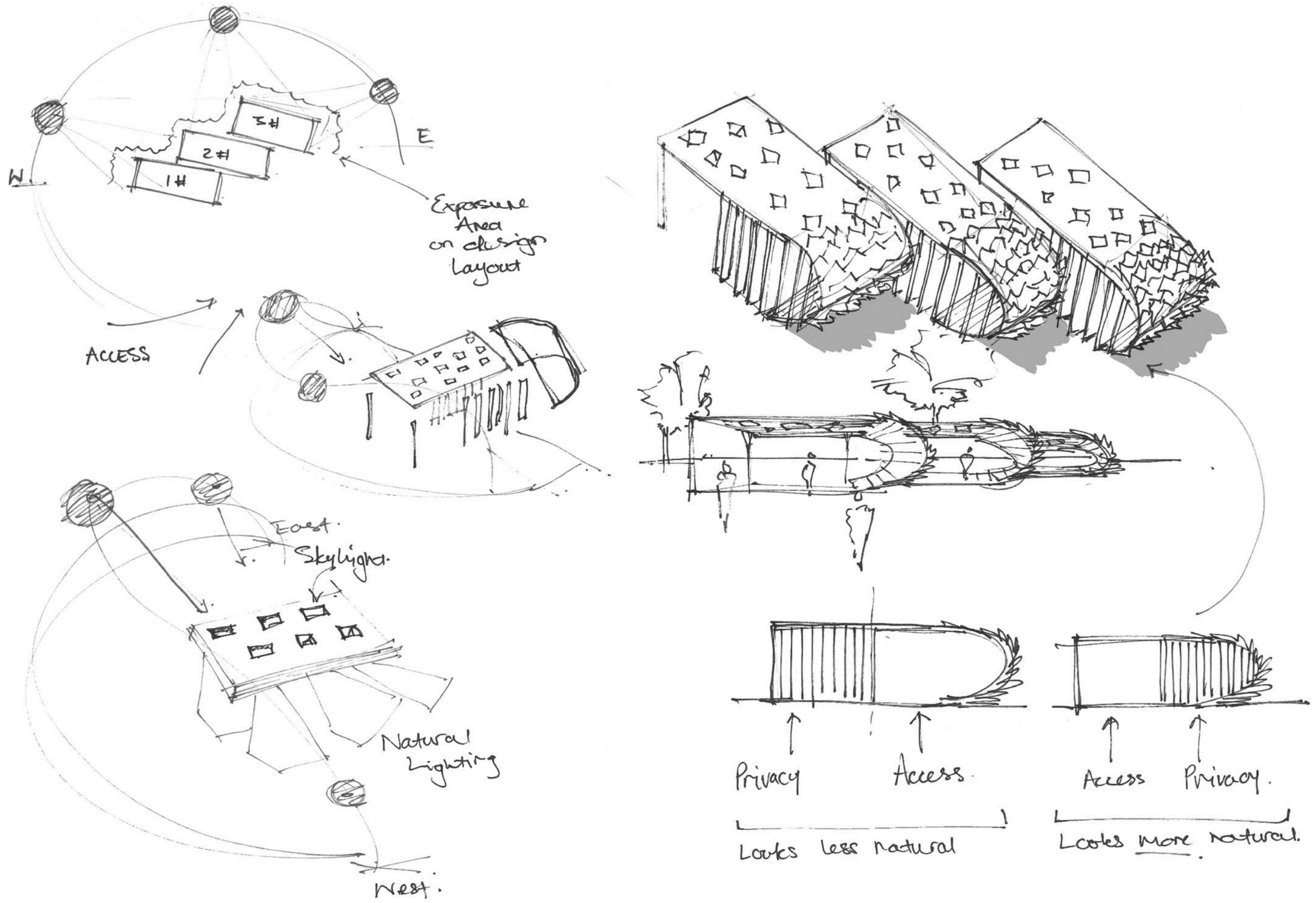


Figure 30: Mapping natural light and positioning spaces.

Design process and iteration

The design process followed an iterative, model-based approach in which spatial decisions emerged through physical making, testing, and reflection rather than being predetermined (see figure 31 - 52). Early conceptual models were intentionally small and unscaled, enabling rapid experimentation with massing, light penetration, spatial flow, and orientation without the constraints of programme or technical resolution. These models functioned as thinking tools, allowing intuitive exploration of how form could respond to site contours, prevailing winds, and natural light. Decisions were made through comparative testing, with forms adjusted or removed according to their capacity to mediate light, air movement, and spatial transitions.

As the project progressed, the exploratory models informed a shift toward more explicit spatial definition and programmatic organisation. Massing studies began to respond directly to topography, positioning volumes to harness wind paths for passive ventilation and to establish gradients between exposed and protected zones. Through this process, the relationship between above-ground and below-ground spaces emerged as a central architectural strategy, enabling acoustic performance, atmosphere, and sensory experience to vary across the studio.

These decisions were consolidated in the 1:100 scale final model, which formalised a hierarchy of programmatic zones. The above-ground recording envelope was developed as an acoustically isolated yet visually permeable environment, using filtered apertures and framed views to maintain a controlled connection to the landscape. The below-ground recording envelope, by contrast, was embedded within a greater mass to achieve greater acoustic containment and atmospheric depth. The orientation of the underground studio was tested so that window openings face outward toward the exposed hillside, allowing controlled daylight and visual connection while preserving the acoustic benefits of submergence. This relationship was explored physically through model-making and subsequently verified through photogrammetry to test scale, proportion, and site placement before detailed digital modelling.

The communal area was positioned at the site's access point as a mediating space between the public realm and the studio. Conceived as a social and sensory threshold, it supports community engagement while functioning as a decompression zone. Shifts in sound, airflow, and light quality were used to prepare users for entry into the acoustically dense recording spaces.

By employing photogrammetry as a bridge between physical and digital development, the process ensured that decisions around scale, massing, and placement remained grounded in embodied understanding. Through this iterative approach, design choices were continually evaluated against the core aims of biophilic integration, multi-sensory experience, and acoustic performance.

Figure 31: Top view of Model 1# Cardboard used as the only material.

Figure 32: Side view of Model 1# Exploring shadow movement in different angles of lighting.

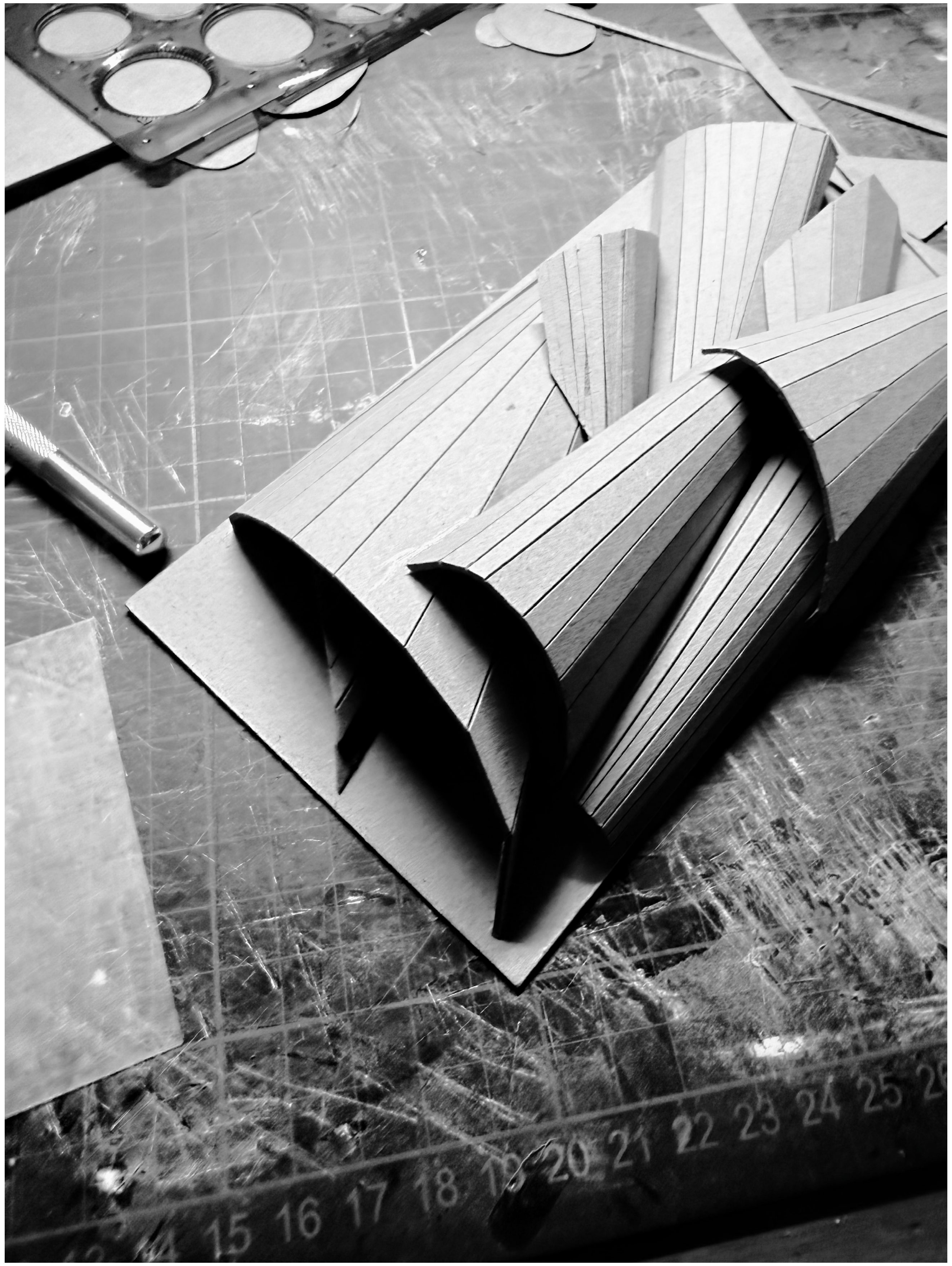


Figure 33: Side view of Model 1# Exploring shadow movement in different angles of lighting.

Figure 34: Zoomed-in view of Model 1# Exploring shadows and lighting.

Figure 35: Top view of Model 2# Cardboard combined with thin brushed plastic layers.

Figure 36: Side view of Model 2# Exploring shadows and lighting.

Figure 37: Zoomed-in view of Model 2# Exploring texture and lighting.

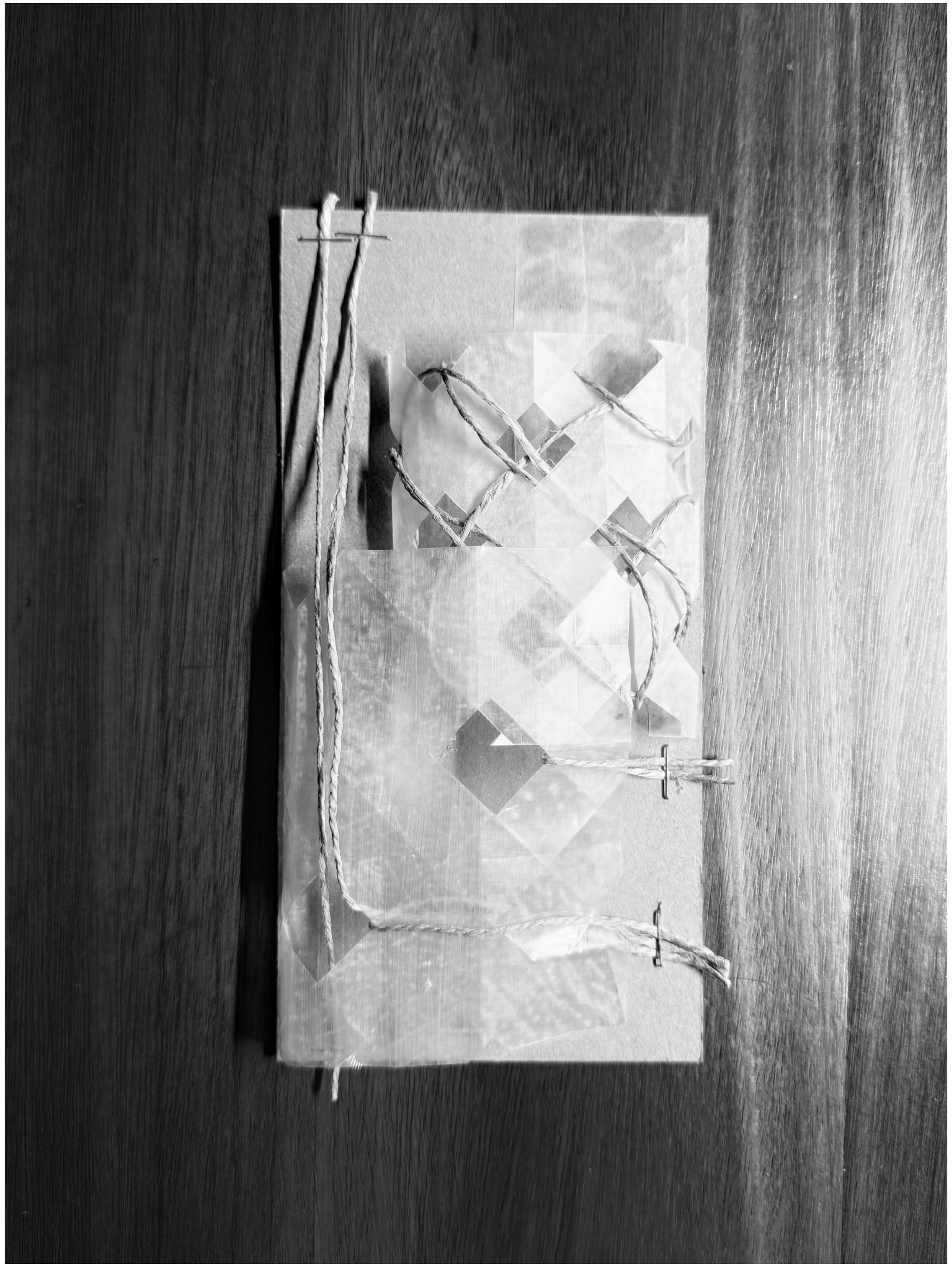


Figure 38: Top view of Model 3# String and thin brushed plastic layers with patterns.

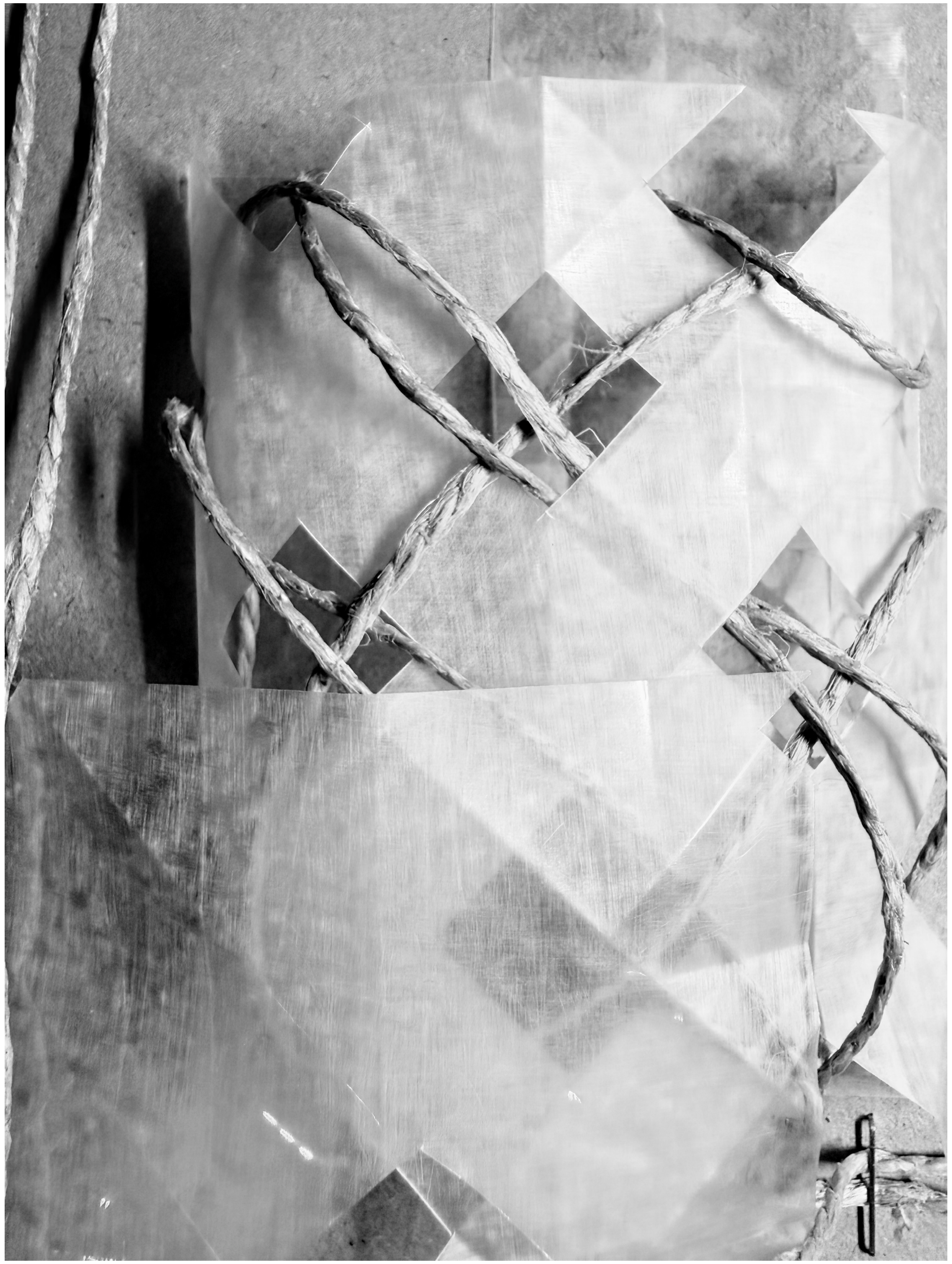


Figure 39: Zoomed-in view of Model 3# Exploring textures and shadow casting.

Figure 40: Top view of Model 4# Patterned cardboard, string and thin brushed plastic layers.

Figure 41: Side view of Model 4# Exploring shadow and texture with patterns.

