un·c o m m o n  b o u n d a r i e s
an architectural interface between experience & protection

Master Thesis Explanatory Document
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Abstract

With its isolated location, and variation in climate and land formations, New Zealand is privileged with an abundance of wildlife unique to these islands. Our indigenous flora, fauna, and the environment they inhabit, make up the wealth and depth of our natural heritage. These natural elements are a privilege to experience. However the act of visiting them can threaten their existence, and therefore issues of protection arise. “How do we ensure that we don’t love heritage to death?”

Un-common Boundaries is an investigation into the role architecture can perform as an interface between visitor experience of natural heritage, and its protection. This project is first and foremost an exploration, applying both the review of current knowledge (theoretical and practice), and design process methods to examine this paradoxical relationship in the context of an architectural response.

AUTHENTICITY

This explanatory document has been prepared by Neil Newman in partial fulfillment of the requirements for Unitec’s Master of Architecture (Professional) programme.

I declare that all work included in this document is my own individual work unless stated otherwise, and has been carried out within the guidelines stated in the Unitec Students Handbook. Where work is not my own, it has been cited in accordance with the Chicago Manual of Style (15th edition).

Neil Newman                                    Student # 1316377

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### Table of Contents

1. **Introduction**
   - 0.1 Architectural Question 4
   - 0.2 Project Outline 8
   - 0.3 Definitions 9
   - 0.4 Purpose 10
   - 0.5 Objectives 11
   - 0.6 Limitations 12
   - 0.7 Methodology 14

2. **Research for Design**
   - 1.2 Project Overview 16
   - 1.3 Natural Heritage Protection 22
   - 1.4 Architectural Boundary 26
   - 1.5 Architectural Precedent Study 30
   - 1.6 Limitations 34
   - 1.7 Methodology 36

3. **Research by Design**
   - 2.1 Project Design Brief 42
   - 2.2 Waipoua Forest Analysis Maps 44
   - 2.3 Architectural Precedent Study Drawings 48
   - 2.4 Architectural Precedent Study Summary 52
   - 2.5 Final Design Presentation 58

4. **Conclusion**
   - 4.1 Summary 60
   - 4.2 Critical Appraisal 64

5. **Bibliography**
   - 5.1 Waipoua Forest Analysis Maps 72
   - 5.2 Architectural Precedent Analysis Drawings 74
   - 5.3 Architectural Precedent Study Summary 78
   - 5.4 Final Design Presentation 82

6. **Table of Figures**
   - 6.1 Waipoua Forest Analysis Maps 90
   - 6.2 Architectural Precedent Analysis Drawings 96
   - 6.3 Architectural Precedent Study Summary 102
   - 6.4 Final Design Presentation 108

7. **Appendix**
   - 7.1 Waipoua Forest Analysis Maps 114
   - 7.2 Architectural Precedent Analysis Drawings 120
   - 7.3 Architectural Precedent Study Summary 124
   - 7.4 Final Design Presentation 130

8. **Acknowledgements**
9. **Abstract**
10. **ResearcH foR dESIGN**
11. **Appendix**
1. INTRODUCTION
11 ARCHITECTURAL QUESTION

How can Architecture enhance the public experience of New Zealand’s natural heritage while supporting its protection?

Figure 1: Historic visitor experience.
- (Left) Image of visitors stopping to view large Kauri adjacent to the roadside in the Waipoua Forest Sanctuary - Circa 1946.

Figure 2: Current visitor experience.
- (Opposite) The Yakas Kauri boardwalk, Waipoua Forest Sanctuary - December 2012.
The premise of this research is the concept of an uncommon boundary. To investigate this, we first need to clearly define our understanding of what this title may mean.

**Boundary:**
"That which indicates or fixes a limit or extent"

**Uncommon:**
"not common"
not "belonging equally to or shared equally by two or more"

In isolation, the two terms can be seen to have very different directions; boundary indicates a common connection between elements, whereas uncommon (by its very definition) describes an unequal connection. Together the two words hint at a type of paradoxical treatment between elements, and in the context of an architectural relationship, a potentially ambiguous relationship between architectural form, space and context/environment.

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1.3 DEFINITIONS

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**Uncommon:**
"not common"
not "belonging equally to or shared equally by two or more"

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The intention of this research project is to investigate an architectural response to that boundary condition; explore and analyse the existing interpretations, and propose an Un-Common Boundary that serves both to enhance the public’s experience of our countries’ natural heritage, while supporting its protection.
Following the 2008 Treaty settlement between the crown and Te Roroa, management of the Waipoua (and other nearby conservation areas) came under a partnership approach. The research potential of this issue alone is an entire project in itself, perhaps several. In fact the redevelopment and co-management of the forest’s visitor interventions is the focus of a 9 year project called Rakau Rangatira ‘Chiefly Trees’ between Do.C and Te Roroa with Boffa Miskell Landscape Architects6. Given the restricted duration of this project, and the specific architectural focus of the relationship between experience and protection, this component of the present situation shall be set aside.