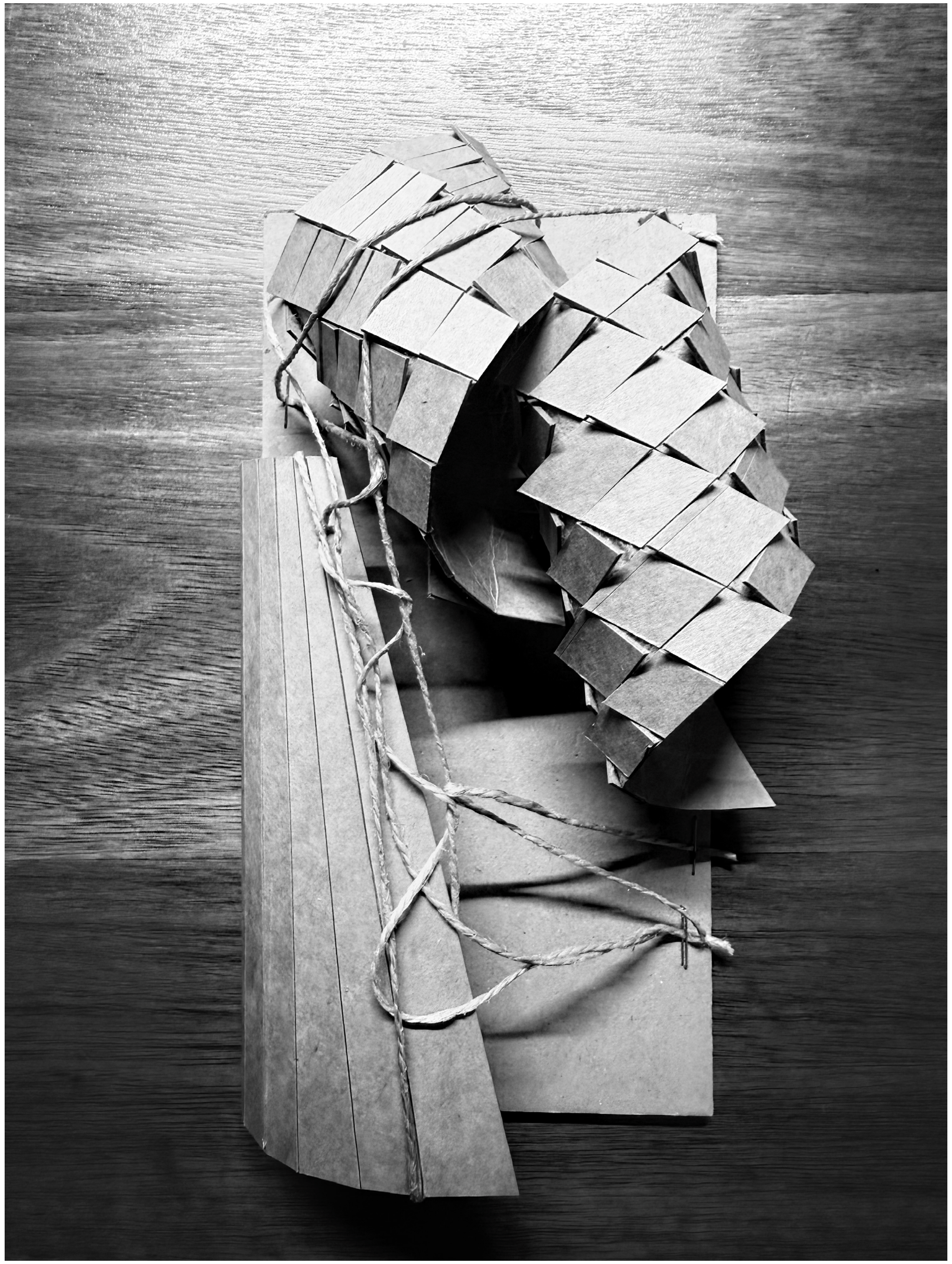


Figure 42: Top view of Model 5# Patterned cardboard and string.

Figure 43: Zoomed-in view of Model 5# Exploring textures and shadows.

Figure 44: Top view of Model 6# Plastic only.

Figure 45: Side view of Model 6# Exploring flow and lighting.

Figure 46: Zoomed-in view of Model 6# Exploring Shadows and refelction.

Figure 47: Side view of Model 6# Exploring flow and sharpness

Figure 48: Zoomed-in view of Model 6# Exploring texture and shadows.

Figure 49: Top view of Model 1# and 2# Exploring texture and combination of concepts.

Figure 50: Side view of Model 1# and 2# Exploring shadows and combination of concepts.

Figure 51: Side view of Model 1# and 2# Exploring shadows and combination of concepts.

Figure 52: Side view of Model 1# and 2# Exploring textures and shadows of combining concepts.

Spatial and material development

Spatial and material development evolved through a sequential design process that translated earlier conceptual explorations into a resolved architectural proposition. Following initial massing and site studies, spatial restrictions and material conditions were progressively introduced to test how biophilic and multi-sensory principles could operate within the technical constraints of a recording studio. This phase employed plan iterations, sectional studies, physical models, and material mock-ups, enabling simultaneous refinement of spatial organisation and material performance.

Early studies established a distinction between above-ground and below-ground recording environments. Timber and rammed earth emerged as primary materials for the underground studio, where increased mass was required for acoustic containment and low-frequency control. These choices were tested through sectional models to assess enclosure, thickness, and acoustic behaviour. Above-ground recording spaces and communal structures were explored primarily through timber construction, which enabled lighter expression, tactile warmth, and a stronger visual connection to the landscape. Moss and vegetated wall systems were later introduced across both zones following acoustic and tactile testing, demonstrating effectiveness as sound-dampening surfaces while enhancing texture, air quality, and sensory richness.

As spatial hierarchies became clearer, transitions between communal areas, the above-ground studio, and the underground studio were refined through comparative modelling and atmospheric evaluation. These transitions were designed to produce deliberate shifts in acoustic pressure, enclosure, and sensory intensity. Adjustments to ceiling heights, material thicknesses, and surface textures across successive models guided users from acoustically dense environments toward more open, restorative zones. Rougher earthen textures and vegetated surfaces were applied in transitional areas to strengthen sensory grounding, while smoother, acoustically neutral finishes were retained in control rooms to support focus and precision.

Lighting design was developed in parallel with spatial and material refinement. Daylight studies using physical models informed the orientation of north-facing spaces, allowing natural light to diffuse into work zones without glare. These findings shaped sectional refinements that balanced daylight access with acoustic enclosure. Artificial lighting strategies were integrated to support nighttime sessions, drawing on Turrell-inspired approaches to shape atmosphere and emotion. These decisions were informed by environmental psychology and phenomenological theory, thereby reinforcing support for circadian rhythms and sensory balance (Heschong, 2002; Holl, 2006).

Through iterative movement between drawings, models, material testing, and environmental analysis, spatial and material strategies were continually evaluated against the research question (see figure 53 - 68). The resulting design integrates biophilic material systems, multi-sensory transitions, and acoustic performance, demonstrating how decisions at the scales of material, space, and light can support creative production and user well-being within a recording-studio context.

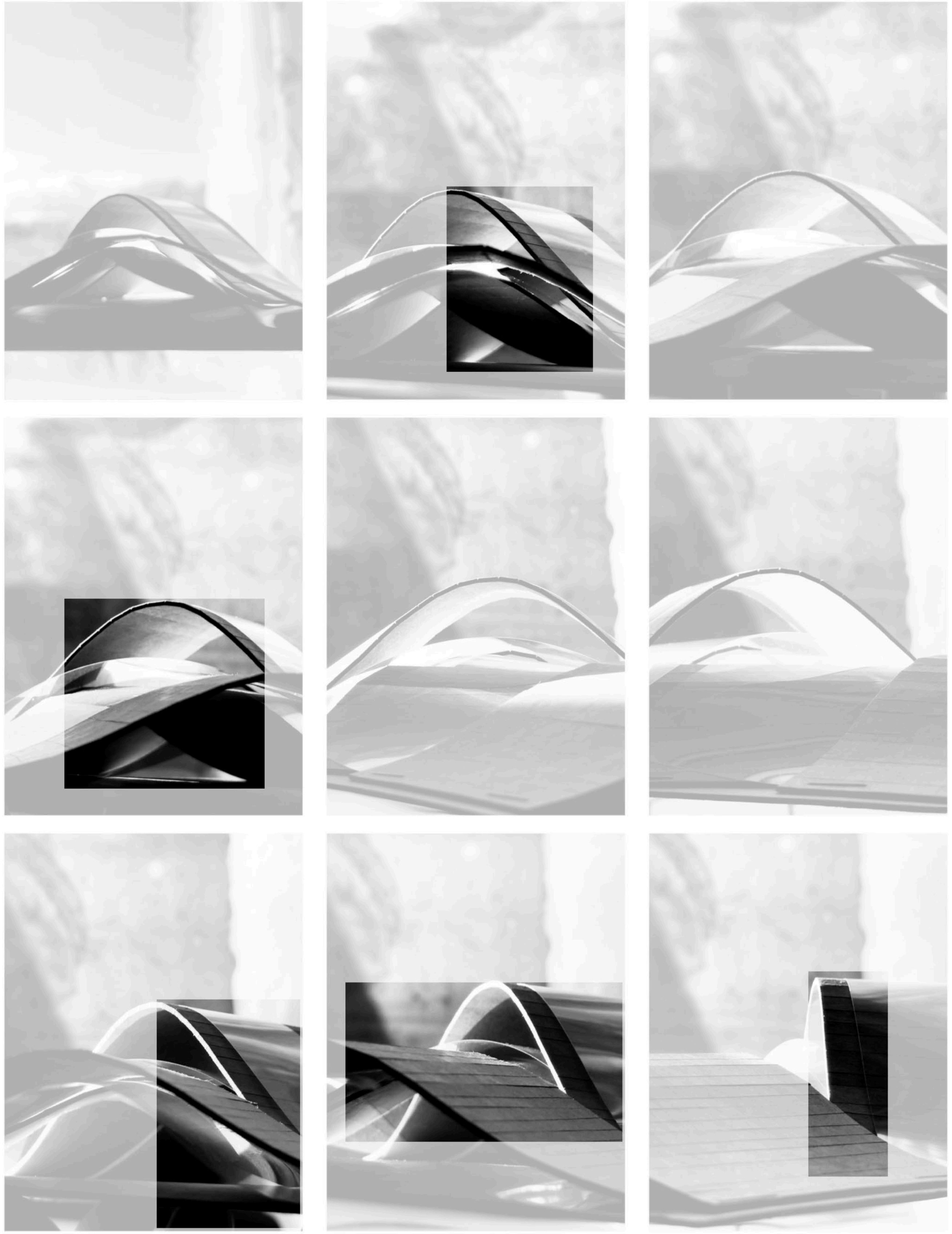


Figure 53: Dissecting models and analysing their features. Sectioning textures and materials.

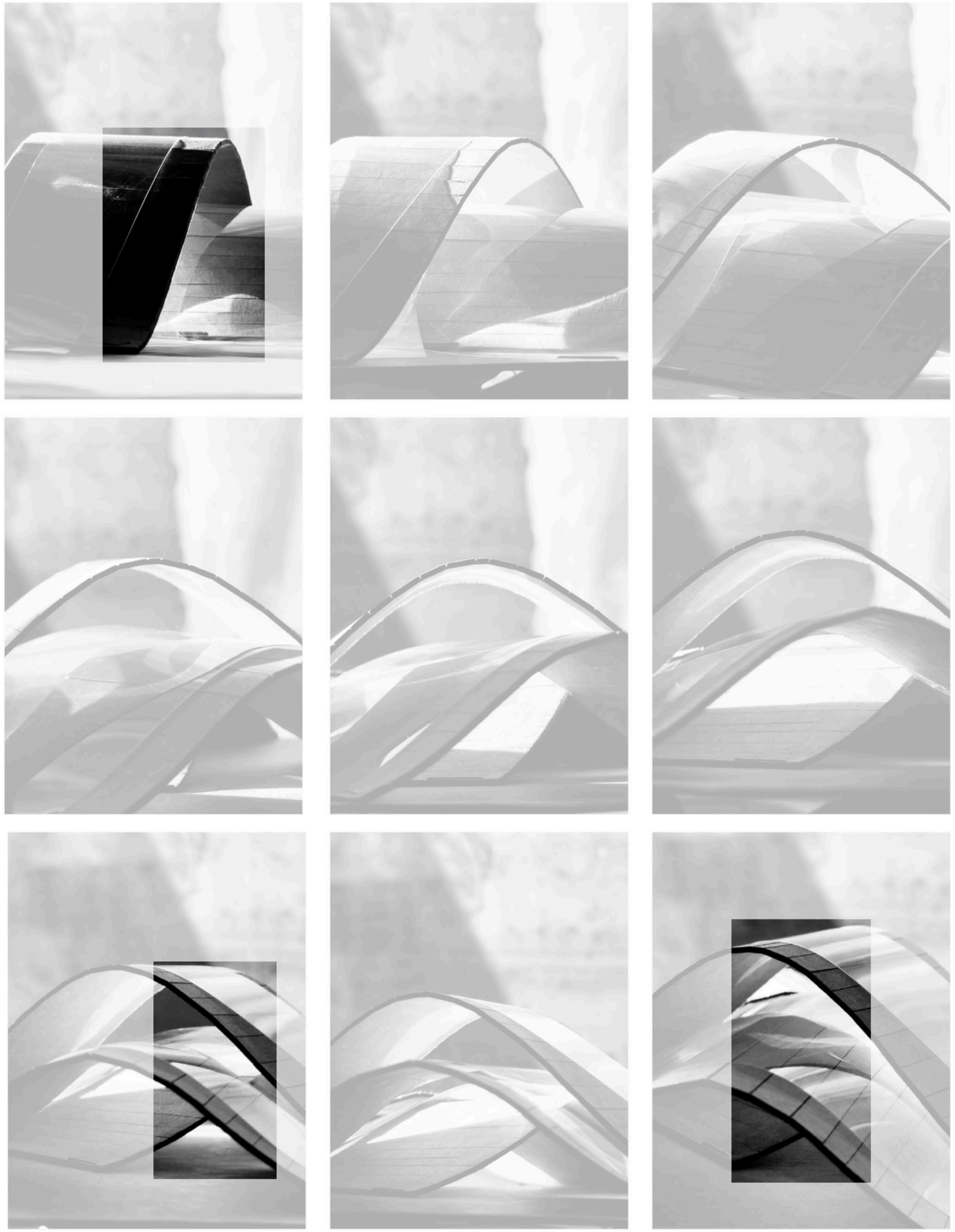


Figure 54: Dissecting models and analysing their features. Sectioning textures and materials.

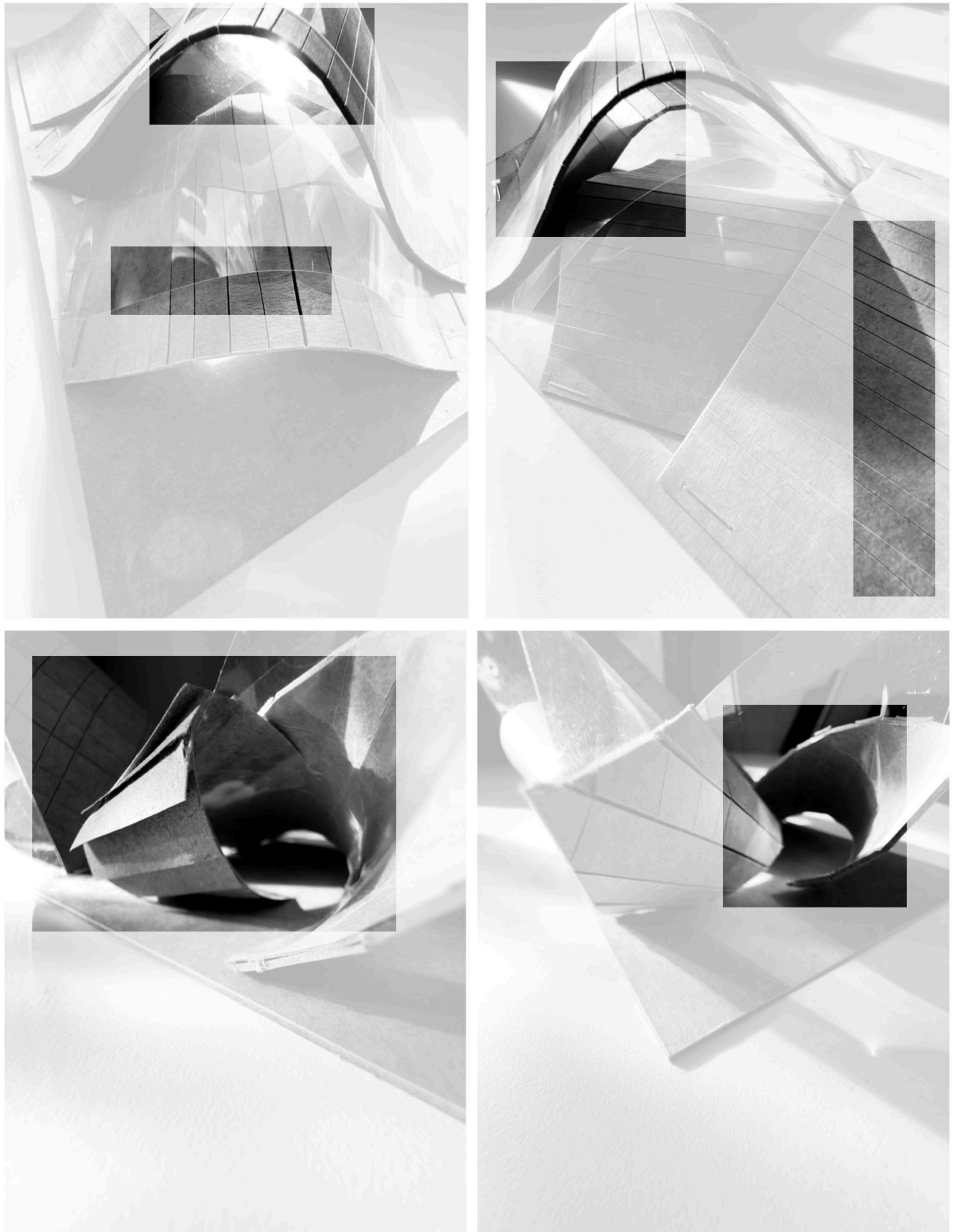


Figure 55: Sectioning textures and materials.

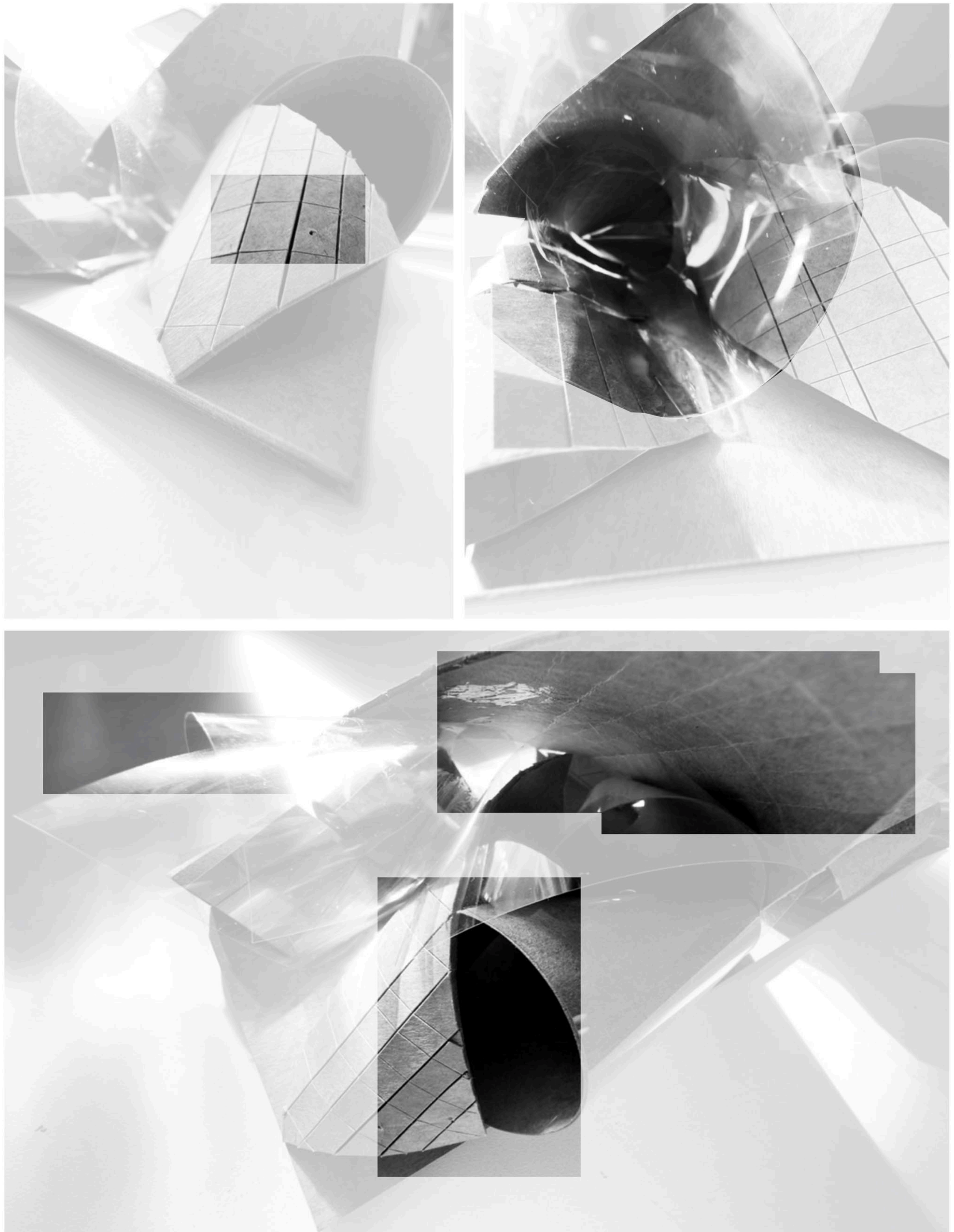


Figure 56: Sectioning textures and shadows.

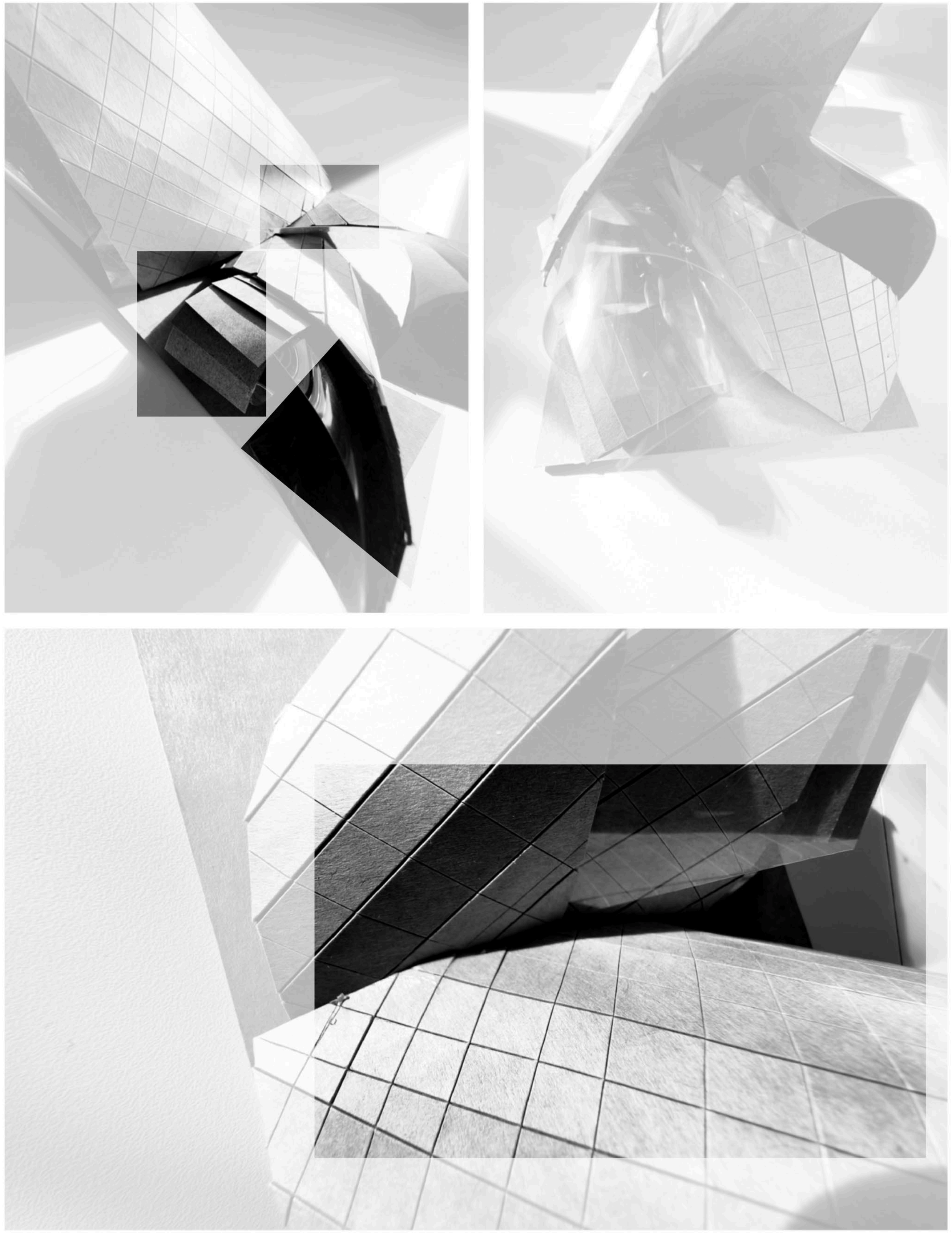


Figure 57: Sectioning light responding to the models’ textures.

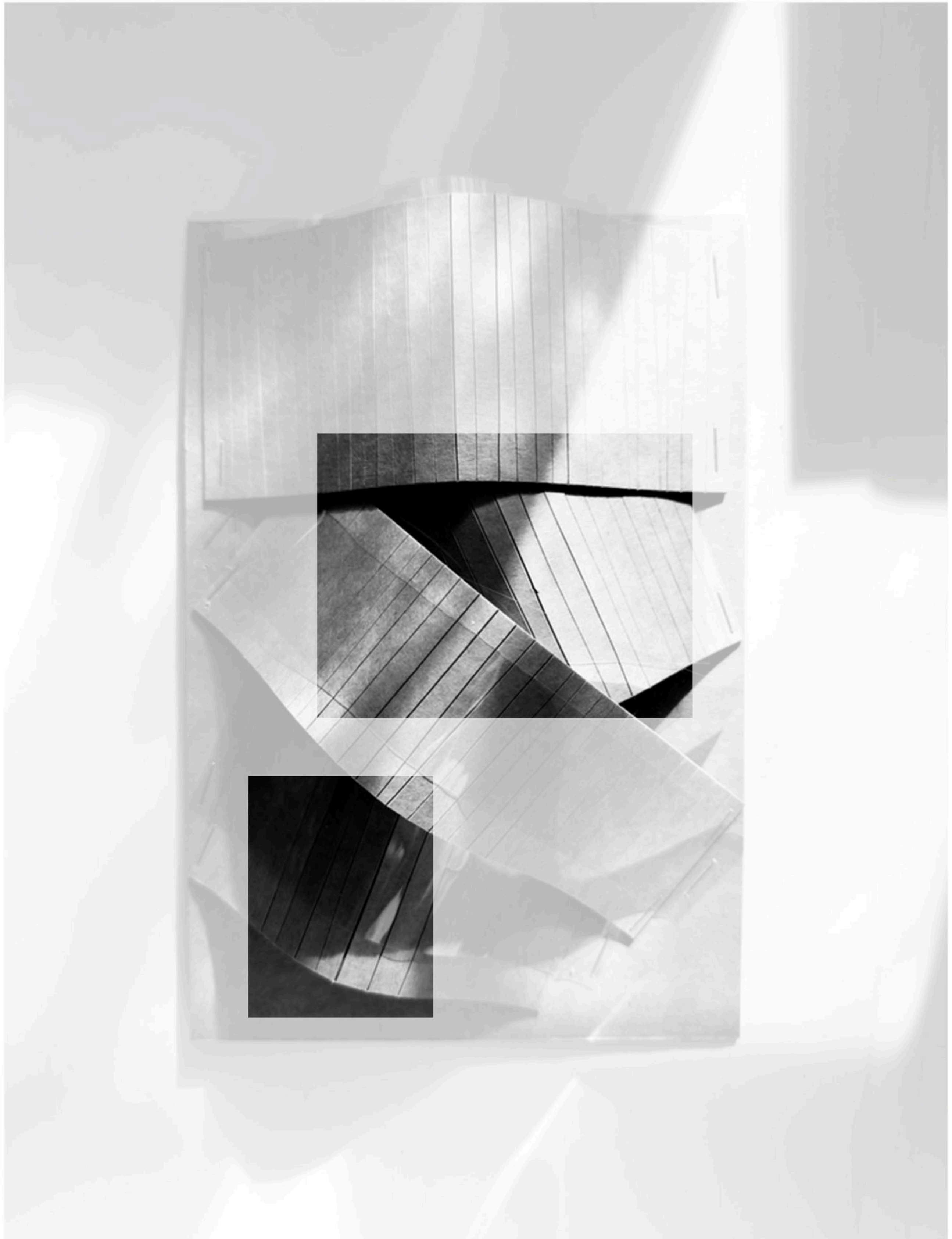


Figure 58: Sectioning light responding to the model’s textures.

Figure 59: Sectioning the model's material response to shadows and light.

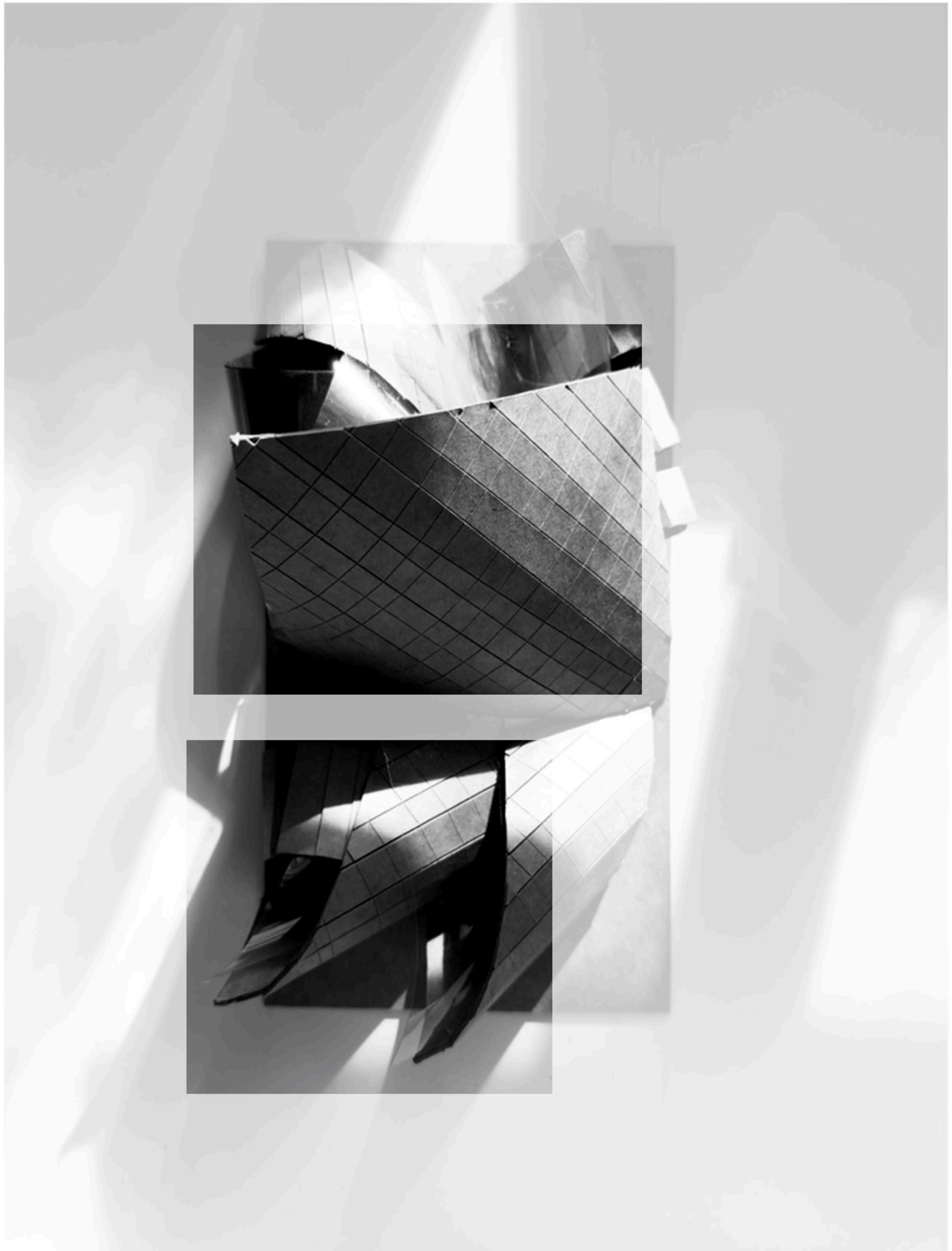


Figure 60: Sectioning the model's material response to shadows and light.

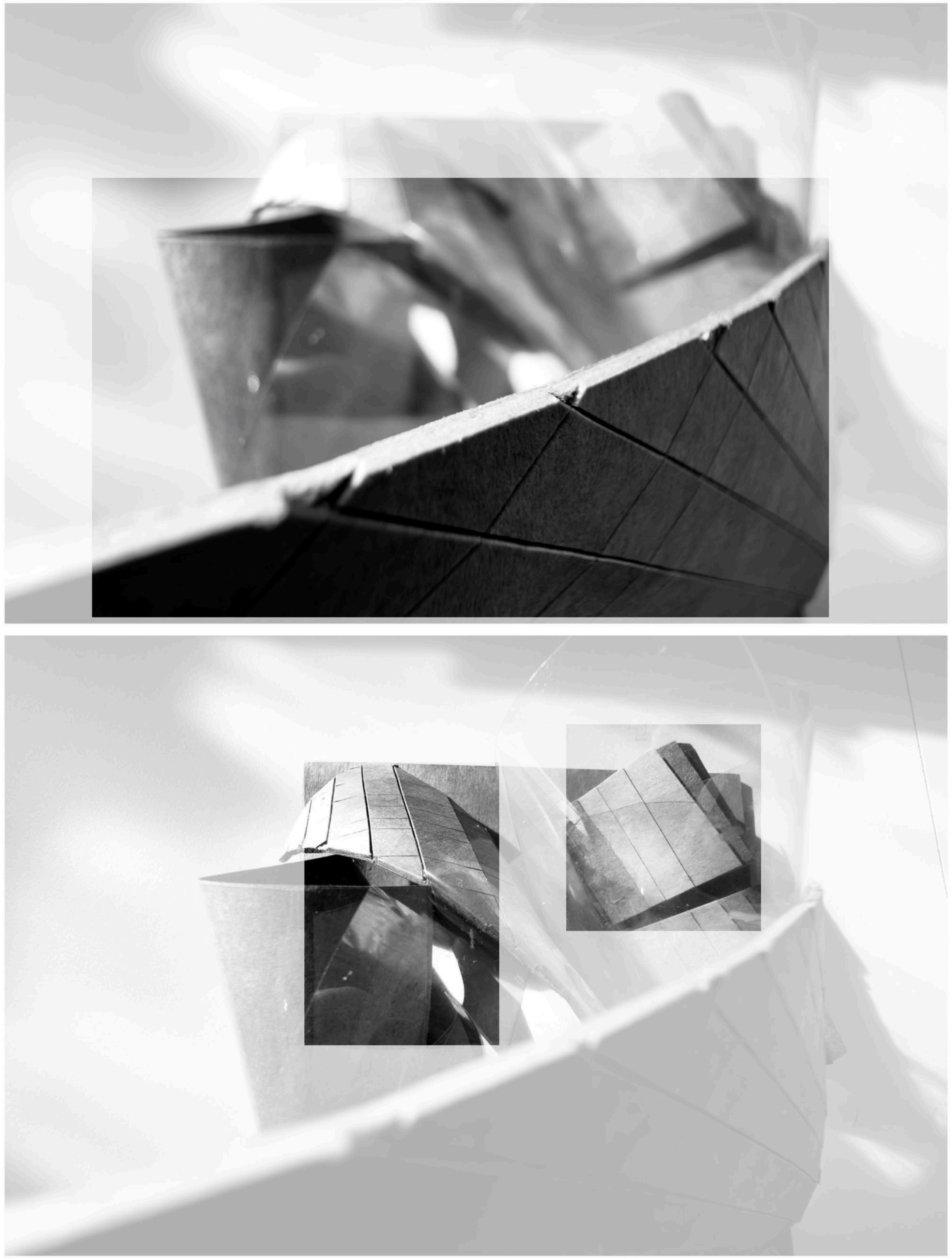


Figure 61: Sectioning the model's textures combined with light.