Another limiting issue is the extent and effects of the P.T.A occurrence within the Waipoua forest Sanctuary. This is still a relatively unknown threat which has yet to be fully surveyed & identified. This issue alone has potentially serious implications to the enduring health of the kauri, the public’s experience of the forest, and even threatens the formation of the Kauri National Park. At the time of writing there have been both confirmed and unconfirmed instances of infection in the forest. Specific surveying & testing of these areas have started, but the results have not yet been released to the public due to cultural sensitivities. Due to the initial inaccessibility to information surrounding P.T.A and the Waipoua, and the general unknown nature of the infection, this research will take a broad approach to this issue based on information available at the time.

1.4 PURPOSE

The Purpose of this research document and the related design proposal is twofold. Firstly it will satisfy the assessment requirements for the Level 9 Research Project component of the Master of Architecture (Professional) at Unitec, and conclude the academic requirements for this qualification. Secondly it will provide an opportunity to investigate the relationship of architecture to its environment and develop a framework of understanding for later professional work.

1.5 OBJECTIVES

Objective 1 - Investigate issues involved in visitor experience & natural heritage protection.

Objective 2 - Explore the concept of the architectural boundary condition and identify methods of manipulating it to function as an interface between uncommon conditions/requirements.

Objective 3 - Develop and demonstrate a series of architectural proposals that utilize the boundary condition as an interface between visitor experience and natural heritage protection.

1.6 LIMITATIONS

Following the 2008 Treaty settlement between the crown and Te Roroa, management of the Waipoua (and other nearby conservation areas) came under a partnership approach. The research potential of this issue alone is an entire project in itself, perhaps several. In fact the redevelopment and co-management of the forest’s visitor interventions is the focus of a 9 year project called Rakau Rangatira ‘Chiefly Trees’ between Do.C and Te Roroa with Boffa Miskell Landscape Architects. Given the restricted duration of this project, and the specific architectural focus of the relationship between experience and protection, this component of the present situation shall be set aside.

**INTRODUCTION**

The method of research employed throughout this architectural research can be broadly split into two separate, but intrinsically related courses: ‘research for design’, and ‘research by design’.

The first is an analytical stage where current knowledge related to the research question is explored to provide a basis of understanding to influence and challenge the later investigative stage. The second stage utilizes the design process to further explore, test and expand the ‘research for design’ findings, providing potential direction/s for later research work to follow.

**RESEARCH FOR DESIGN**

The “research for design” stage covers three parallel lines of inquiry and analysis in preparation for the “research by design” component.

The first focuses on the current knowledge relating to the issues identified in the research question; Natural Heritage experience, protection and the architectural boundary. This includes a critical review of key concepts & principles described in relevant literature to provide points of reference for the later analysis and exploration work.

The second line of enquiry involves the study of a series of selected architectural precedents, each engaging with issues related to the research question. The precedent study provides not only examples of design responses to particular problems related to the research question, but can also help to further define the design problem/s or suggest others.

The final line of exploration in the ‘research for design’ stage focuses on the chosen site for the research project, identifying characteristics, opportunities and constraints particular to the site itself. This information is then used along with information from the previous lines of inquiry to base the later “research by design” work within.

**RESEARCH BY DESIGN**

The “research by design” component involves an exploration of solutions in response to set design briefs/problems through the process of design. This process is a negotiation from a design problem to a design solution through three distinct activities; Analysis, Synthesis and Evaluation.

- **Analysis:** the defining and structuring of the problems.
- **Synthesis:** the creating of responses to the problems.
- **Evaluation:** the critical appraisal of problems and/or responses.

It is important to note that although this process involves these three activities, there is not necessarily a set start point or finish point. The process could begin at evaluation just as well as it could from analysis or synthesis. Additionally, there is not set “direction of flow from one activity to another”

Throughout the process, investigative drawings (sketches and hard line) and models (digital and physical) have been employed, often interchangeably. Unlike presentation drawings/models which are prepared solely for conveying information to others, these drawings/models should be recognised as ‘conversations’ with the design problem and research question, sometimes with all three design process activities evident in the same drawing.

By requiring the exploration of a series of architectural problems within the design brief instead of a single architectural response, the research project provides the added challenge/opportunity of investigating the research question with differing scales, relationships, and solutions.

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8 Ibid, Page 37.
10 Ibid.
11 Ibid, Page 278.
INTRODUCTION

The opportunity to experience natural heritage wildlife and environments has been described as a “core element in New Zealand’s heritage, identity and culture”[12]. On a daily basis, thousands of visitors from the local areas, nearby cities and overseas countries set out on journeys (individually or in groups) to our country’s natural spaces, and seek out a distinctly New Zealand encounter.