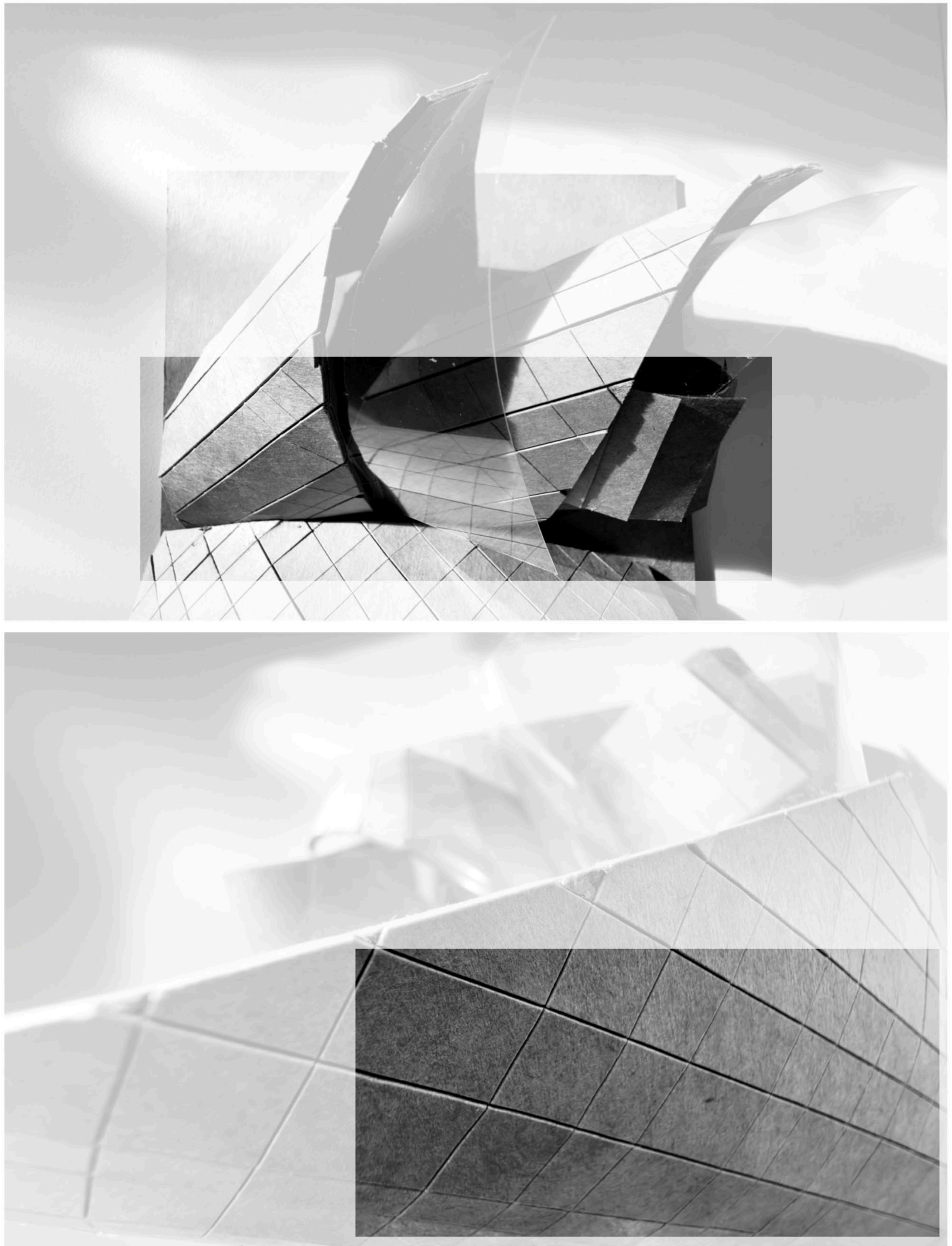
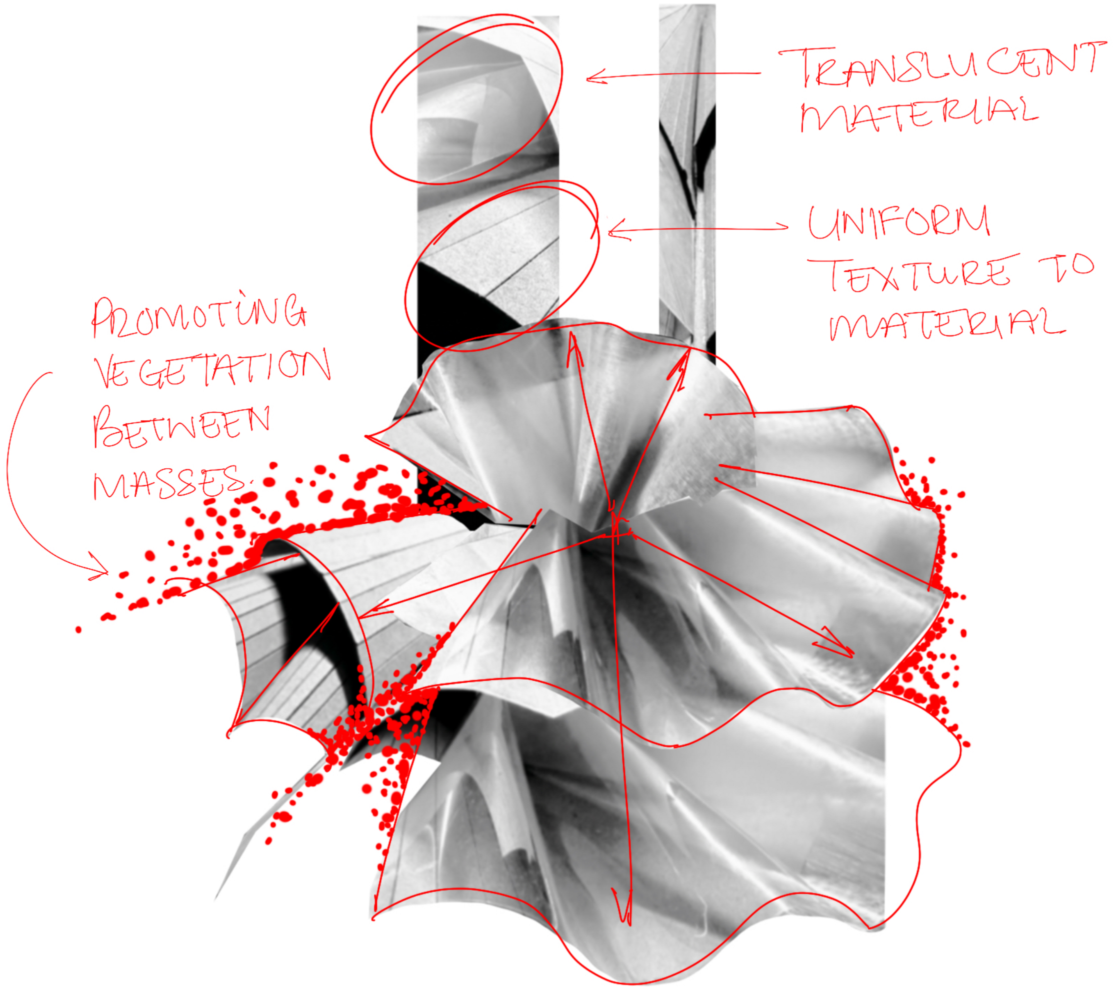


Figure 62: Sectioning textures responding to shadows.



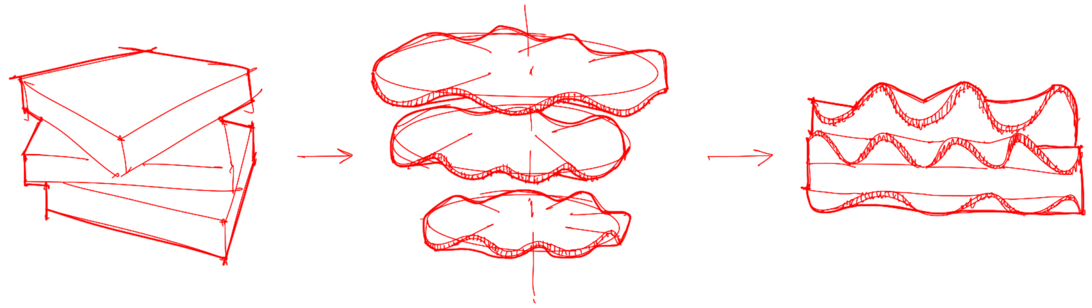


Figure 63: Analysing sectioned images.

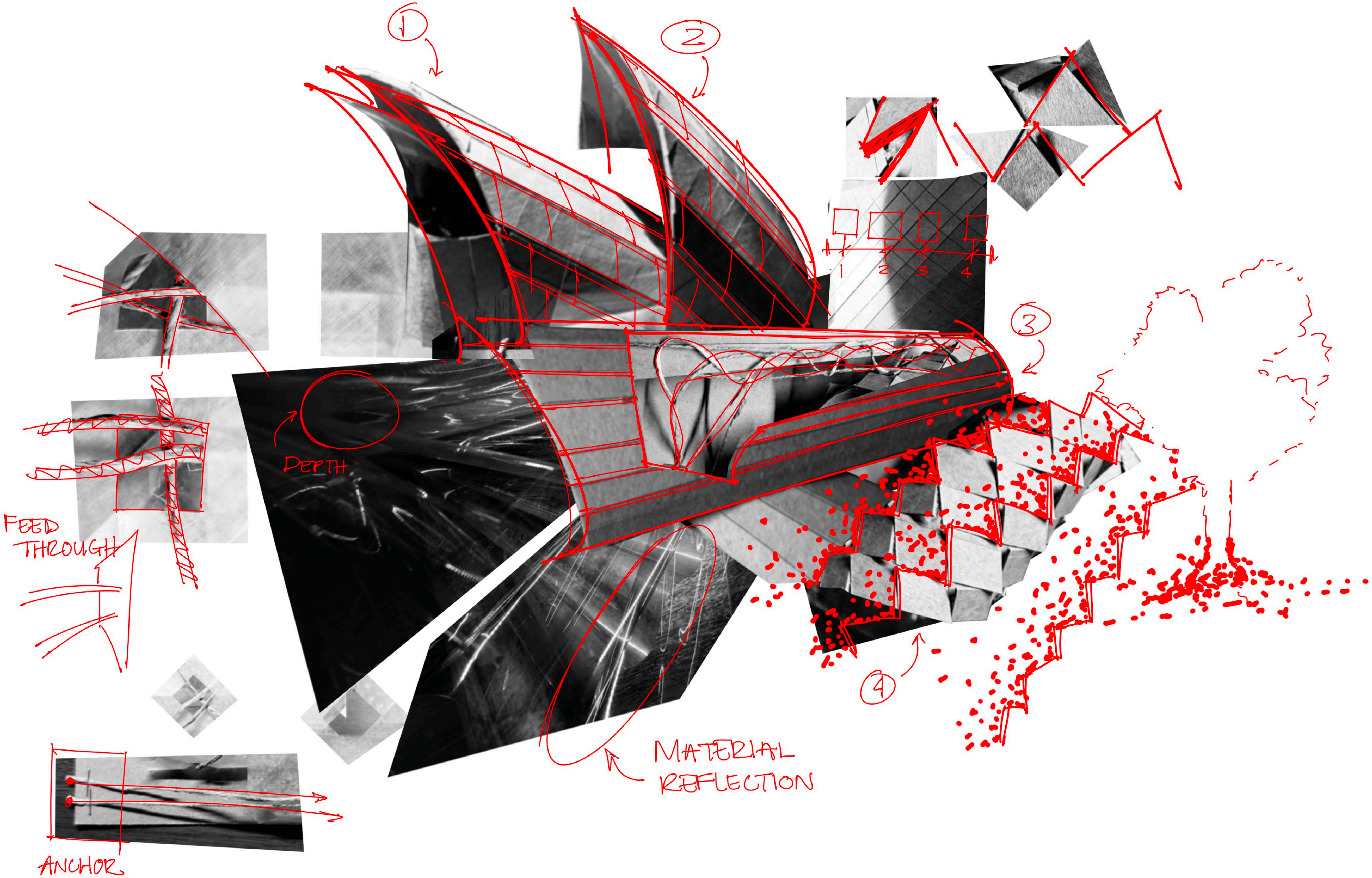


Figure 64: Analysing sectioned images. Developing concepts and broader ideas.

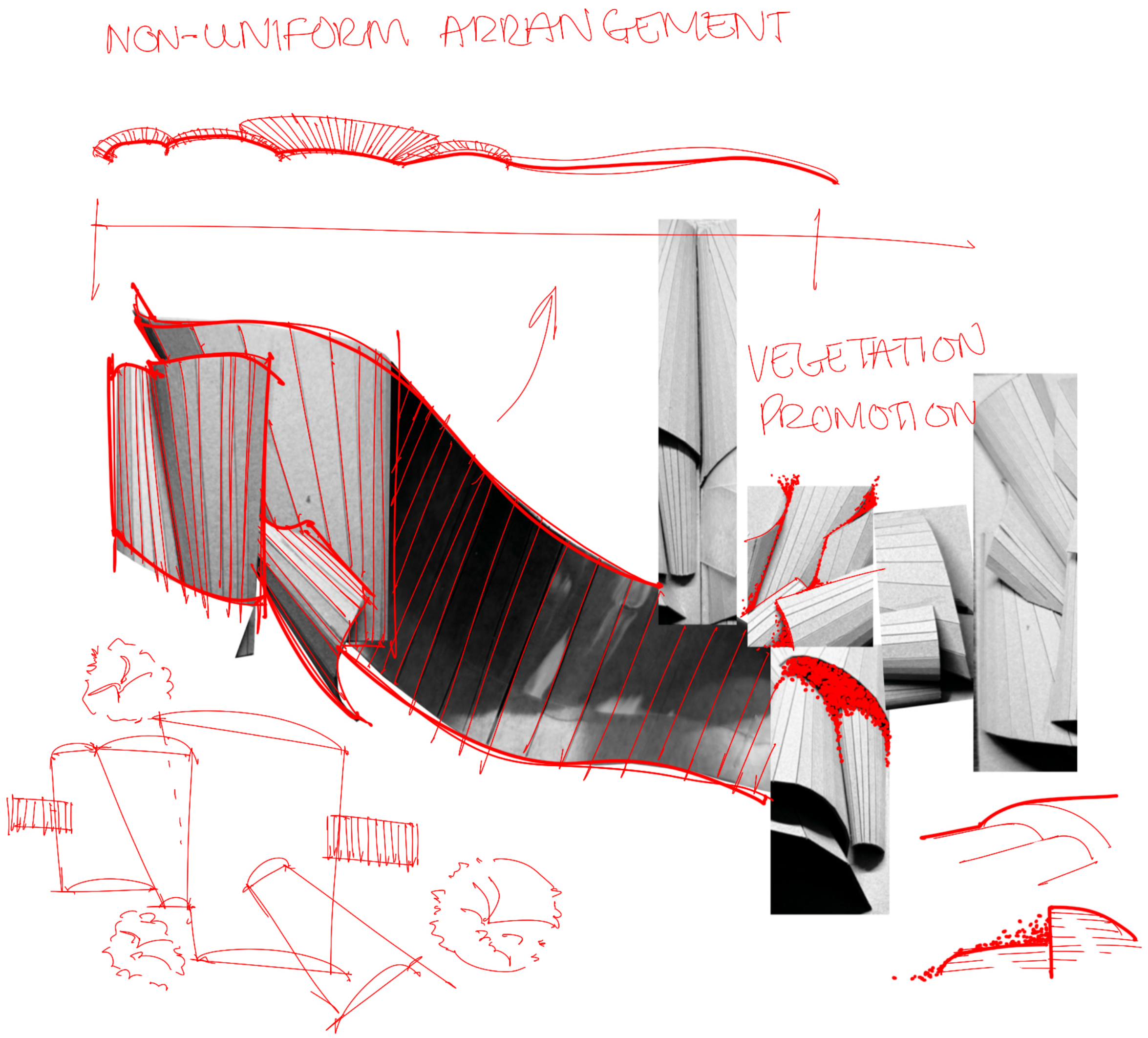


Figure 65: Analysing sectioned images. Developing concepts and broader ideas.

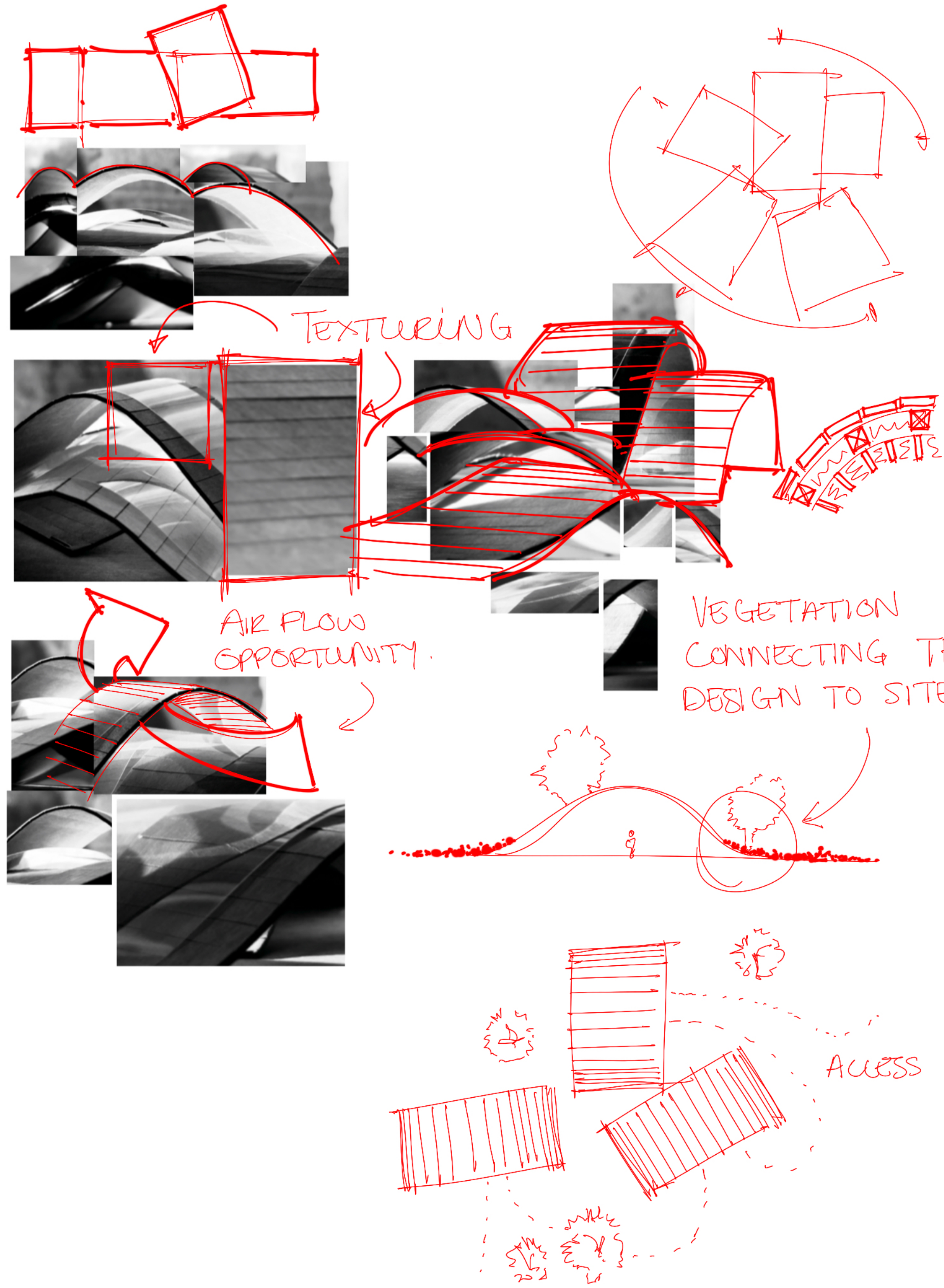


Figure 66: Analysing sectioned images. Developing concepts and broader ideas.

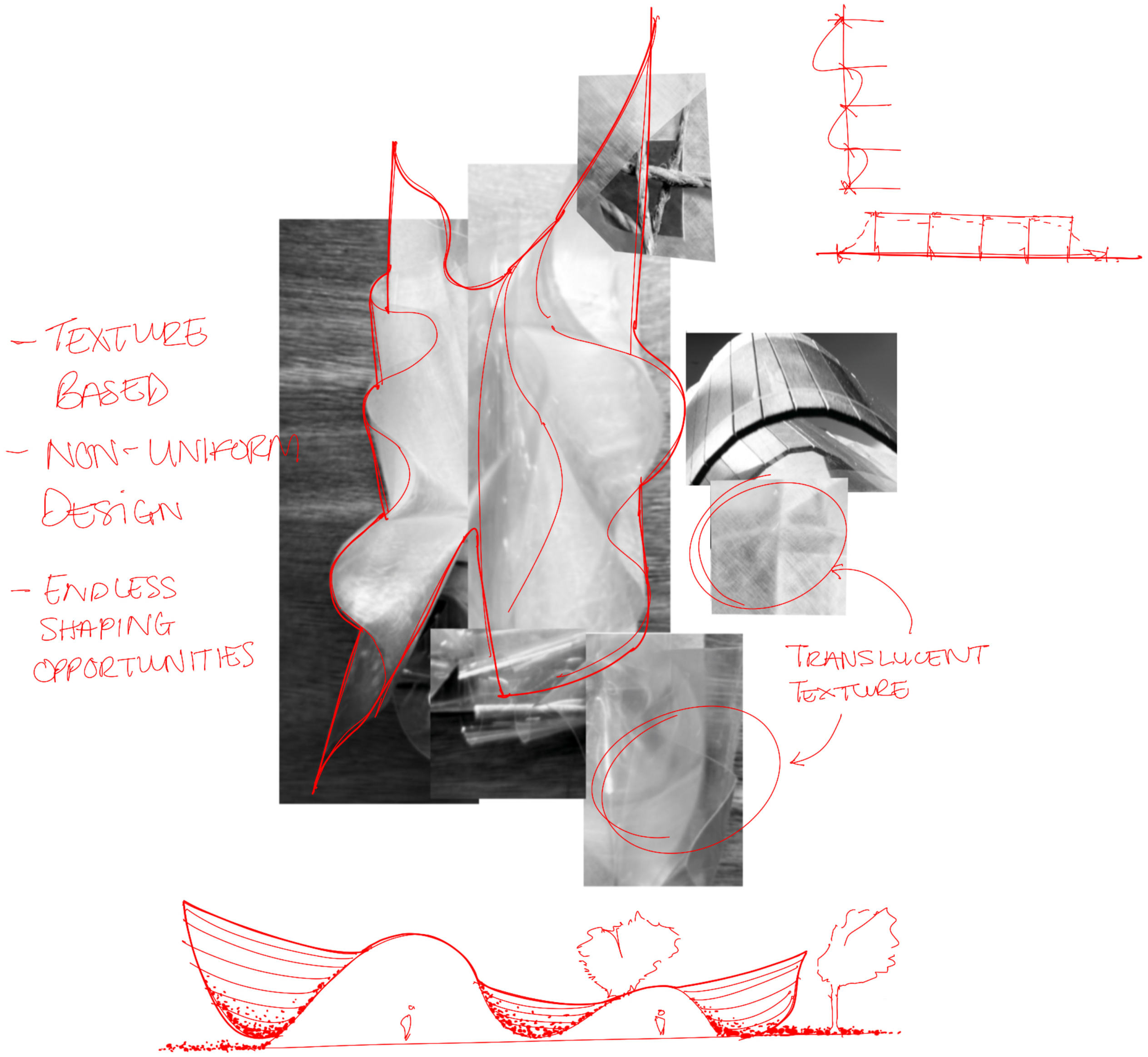


Figure 67: Analysing sectioned images. Developing concepts and broader ideas.

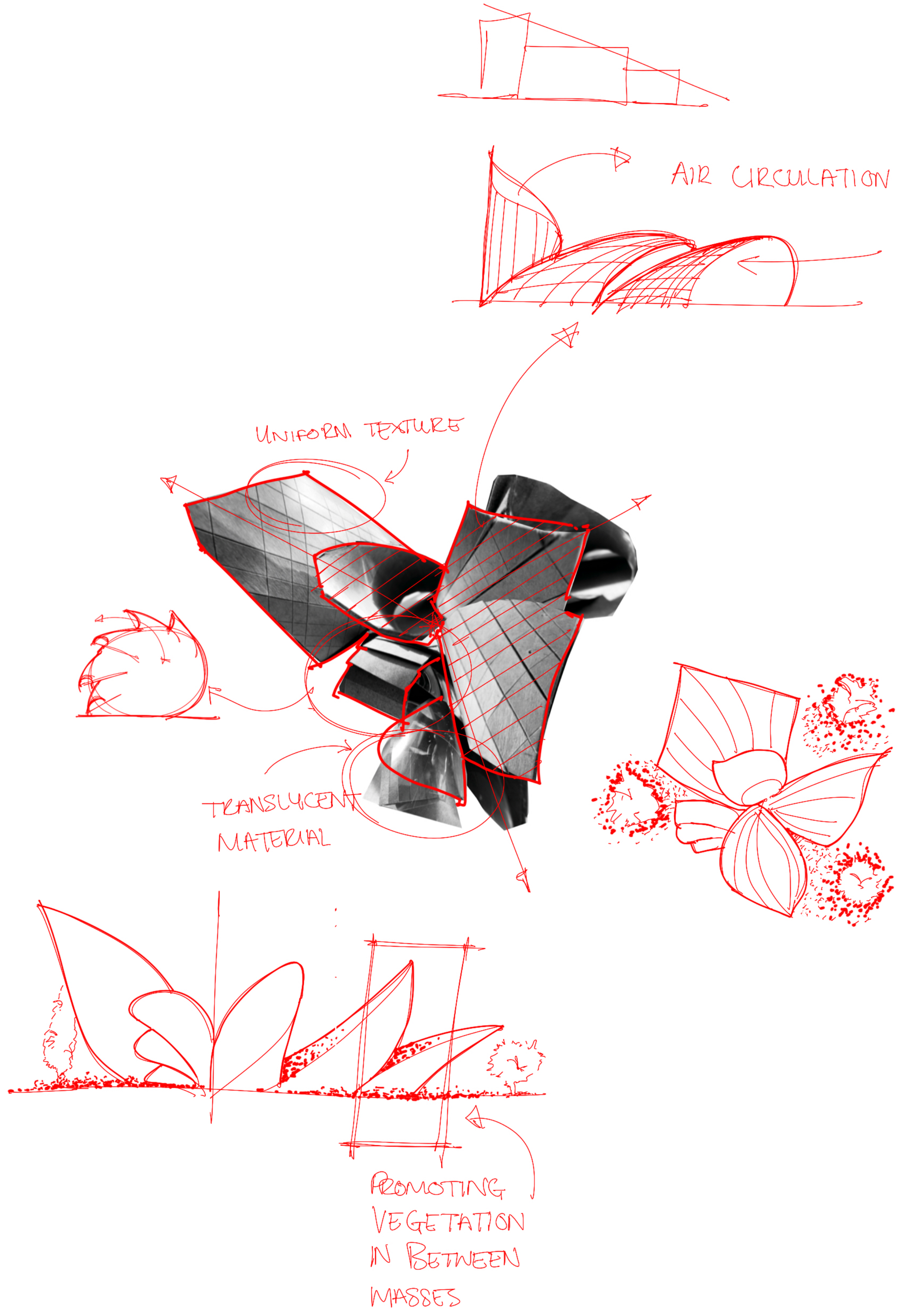


Figure 68: Analysing sectioned images. Developing concepts and broader ideas.

Justification of methods

The iterative design process adopted in this research aligns with regenerative and biophilic principles by embedding environmental and sensory considerations within the design process rather than treating them as secondary additions. Söderlund and Newman (2015) argue that such strategies are most effective when developed through continuous feedback between design intent and environmental response. In response, this thesis employed a sequence of complementary physical and representational methods that enabled the testing and refinement of spatial, material, and sensory qualities over time.

Early exploration relied on physical model-making at multiple scales, supported by photography and collage, to investigate atmosphere, light, and spatial relationships. These analogue methods allowed embodied evaluation of form and materiality, ensuring that decisions were informed by sensory perception rather than abstract metrics alone. Sketching functioned as a reflective tool throughout this phase, enabling rapid critique and iterative refinement as ideas emerged through making.

As the design became more defined, photogrammetry was used to translate physical models into a digital environment while preserving spatial proportions and site relationships. This method was significant for testing the scale and placement of the underground studio, where window orientation and the relationship to surrounding terrain required careful evaluation before detailed digital modelling.

The digital model was then developed to refine environmental performance and spatial clarity. Daylight behaviour, enclosure, and proportion were assessed alongside qualitative evaluation of multi-sensory and biophilic outcomes, ensuring that technical performance supported rather than compromised experiential quality.

Through this iterative cycle of making, testing, and translation, the methodology grounded design decisions in both environmental performance and sensory experience. The use of multiple complementary methods was therefore justified, as each contributed distinct knowledge essential to addressing the research question and achieving a cohesive architectural outcome.

Design Development to Fabrication

The design development process translated early conceptual strategies into a spatially resolved architectural proposition through iterative model-making, sectional studies, and material testing. Spatial hierarchies were refined through sensory sequencing and performative envelopes, allowing acoustic control, environmental performance, and experiential quality to develop in parallel. Timber, rammed earth, and vegetated systems emerged as the primary material drivers, supporting acoustic containment, sensory grounding, and user well-being simultaneously. Digital analysis validated environmental performance without compromising the embodied design intent established through physical making.

However, design development alone could not fully resolve the relationship between material intention and architectural reality. The decisions made through drawing, modelling, and spatial testing required translation into physical form — to be tested through making, touch, light, and environmental exposure rather than representation alone. The fabrication stage therefore extends directly from the design development process, treating physical and digital making as the primary means through which biophilic and multi-sensory principles were tested, refined, and grounded in both experiential and technical understanding.

Fabrication was structured as a series of progressively scaled investigations, each addressing a specific layer of architectural experience - from primary material testing through atmospheric experimentation to complete architectural synthesis. Across all stages, fabrication served as a critical design tool, refining the recording studio's sensory narrative while ensuring alignment with professional performance requirements.

Series One: Materiality #1 Investigations

The first fabrication series focused on testing natural, tactile, and performative materials-such as timber, moss wall panels, rammed earth, and textile membranes-in alignment with the biophilic framework. Locally sourced materials were selected for their sensory richness, environmental performance, and relevance to the studio's acoustic requirements. The aim of this stage was not to resolve construction details, but to understand how material qualities are perceived through touch, sound, light, and environmental exposure, directly supporting the biophilic and sensory design objectives.

Small-scale physical models and samples were fabricated to test surface texture, tactile response, shadow casting, acoustic absorption, and the potential for integrating natural systems such as planting and moisture control. Several samples were tested outdoors to simulate climatic exposure and to assess how materials respond to temperature variation, humidity, and weathering. This process also enabled reflection on the human sensory response to materials, particularly regarding thermal mass and comfort, which informed later passive insulation strategies.

In these tests, timber—specifically Radiata Pine—demonstrated warm acoustic qualities and a visually comforting texture, although the need for treatment in humid conditions became evident. Rammed earth samples revealed strong thermal performance but required further investigation into acoustic isolation at lower frequencies. Moss wall panels proved effective in strengthening biophilic connection and softening sound, while highlighting the necessity for integrated moisture management. Overall, this series validated the use of natural materials as both sensory and performative elements, particularly within transitional and communal studio spaces.

Series Two: Materiality #2 Investigations

Building on the outcomes of the first series, the second phase extended material testing into a digital environment to explore more complex material assemblies and interfaces. The focus shifted from individual material properties to how materials interact when combined within architectural systems. This stage enabled the exploration of structural logic, acoustic behaviour, and environmental performance at a higher level of resolution.

The digitally modelled panel sections were developed to test timber framing combined with rammed-earth infill and moss-wall junctions. These assemblies were examined for acoustic bridging, ventilation potential, and material continuity. Lighting behaviour was also tested digitally to assess how light interacts with layered materials, surfaces, and textures. Using ArchiCAD, Twinmotion, and Shapr3D enabled precise testing of these interfaces, providing transparent insights into how design choices support acoustic, environmental, and sensory goals, thereby reinforcing their validity.

The results confirmed that careful detailing is required at material junctions to avoid acoustic bridging, particularly where dense and lightweight materials meet. Timber framing proved capable of accommodating rammed earth infill at an architectural scale, reinforcing the feasibility of the proposed material system. This series confirmed that the selected materials could support the thesis's biophilic and sensory goals while meeting structural and acoustic requirements.

Series Three: Expanding Reality

The third fabrication series explored extended reality as a means of testing scale, perception, and atmosphere beyond the limits of physical models. Digital photogrammetry and immersive environments enabled evaluation of spatial experience from a user's perspective rather than solely from a designer's.

Augmented and virtual reality tools were used to experience scale, light, enclosure, and atmosphere within the proposed design. Soundscapes were layered into simulations to mimic ambient outdoor noise, filtered sound transmission, and acoustic thresholds between spaces. Walkthroughs enabled testing of circulation, spatial compression, and transition between zones, particularly between acoustically isolated studios and more open communal areas.

This immersive testing confirmed the effectiveness of the sensory threshold strategy, with transitions between controlled and open zones perceived as distinct and legible. The simulations also enabled precise testing of daylight orientation, revealing how light intensity, temperature, and exposure shift across spaces. Feedback from other users engaging with the virtual environment informed refinements to ceiling heights, window placement, and access points, reinforcing the value of extended reality as a collaborative and evaluative design tool.

Series Four: Atmospheric

The fourth fabrication series translated material and spatial strategies into atmospheric conditions, focusing on light, temperature, and olfactory experience. Physical and digital testing explored how environmental variables interact to shape user perception and comfort.

North-facing models were tested to evaluate daylight penetration and diurnal variation. Passive airflow simulations were examined in relation to thermal comfort and insulation strategies. Olfactory testing used native vegetation around Long Bay to assess scent, seasonal variation, and the subtle contribution of external sounds associated with planting and landscaping.

Testing daylight, airflow, and scent demonstrates how atmospheric conditions support user comfort and sensory engagement, reassuring the audience of the design's focus on well-being and experience.

Series Five: Architectural

The final fabrication series synthesised findings from earlier investigations at an architectural scale (see figure 69 - 94). A 1:100 site and studio model integrated landscape, orientation, and building massing to articulate the full spatial and environmental logic of the proposal. Digital sections further clarified relationships between recording spaces, control rooms, and site topography.

This stage demonstrated how layered materials, sensory sequencing, and threshold spaces operate cohesively across the building. The integration of local vegetation into exterior walls and landscape edges reinforced a direct connection between site and architecture. Physical modelling at this scale increased confidence in the design's feasibility, allowing abstract concepts to be understood as inhabitable, performative architectural spaces.

Reflection and Synthesis

Across the five fabrication series, a layered understanding of sensory and technical performance emerged. Early material testing grounded the palette in structural and environmental realities. Digital and immersive tools expanded perceptual evaluation, while atmospheric testing translated material intent into experiential conditions. The final architectural synthesis consolidated these findings into a cohesive, biophilic, multi-sensory recording studio.

The fabrication process demonstrated that biophilic design extends beyond visual greenery to encompass sound, light, texture, temperature, and atmosphere across multiple scales. By integrating sensory richness with acoustic performance, the design supports user well-being while maintaining the technical precision required for music production.

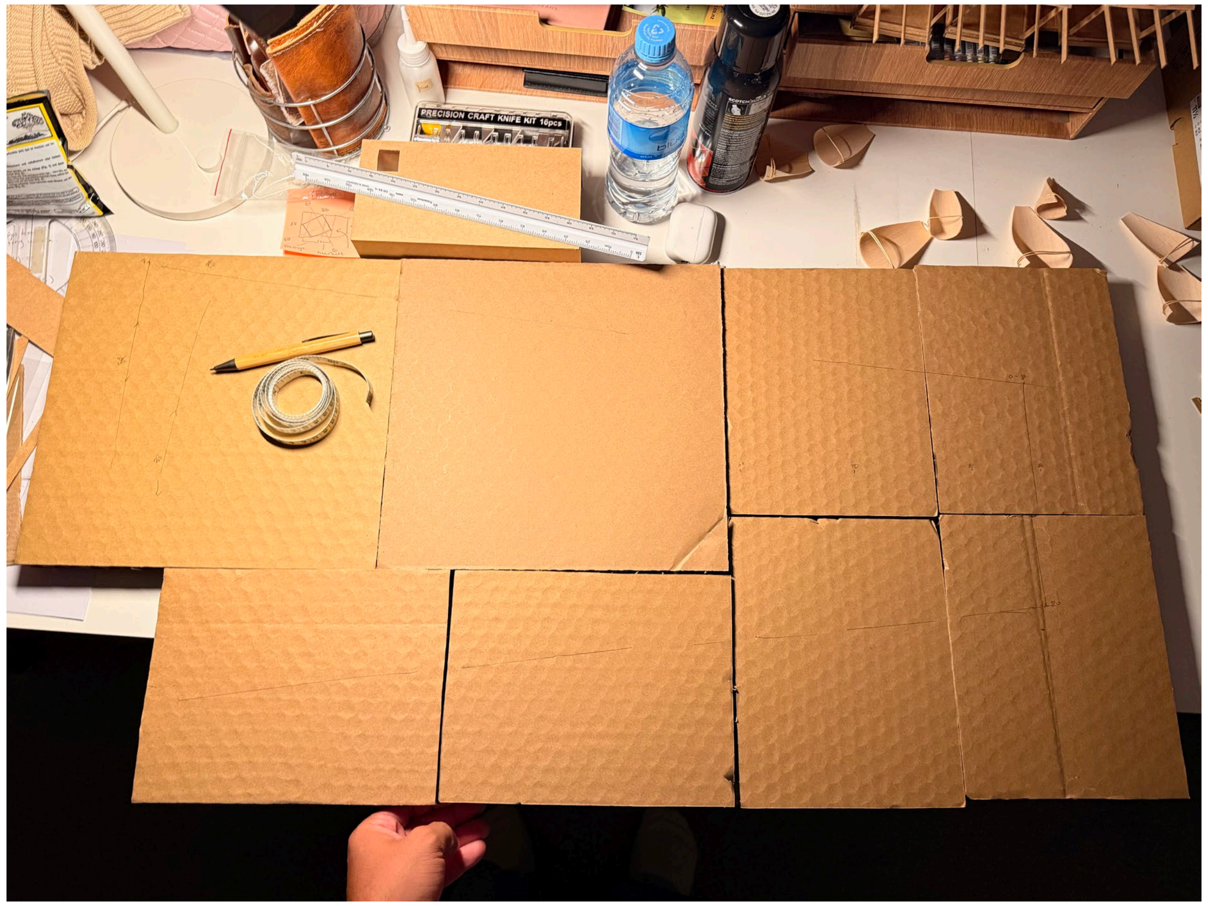


Figure 69: Planning the base for 1:100 model.

Figure 70: Making the base for 1:100 model.

Figure 71: Planning landscape filler.

Figure 72: Filled landscape and zoning areas.

Figure 73: Built studios.

Figure 74: Built underground studio.

Figure 75: Underground studio. Connecting stairs to above ground.

Figure 76: Underground studio.

Figure 77: Showing filled landscape and topography.

Figure 78: Studios above ground and closed underground studio.

Figure 79: Studios above ground and open underground studio.

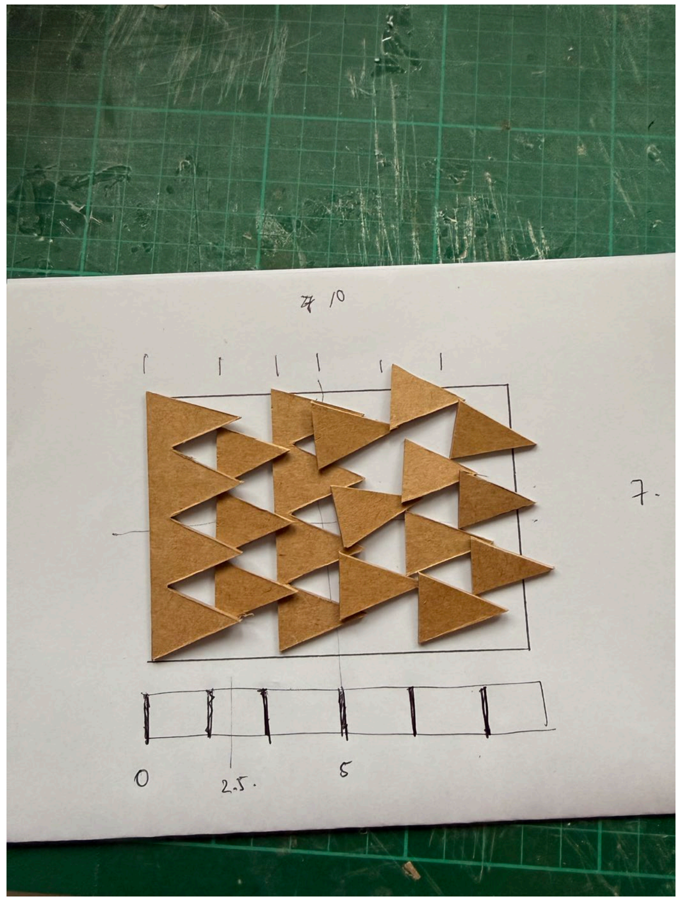


Figure 80: Facade planning and patterns.

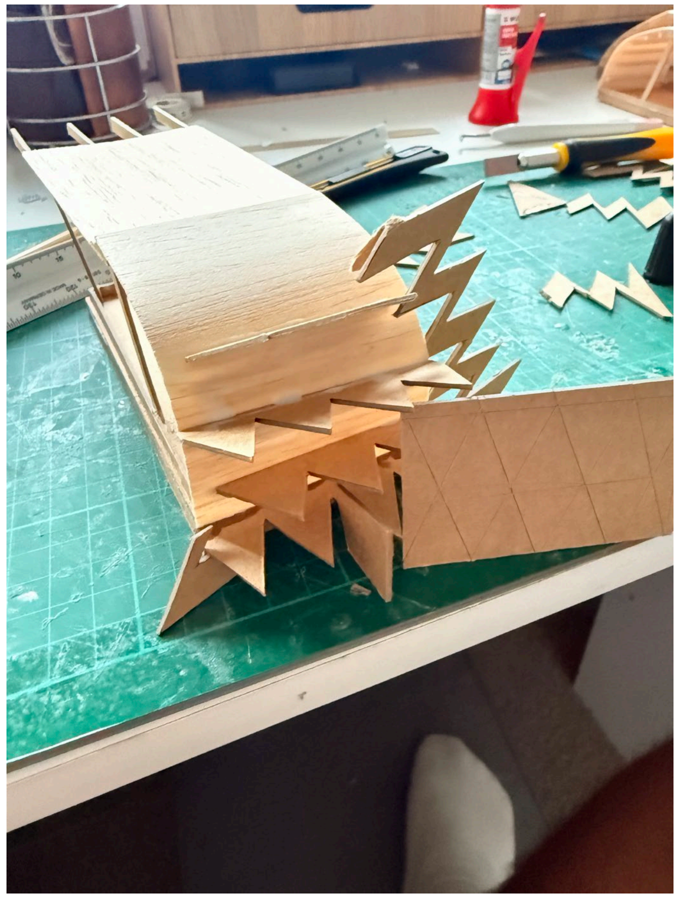


Figure 81: Facade joining with body.

Figure 82: Facade joined with body.

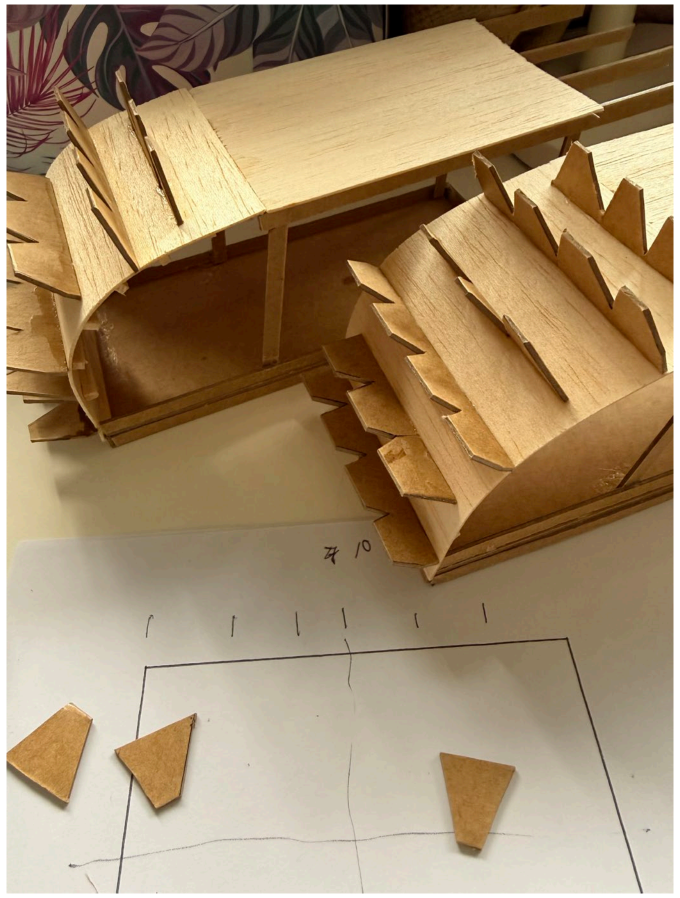


Figure 83: Facade joined with body.

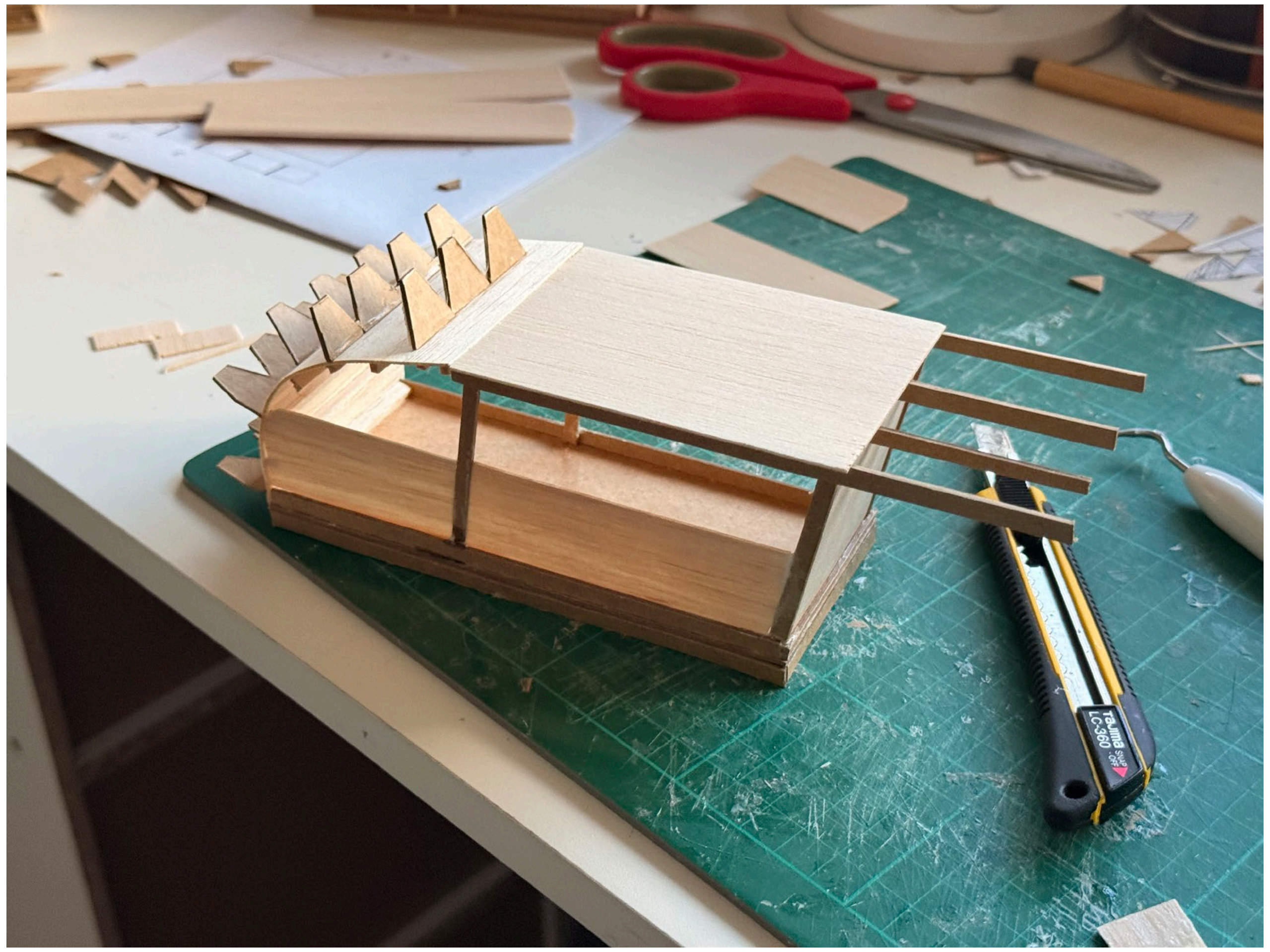


Figure 84: Above-ground studio shape and structural planning.

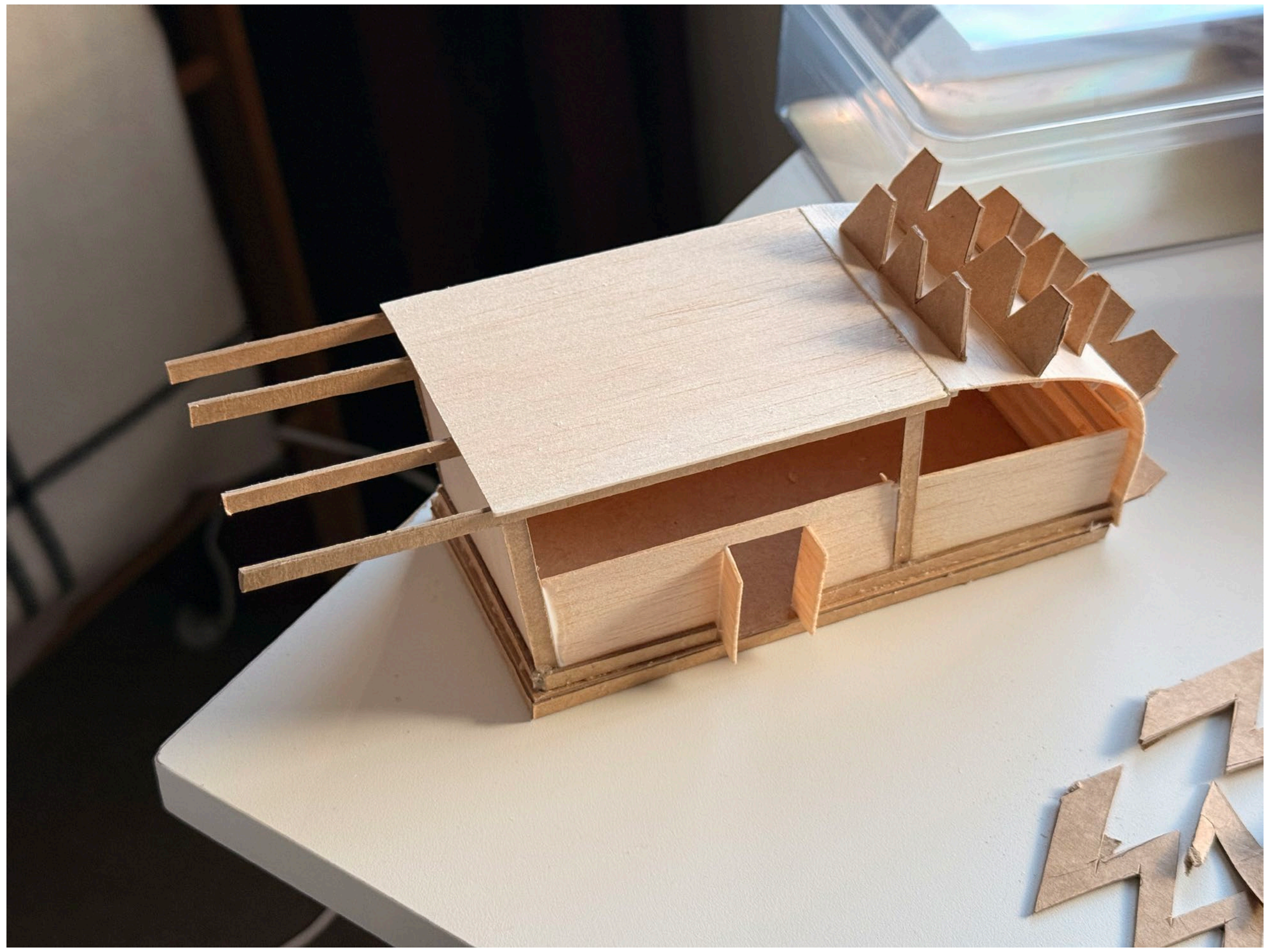


Figure 85: Above-ground studio shape and structural planning.

Figure 86: Side-top angle view of above-ground studio.

Figure 87: Above-ground studio vegetation planning.

Figure 88: Above-ground studio vegetation planning.

Figure 89: Above-ground studio vegetation planning.

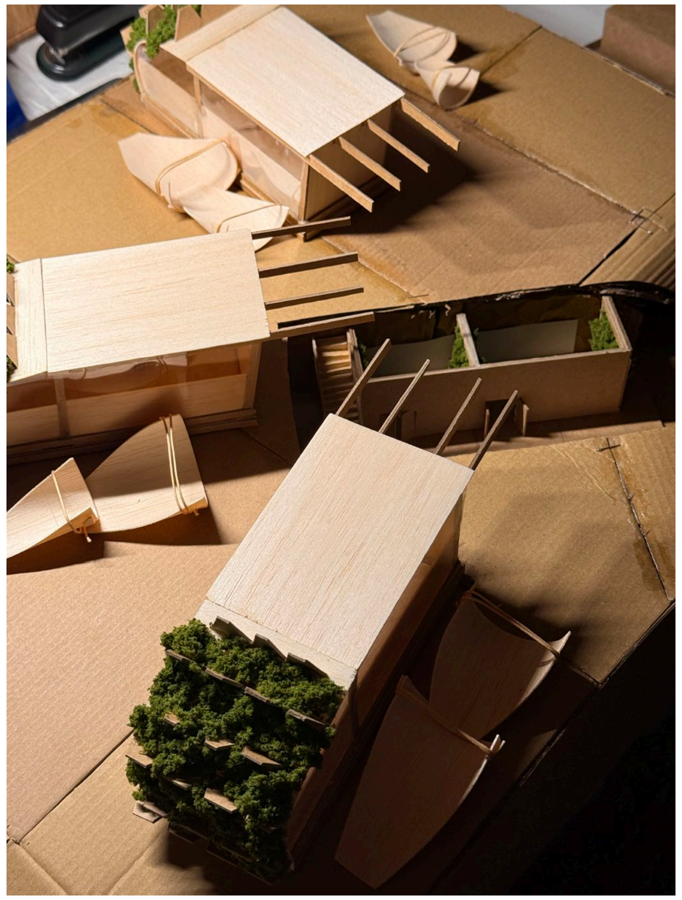


Figure 90: Top view of studio placements.

Figure 91: Side view of studios. Planning space and layouts.

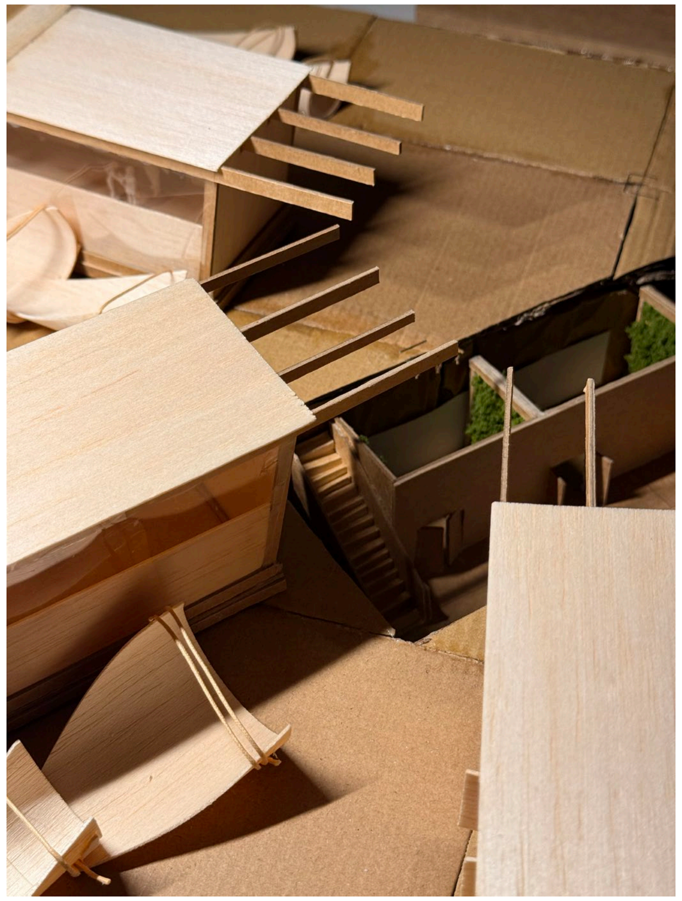


Figure 92: Open underground studio view with above-ground studios.

Figure 93: Understanding scale with people placement.

Scope, Reflection, and Limitations

The fabrication and design development phases confirmed the sensory and atmospheric potential of the proposed material palette, but several aspects remain unresolved at this stage. The acoustic performance of passive ventilation baffling was not empirically tested. The structural feasibility of rammed-earth construction within a hillside setting requires geotechnical assessment (Minke, 2012). Quantitative lux-level analysis of the daylighting strategy was not undertaken. The argument that natural light and passive acoustics can support creative performance involved real compromise: in control rooms, natural light was restricted to indirect elevated apertures to manage glare, and natural sound infiltration was limited to communal zones to preserve recording isolation (Schafer, 1977). These compromises reflect the genuine complexity of integrating biophilic principles within a technically demanding typology (Kellert, 2018) and establish a clear agenda for future development.

Conclusion

This chapter demonstrated how fabrication operated as a critical bridge between conceptual design intentions and architectural resolution. Through a series of progressively scaled material and atmospheric investigations, biophilic and multi-sensory principles were tested and refined within the technical constraints of a music recording studio. Fabrication enabled the evaluation of abstract ideas surrounding sensory experience, materiality, and environmental performance through direct engagement with physical and digital artefacts.

The staged fabrication process confirmed that natural materials such as timber, rammed earth, and vegetated systems can function simultaneously as sensory, acoustic, and environmental devices. Material testing revealed how layering, mass, and surface texture influence sound absorption, thermal comfort, and tactile perception, while atmospheric experiments demonstrated the role of light, temperature, scent, and sound in shaping user experience. Extended reality tools further supported the evaluation of spatial transitions and sensory thresholds from an occupant's perspective.

Collectively, these outcomes refined key design decisions and established a robust foundation for the final architectural intervention.

"Music is an art form that can move people to do things."

- Nina Simone

CHAPTER 6

Integration

Introduction

This final chapter presents the Integration stage of the design process, in which conceptual strategies, material and sensory investigations, and site-specific research are synthesised into a resolved architectural proposal for a biophilic, multi-sensory recording studio. The intervention directly responds to the research question by demonstrating how biophilic design and sensory sequencing can enhance human well-being while meeting acoustic and regenerative performance requirements. Through the integration of material systems, atmospheric strategies, and spatial organisation, the chapter analyses how the final design supports immersive biophilic experience and extends these principles toward broader regenerative urbanism and creative infrastructure.

Site Context and Rationale

Long Bay is located on Auckland's North Shore, adjacent to a coastal ecological reserve and a low-density residential area; within this context, the intervention operates less as a singular building and more as a site-responsive system. The project leverages prevailing coastal breezes, north-facing solar exposure, and existing ecological corridors to structure movement, programme, and spatial hierarchy across the site, aligning with site-based and regenerative design approaches that position climate and ecology as formative design drivers (Mang & Reed, 2012; Beatley, 2017). Public-facing elements, such as a boardwalk, communal market space, and outdoor performance areas, are positioned along natural circulation paths, reinforcing connections between the residential edge and the reserve and supporting social interaction and community engagement. This strategy responds to the established Sunday markets held at Long Bay, recognising an existing pattern of community gathering and integrating the studio as a complementary civic and creative anchor (see figure 94 - 96). These site operations establish a gradual transition from open, socially activated, and environmentally exposed spaces to acoustically controlled studio environments embedded within the landscape. In this way, the site functions as an active sensory gradient, in which climate, ecology, and programme collectively shape the biophilic and multi-sensory experience of the recording studio (Pallasmaa, 2012; Kellert, 2018).

The site analysis conducted in the earlier stages directly informed the intervention by responding to the specific spatial and ecological constraints of Long Bay. The project occupies a narrow strip of land between existing coastal bushland and residential boundaries, requiring a linear, carefully oriented architectural response. Building massing and programme were therefore organised along this elongated site condition, allowing primary spaces to align with north-facing solar access while minimising disturbance to the adjacent bush reserve.

Prevailing coastal winds moving across the open landscape were harnessed through the placement of openings, planted buffers, and changes in section, allowing passive ventilation while simultaneously providing acoustic buffering between public and controlled studio zones. The proximity of dense vegetation informed the integration of the landscape as an extension of the architectural envelope, enabling moments in which indoor studio spaces visually and sensorially reconnect with the surrounding bush.

By responding directly to the site's narrow geometry, ecological edges, and climatic exposure, the intervention treats Long Bay not as a backdrop but as a co-creator of the architectural experience, embedding regenerative principles within the existing coastal ecosystem.

Figure 94: Long Bay Sunday Markets. Outside New World, across from the proposed site.

Figure 95: Long Bay Sunday Markets at the open space in front of New World.

Figure 96: Long Bay Sunday Markets at the open space in front of New World.

Biophilic Design Approach

This intervention aligns directly with the biophilic design principles outlined in earlier chapters (Kellert et al., 2011; Beatley, 2017).

See the following table:

Biophilic Patterns	**Architectural Responses**
Visual connection to nature	Local vegetations on exterior walls of recording studios and communal area planting.
Non-visual sensory stimulation	Moss walls (smell), density of acoustic materiality (sound), tactile/textured timber (touch).
Materiality connection with nature	Rammed earth filled timber framed walls.
Refuge and prospect	Semi-subterranean recording studios with outdoor views.
Natural ventilation systems	Passive when/airflow sections within the design throughout all the recording studios.
Dynamic diffusion of light	Correct positioning/orientation of recording studios, diffusing light with layered timber screens.

Table 2: Biophilic Design Approach.

This approach has moved beyond the aesthetics and stereotypes associated with this terminology, embedding nature as an active design element to enhance artists' mental and psychological well-being.

Sensory Journey: Presentation, Analysis, and Results

The final architectural intervention is organised as a continuous sensory journey that integrates spatial configuration, material performance, ecological rehabilitation, and user experience. The recording studio is conceived not as a set of discrete components but as a sequence of sensory thresholds that guide users from the public landscape of Long Bay into increasingly controlled, acoustically precise environments.

Arrival & Orientation

Arrival occurs from the residential and coastal edge (see figure 97), where the building reads as an extension of the landscape rather than an isolated object. A boardwalk and communal forecourt guide visitors across a narrow strip between coastal bush and built form, using planting, timber structures, and changes in ground texture to signal entry (see figure 104). Sensory engagement is initially visual and olfactory: native planting introduces scent and seasonal variation, while filtered views to the ecological reserve establish a calm atmosphere. Ambient sounds of wind through vegetation and distant coastal activity differentiate the site from its suburban context and intuitively direct movement toward the public edge.

Communal Threshold and Decompression

The communal area at the site entrance functions as a sensory threshold between public and private realms (see figure 97). Constructed from local timber and featuring tree-like structures, it supports informal gatherings, markets, and community events. Daylight, air movement, and acoustic openness contrast with the enclosed studios beyond, enabling users—particularly musicians and producers—to decompress between sessions. This zone operates at both the social and psychological levels, supporting creative recovery through sensory openness before re-entering more controlled environments.

Acknowledging Multiple Soundscapes: Social Density and Acoustic Transition

The Long Bay site presents a layered landscape of overlapping soundscapes rather than a single acoustic condition. At the public edge, the Sunday markets generate a socially dense and temporally variable acoustic environment — voices, music, and movement that reflect community life and seasonal rhythm. The design does not attempt to suppress this but positions the communal forecourt as a zone where social acoustic character is accommodated and celebrated alongside outdoor performance areas (Schafer, 1977).

Moving inward, planted buffers, changes in ground level, and enclosing timber structures produce a gradual attenuation — a perceptible shift from open ambient sound to something more contained. This transition mirrors the psychological preparation required to move from social engagement into focused creative work (Pallasmaa, 2012). Within studio zones, the soundscape is controlled by design, but even here a spectrum exists: above-ground studios retain subtle environmental presence through filtered apertures, while the underground studio offers near-complete isolation for demanding recording tasks (Blesser & Salter, 2007).

Occupancy density introduces an additional acoustic variable that the design must honestly acknowledge. A communal space filled with people during market activity can raise ambient levels by 10 to 15 dB, meaning the acoustic buffer between communal and studio zones must perform under worst-case rather than average conditions (Everest & Pohlmann, 2015). The design addresses this through spatial depth and acoustic lobbies, but simultaneous community events and professional recording sessions will also require operational management. The building cannot resolve this tension through architecture alone — it requires the kind of community relationship that the Te Aranga principle of Ahi Kā encourages (Kiddle et al., 2020).

Underground and Above-Ground Recording Studios

Recording environments are divided between underground (see figure 99) and above-ground studios (see figure 98), each offering distinct atmospheres while meeting professional acoustic standards. The underground studio is embedded within the hillside, with rammed-earth walls providing thermal mass and low-frequency absorption. Reduced visual stimuli and controlled daylight create an introspective setting suited to concentrated creative work.

The above-ground studios maintain a stronger visual relationship with the landscape (see figure 100). Timber finishes provide warmth and acoustic diffusion, while filtered daylight minimises glare and fatigue. Moss panels contribute to sensory softness and environmental regulation, ensuring that acoustic control does not produce a sterile atmosphere. Together, these spaces balance immersion with connection, supporting collaboration without compromising technical precision (see figure 101).

Transition into the Recording Environments

Movement into the studios is marked by gradual shifts in enclosure, light quality, and acoustic pressure. Wayfinding relies on sensory cues: light softens, materials shift from open timber to denser surfaces, and ambient sound is progressively attenuated. Moss panels and earthen textures along circulation paths provide tactile grounding while subtly regulating humidity. These transitions prepare users for the focus required within the recording spaces (see figure 113).

Reflection Zones and Sensory Recovery

Non-production spaces function as reflection zones in which sensory intensity is reduced to support mental recovery. Moss panelling, softer lighting, and moderated acoustics create environments for pause and transition between sessions (see figure 113). These areas reinforce the thesis position that sensory modulation—rather than constant stimulation—is essential for sustaining creativity and well-being.

Analysis and Results

The intervention demonstrates outcomes across spatial performance, sensory engagement, and ecological regeneration. Passive insulation and thermal mass provide year-round thermal stability, reducing reliance on HVAC. Daylight strategies support cognitive focus, while layered acoustic materials meet recording standards without sacrificing sensory richness. Calibrated transitions in light, texture, and sound reduce stress and improve orientation. Ecologically, native planting and water management enhance resilience and environmental performance.

Implications for Future Architectural Interventions

The project illustrates how biophilic and multi-sensory architecture can guide the design of creative facilities in sensitive contexts. Recording studios can operate with low energy demand, enhance well-being, and contribute to ecological systems. By unifying sensory experience, environmental performance, and cultural identity, the intervention offers a transferable model for regenerative, site-responsive design.

Conclusion

The integration presented in this chapter translates the thesis's theoretical foundations, methodological approach, and fabrication explorations into a resolved architectural proposal. Through the integration of environmental responsiveness, multi-sensory design strategies, and cultural awareness, the project demonstrates how architectural research can be synthesised into a coherent spatial and material outcome. The recording studio at Long Bay serves as a testing ground for these ideas, thereby situating the research within a specific ecological and social context.

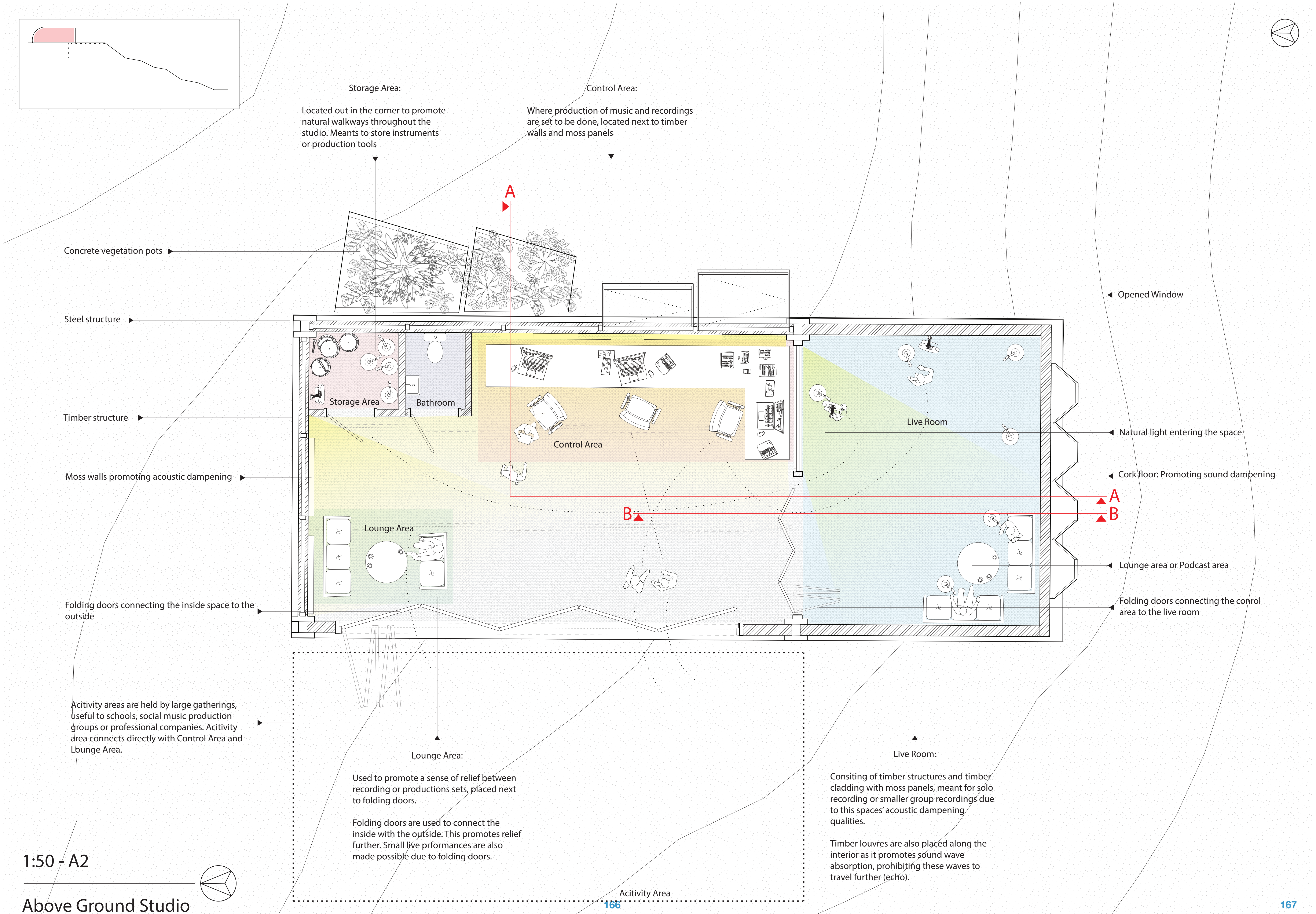
By employing biophilic design principles and multi-sensory sequencing, the studio establishes a textured, tactile architectural environment that engages users physically, emotionally, and cognitively. Material decisions, spatial transitions, and sensory thresholds foster deeper connections between occupants and their surroundings, while the building's embedded relationship with the landscape enables environmental systems to shape experience actively. In this way, the intervention moves beyond the notion of the studio as a purely technical enclosure, positioning it instead as a restorative and creatively supportive environment.

Importantly, the project frames regeneration as both a human and ecological condition. Through passive environmental systems, local materiality, and landscape integration, the intervention supports user well-being while contributing positively to the surrounding ecosystem. This chapter, therefore, presents the architectural resolution to the thesis research question, establishing a basis for the conclusion to reflect critically on the broader implications, limitations, and future potential of biophilic and multi-sensory design within creative architectural typologies.

1:250 - A2

Site Analysis

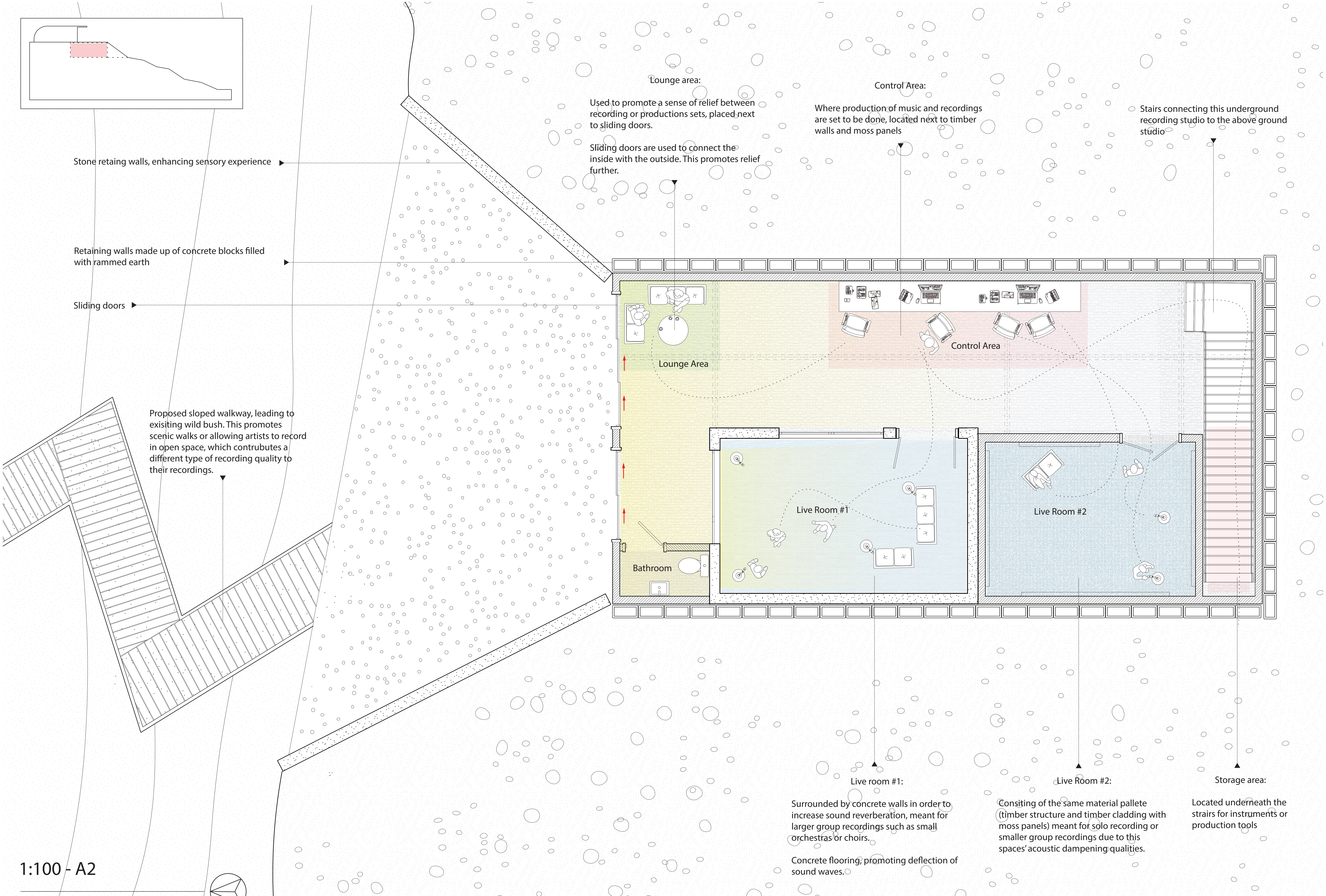
Figure 97: Proposed site in Long Bay.



1:50 - A2

Above Ground Studio

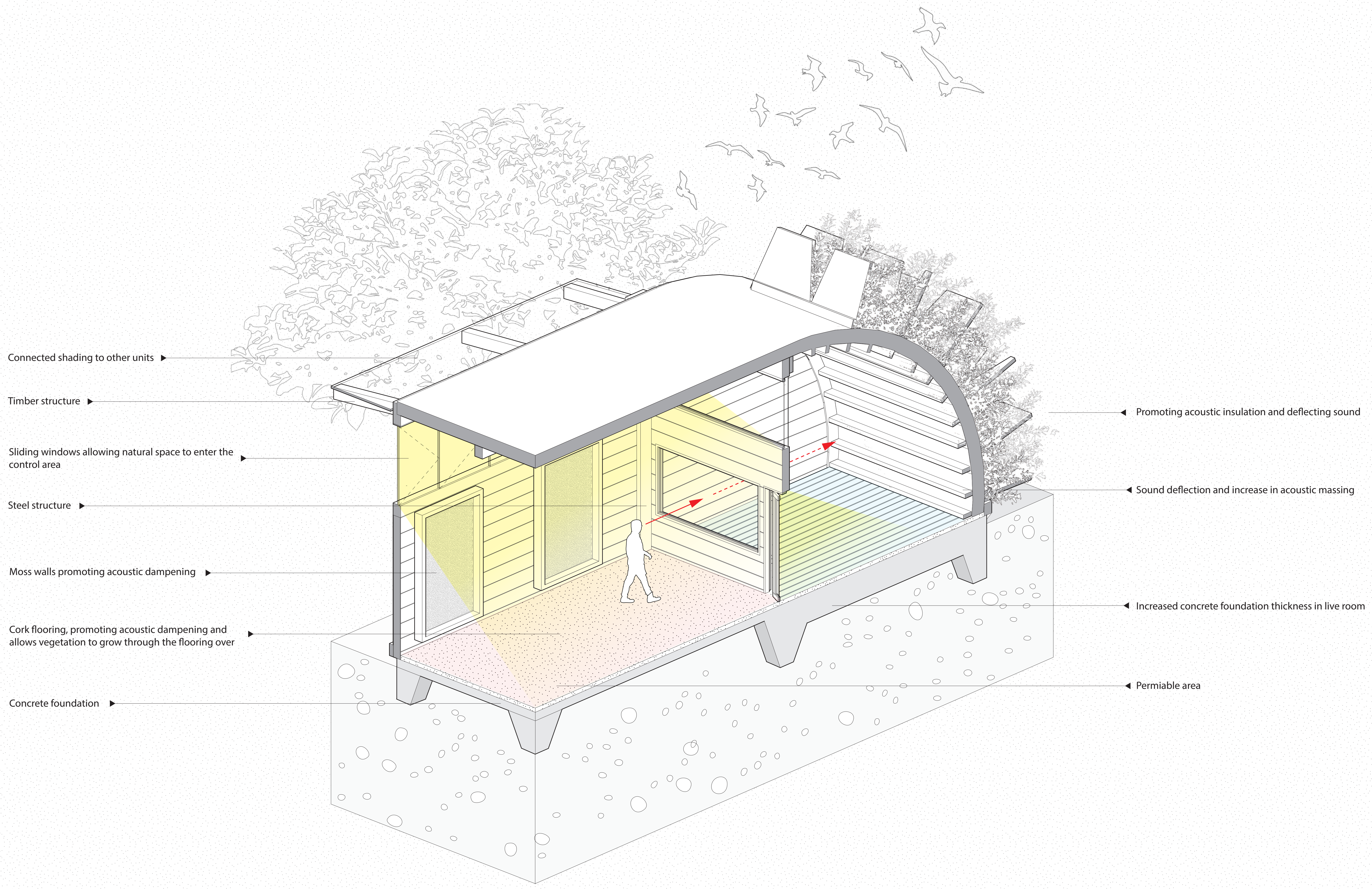
Figure 98: Proposed above ground floor plans.



1:100 - A2

Underground Studio

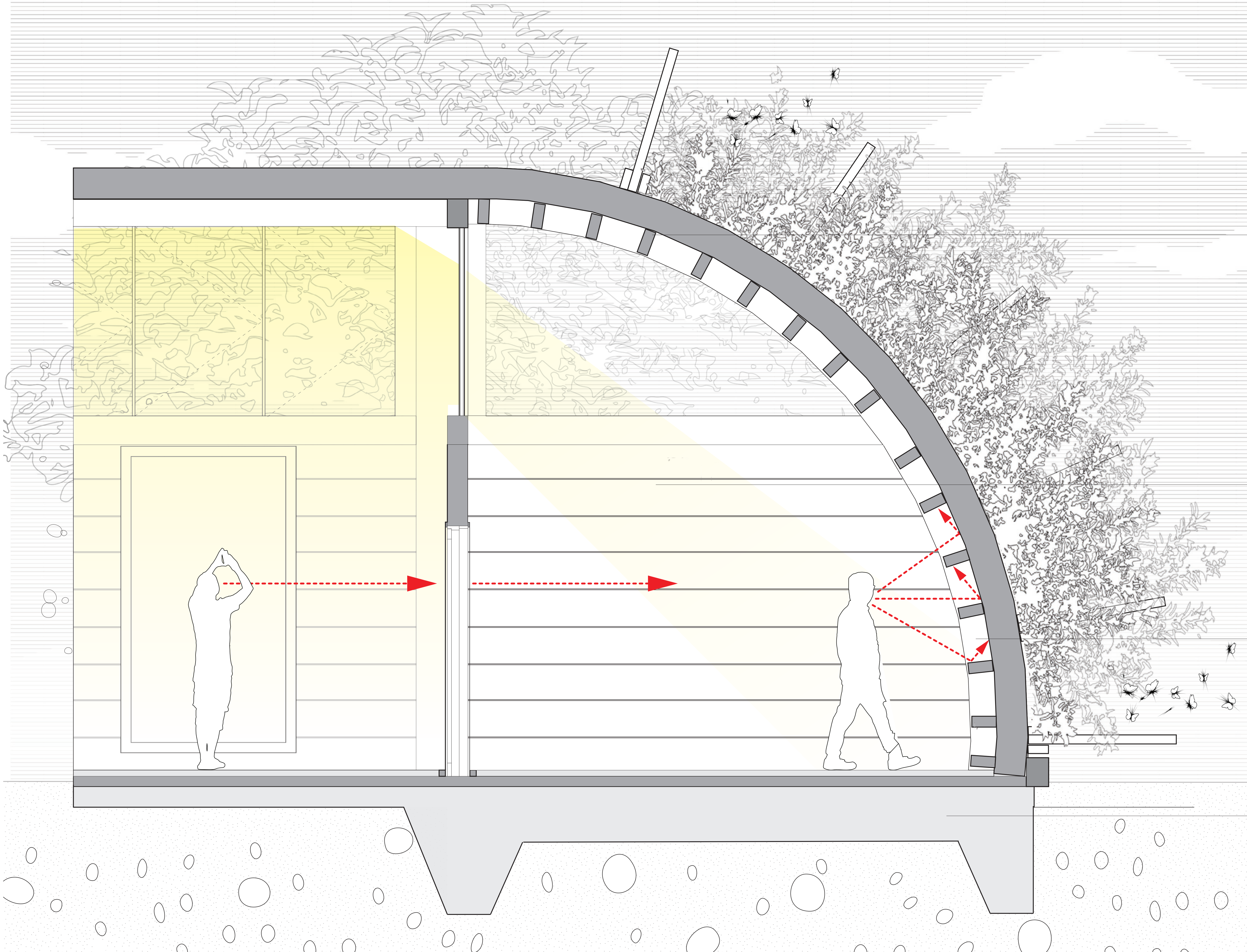
Figure 99: Proposed underground floor plans.



1:100 - A2

Section A-A

Figure 100: Section A-A of the above-ground studio.



Connected vegetation zones:

These steel louvres are meant contain vegetation all along the back of the outer body of the above ground studios.

The vegetation zones are deflecting wind and adding more mass for wall density, improving acoustic density.

This is a symbolic measure of connection between the studios and the site. Providing an organic and biophilic connection to site.

The vegetation zones are self watering, due to its slit design between panels. Through natural rain fall, water can flow down to the next zone, watering the plants.

Live Room:

Moss panels connected to the side walls of the live room due to its sound absorption qualities.

Timber louvres are surrounding the artist in order to deflect sound waves with in the area. This technique promotes sound dampening and prohibits sound waves reflecting back in to themicrophone.

Flooring concist of cork, allowing sound waves to be absorbed.

Sound deflection and increase in acoustic massing

Increased concrete foundation thickness in live room

1:25 - A2

Section B-B

Figure 101: Section B-B of the above-ground studio.

Figure 102: Wide view of the proposed site.

Figure 103: Wide view of the above-ground studio and underground studio.

Figure 104: Walkway leading to underground studio.

Figure 105: Walkway leading to the underground studio and native bush around the studios.

Figure 106: Close-up view of the underground studio and outside area.

Figure 107: Close-up view of the underground studio being used by the community and youth.

Figure 108: Wide view of the community and youth outside the above-ground studios.

Figure 109: Wide view of the community and youth outside the above-ground studios.


Figure 110: Inside the above-ground recording/live room used by the community or professionals.


Figure 111: Inside the above-ground control room used by the community or professionals.


Figure 112: Wide view of the above-ground control room used by the community or professionals.


Figure 113: First-person view of the above-ground control room used by the community or professionals.

Figure 114: Inside the above-ground control room, looking out to the connecting studios.

Figure 115: Inside the above-ground control room used by the community or professionals.

Figure 116: Close-up view of the proposed vegetation, connecting the site physically to the above-ground studios.

Figure 117: Wide view of the proposed Sunday Markets connecting with the existing Sunday Markets at Long Bay.

Figure 118: Wide view of the proposed Sunday Markets next to the car parks.

Figure 119: First-person view of the proposed Sunday Markets across from the recording studios.

Figure 120: Wide-top view of the proposed Sunday Markets across from the recording studios.

Figure 121: Wide view of the proposed Sunday Markets next to the car parks.

"Music gives a soul to the universe, wings to the mind, flight to the imagination, and life to everything."

- Plato

CONCLUSION

CONCLUSION

CONCLUSION

Thesis Summary

Overview of the Research

The research began from the premise that the built environment profoundly affects human well-being, particularly within creative workspaces such as music recording studios. Conventional studios prioritise technical acoustic performance, often neglecting the sensory and environmental dimensions that shape creativity and psychological health.

By integrating biophilic design theory (Kellert, 2008; Beatley, 2017) and multi-sensory architectural thought (Pallasmaa, 2012; Zumthor, 2006), this thesis proposes a new foundation for recording-studio design. The proposed studio becomes ecologically grounded in its site and materially responsive to the rhythms of the surrounding landscape while remaining emotionally attuned to its users. Rather than functioning as a neutral technical container, the studio is positioned as an active participant in the creative process—shaping mood, attention, and imaginative capacity.

By engaging multiple senses through daylight modulation, tactile materials, natural ventilation, and curated soundscapes, the space supports psychological restoration and sensory balance—conditions essential for sustained artistic production. This integration of environmental systems with human experience fosters an environment in which musicians are not merely isolated from distraction but are instead encouraged to enter states of focus, reflection, and play. The studio, therefore, becomes more than a facility for sound capture; it becomes a generative environment that nurtures creativity through ecological connection and embodied architectural presence.

Key Theoretical Contributions

The theoretical framework established four interrelated pillars:

1. Biophilic Design Theory – grounding the project in the human–nature connection and site responsiveness.
2. Multi-Sensory Architecture – emphasising engagement of all senses to create spatial meaning.
3. Regenerative and Indigenous Frameworks – embedding mātauranga Māori and Te Aranga principles to ensure place-based design.
4. Acoustic Ecology – reframing studios as environments that curate sound rather than merely exclude it.

Together, these frameworks positioned the recording studio as a regenerative organism mediating between human experience, ecology, and sound.

Methodological Approach

The methodology adopted a practice-based research model in which design, making, and reflection were primary modes of inquiry. Site analysis, material testing, and iterative model-making—including sensory mapping—translated theoretical knowledge into spatial outcomes. This process enabled tactile learning and intuitive understanding, revealing how materiality and atmosphere influence creative experience. Continuous feedback between models and reflection-informed conceptual refinement ensured alignment between sensory intention and technical performance.

Design and Fabrication Outcomes

Precedent studies and fabrication experiments transformed theory into experimentation. Material tests demonstrated that timber, rammed earth, and vegetated systems can enhance tactile and sensory richness while maintaining acoustic control. The 1:100 site model, supported by photogrammetry and augmented reality, enabled the evaluation of scale, orientation, and atmosphere prior to digital development. These stages confirmed the viability of a studio that balances professional acoustic standards with biophilic engagement.

The final intervention in Long Bay integrated community connection with environmental rhythms of light, sound, air, and landscape, producing a studio that operates as both creative infrastructure and ecological participant.

Major Findings

Biophilic Design as a Regenerative Framework

Biophilic principles have moved beyond visual "green" aesthetics to serve as functional tools for ecological and psychological restoration. Direct experiences—daylight, airflow, vegetation—provide physiological benefits, while indirect experiences—texture, colour, and form—support emotional regulation (Kellert, 2008; Ulrich, 1984). Within the studio, these strategies counteract sensory deprivation typical of sealed rooms, reframing the environment as restorative rather than merely technical (Pallasmaa, 2012).

Local Material and Ecological Integration

Use of regionally sourced timber, earth, and planting reduced embodied carbon while embedding the building within Long Bay's material identity (Mang & Reed, 2012; Minke, 2012). The studio participates in local ecological cycles, strengthening biodiversity and positioning architecture as part of a regenerative network (Beatley, 2017).

Adaptable Atmosphere

Dynamic lighting, natural ventilation, and curated sound supported circadian rhythms and creative flow (Heschong, 2002; Schafer, 1977). Operable systems allow spaces to shift between focus and restoration, enabling the building to collaborate with artistic processes rather than constrain them.

Multi-Sensory Design as a Creative Catalyst

Throughout material tactility, different sound modulations and controlled lighting, multi-sensory design has proved to:

- Enhancing the users' creative performance through reducing stress and providing sensory stimulation.
- Promote the embodiment of engagement, through deliberately making users more aware of their surroundings.
- Create a special identity for each area, which has been layered through sensory cues and guided through movement.

It demonstrates the correlation between the design and the body and its senses, which is critical to achieving this in this environment.

Integration of Regenerative and Cultural Design

The inclusion of Te Aranga Māori principles has ensured that the final design decisions show respect for place, ecology, and cultural narratives. The intervention has responded to Long Bay's requirements and spiritual context by:

- The rehabilitation of local plants/vegetation and water cycles.
- Existing natural topography reflected through the architectural form.
- An encouragement of whakapapa (connection) between place, sound and people.

This reinforced cultural authenticity and supported the project's environmental goals.

Human and Ecological Outcomes

The final design included several outcomes that have been measurable across three scales:

Scale	Outcome	Description
Human	Psychological comfort	The reduction of fatigue through natural modulation.
Spatial	Acoustic and sensory balance	Specific material palette, which supported both absorption and resonance.
	Site rehab rehabilitation	Made of vegetation and planting with natural water systems, restoring the local ecologies.

Table 3: Human and Ecological Outcomes.

The human and ecological outcomes of the final design were evaluated across three interconnected scales: human, spatial, and ecological. At the human scale, the studio environment demonstrated clear potential for psychological comfort through the modulation of natural elements, including daylight, airflow, and tactile materials. These features reduce cognitive fatigue and emotional tension commonly associated with conventional recording studios, thereby supporting more extended periods of creative focus and more effective mental recovery between sessions. At the spatial scale, an acoustic and sensory balance was achieved through a carefully selected material palette combining absorptive and resonant qualities. Timber, rammed earth, and vegetated surfaces provided complementary acoustic behaviours, enabling clarity within recording rooms while sustaining a warm and engaging atmosphere. At the ecological scale, the project contributed to site rehabilitation through native planting, permeable surfaces, and natural water-management systems. These strategies enhance biodiversity, improve stormwater retention, and reconnect the building with the Long Bay ecosystem, demonstrating that a recording studio can operate as a regenerative environment supporting human well-being and landscape restoration.

Answering the Research Questions

This thesis examined whether biophilic and multi-sensory strategies could meaningfully transform the experience of a music recording studio. The first question asked whether biophilic design can enhance well-being in creative environments. The research confirms that it can. When nature is embodied through materiality, lighting, airflow, and sensory modulation, the studio becomes a living system rather than a neutral container. Such environments support comfort, sustained focus, and emotional connection—conditions essential to creative flow. Notably, the findings indicate that natural integration strengthens, rather than compromises, technical performance.

The second question considered whether multi-sensory architecture could enrich sound-based environments. Design investigations demonstrated that engaging non-visual senses—texture, sound, thermal variation, and spatial resistance—adds experiential depth, shaping mood and behaviour. Recording studios can therefore be understood as embodied instruments whose materials and atmospheres participate in the creative act, rather than as purely functional machines.

The third question explored how regenerative frameworks and Indigenous knowledge could inform place-based design. Guided by Te Aranga principles and mātauranga Māori, the project shows that architecture can contribute to ecological and cultural regeneration beyond conventional sustainability. Site responsiveness and respect for whakapapa enabled the design to move beyond universal studio typologies toward an approach grounded in the specific conditions of Long Bay. Together, these responses confirm that a biophilic, sensory-led approach can enhance human well-being while redefining the recording studio's identity.

Correlation with Professional Standards: Initial Findings

Drawing initial correlations between the design proposal and professional acoustic standards reveals that the material and spatial choices made in this thesis are not acoustically naive. The rammed-earth mass walls proposed for the underground studio — with densities of approximately 1,800 to 2,200 kg/m³ and thicknesses of 300 to 400mm — offer mass law performance broadly consistent with the high levels of sound isolation typically required between live rooms and control rooms (Everest & Pohlmann, 2015; Minke, 2012). The layered material strategy of timber diffusion, moss absorption, and earthen mass corresponds to the broadband acoustic approach recommended by Everest and Pohlmann (2015), in which absorption, diffusion, and mass address different frequency ranges in combination.

Achieving NC-20 within the underground studio is plausible given its semi-subterranean positioning, but requires careful mechanical system selection and acoustic detailing at all penetrations (Newell, 2012). Above-ground studios are likely to achieve NC-25 to NC-30 under typical conditions - appropriate for rehearsal and tracking if not for the most critical monitoring tasks. These correlations do not constitute acoustic verification but demonstrate that the proposal engages seriously with professional standards (Everest & Pohlmann, 2015), establishing a credible foundation for the next phase of technical development in which acoustic consultants and engineers would refine and validate the architectural framework developed here.

Evaluation of Research

The research demonstrates several strengths. The integration of theory with embodied design practice enabled the testing of ideas from biophilia, phenomenology, and acoustic ecology through models, materials, and spatial sequencing. Material testing and atmospheric modelling grounded abstract concepts in tangible outcomes, while digital simulation tools enabled immersive evaluation of light, scale, and acoustic behaviour. The Long Bay site provided a meaningful context for exploring ecological, cultural, and community narratives simultaneously.

Limitations remain. Time constraints prevented long-term monitoring of materials and passive systems, leaving some performance claims predictive. Sensory responses were evaluated primarily through self-assessment rather than structured participant studies, and full quantitative acoustic mapping would require post-construction testing. These constraints do not undermine the conceptual argument but indicate the need for future empirical validation.

Future Research Suggestions

Further research could include user and expert evaluation instead to assess long-term impacts on creativity and well-being. Responsive sensory systems could allow environments to adjust light, temperature, and acoustics to users’ needs. Collaboration with musicians, ecologists, and neuroscientists could deepen understanding of how sensory conditions shape artistic cognition. The principles explored here could be tested in community centres, galleries, and performance venues to evaluate broader social value. Expanded partnerships with mana whenua would further embed regenerative projects within kaitiakitanga and whakapapa.

These directions position biophilic and multi-sensory design as a transformative practice capable of uniting cultures, ecologies, and human experience. The thesis concludes that recording studios can evolve from isolated technical chambers into regenerative, emotionally supportive environments that actively participate in the making of music and place.

Final Reflection

The thesis has led me from various theoretical frameworks to material and sensory testing and experimentation, culminating in a holistic architectural intervention. Through biophilic design and multisensory engagement, the music recording studio was transformed into a living landscape for sound—a landscape that restores people to their place and reminds them that creativity is inseparable from the environment and feeling.

My findings confirmed that architecture must be returned to its prime, reawakened by the human senses. By curating a design hand-in-hand with nature, texture, and atmosphere, an architect can craft an environment that resonates with people emotionally and ecologically, allowing space to become an active participant in the creative process rather than a silent container.

In Long Bay, the proposed project demonstrates that nature can compose an architecture that fosters healing. It has shown that a studio can be both a precise acoustic instrument and a sensory refuge, where technology and ecology no longer compete but collaborate.

The thesis has contributed to a growing body of regenerative thinking that argues for today's architecture as an ecological participant and not merely an artefact. It suggests that future creative buildings must be designed not only for performance, but for presence—for how they feel, breathe, sound, and live with their users.

The final recording studio intervention serves as a prototype for sensory regeneration: a spatial symphony in which human creativity can be empowered once again and in which natural systems can coexist in harmony with beauty, culture, and sound.

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"Music is a world within itself."

- Stevie Wonder

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