To explore how architecture may have a role in these natural heritage experiences, the experiences themselves must be explored. Definitions for the types of experiences are introduced, along with working frameworks to accommodate the differing types of visitors. The basic requirements for visitor interpretation are described, and the issues of experience protection introduced.


NATURE-BASED TOURISM

The visiting of natural heritage wildlife & environments generally comes under the all encompassing term ‘nature-based tourism’. This type of tourism differs from the other types of outdoor tourism (consumptive based & adventure based) as it “embraces viewing nature as the primary objective”[13]. The activities and experiences available within nature-based tourism can be highly variable depending on which of the A.B.C (Abiotic, Biotic and Cultural) subset elements the visitors are focused on - abiotic elements include geological formations or landscapes, biotic elements involve flora and fauna, and cultural elements focus on an areas historic or heritage attributes.[14] Added to these subset elements of nature based tourism, the experiences themselves are also highly variable with a spectrum of differing values of engagement with the natural heritage attractions, levels of comfort, and degrees of accessibility.


In order to provide for the varying experiences of nature based tourism, and to ensure the relevant facilities are provided for the types of visitors that tend to engage with these natural environments/objects, specific planning systems have been developed. There are several of these systems used throughout the world, however many are derived from one of the first frameworks developed in the USA; the R.O.S (recreation opportunity spectrum). This planning system, also adopted and modified by New Zealand’s Department of Conservation, is used to “identify the range of ‘settings’ appropriate for different recreation activities” and zones these “settings” according to their most appropriate recreational values – “Wheel chair tracks lie at one end of the spectrum, and wilderness at the other.”

The New Zealand R.O.S system incorporates 8 different “settings” or zones in the spectrum, each with their own “recreational opportunities that can be accommodated in that zone.” The settings include:

- Urban
- Urban Fringe
- Rural
- Back Country Drive-in
- Back Country 4x4 Drive-in
- Back Country Walk-in
- Remote
- Wilderness

This system also has an additional layer of information regarding the spectrum of visitors likely to use/visit the different “settings”, categorising them into 7 distinct visitor groups:

- SST: Short Stay Traveller
- DV: Day Visitor
- ON: Overnighters
- BCC: Backcountry Comfort Seekers
- BCA: Back Country Adventurers
- RS: Remoteness Seekers
- TS: Thrill Seekers

With both the setting and the visitor group defined, the R.O.S matrix can be employed as a flexible guidance tool, providing appropriate requirements for the development of experiences, facilities and management systems within natural heritage tourism.

These visitor groups are defined by several factors including; accessibility, activities undertaken, the experiences sought, the degrees of risk present, and the facilities and service sought.
Interpretation is described as “being an educational activity that brings out meaning and enriches visitor experience” 20. When applied to nature-based tourism, it is the communication of ideas relating to the natural heritage element being visited. This communication can be accomplished through many different means; websites, brochures, signs, guided tours and visitor centres are all common types.

It is recognized that when visiting a natural heritage experience, the visitor goes through a series of three cognitive stages; pre contact, contact, and post contact.21 In the pre-contact stage, the visitor “lacks knowledge of the particular tourism experience”22, the contact stage involves the actual engagement with the experience, and the post-contact stage is “where the imbalance between the initial pre-contact phase and the new state of awareness is realized”23. The application of interpretation can not only deepen the visitor’s understanding of the natural heritage object/environment, but also develop an awareness of the need for its conservation24.

Architecture has an opportunity to play a significant role in this process, not just providing support to fix the interpretation panels/signs to, but an active and tangible role in the visitor’s education and experience. An example of this type of engagement can be seen along the General Sherman trail in California USA. Approximately halfway along the walk (from the upper car park to the General Sherman tree) the path widens, and the outline of the giant tree’s girth is represented in a paving pattern. This not only provides a hint of what the visitor is about to see 5 minutes up the track, but on the return trip in the post-contact state, provides another opportunity to experience and re-evaluate the size and shape of this natural heritage element.

20 Newsome, Moore & Dowling, Natural Area Tourism, Page 295.
21 Ibid, Page 300.
22 Ibid, Page 301.
23 Ibid, Page 302.

Figure 9: General Sherman interpretation area
- (Opposite) Interpretation element along the walkway leading to the General Sherman tree in California, U.S.A.
Where visitor numbers have a compromising effect on the experience of a natural heritage space, limits can be placed, either on the numbers that can visit, or perhaps the timing of visits.28 When conflicting activities begin to also negatively affect the visitor’s experience, techniques like zoning are introduced where activities are separated, either in space/location or time.29 Although these differing protection methods may be employed in the form of management strategies of the natural heritage space, opportunities exist for architecture to cater for, reinforce and express experience qualities like ‘natural quiet’.

29 Ibid.

One key value associated with experience protection within natural heritage environments is “natural quiet”. This concept, defined by D.o.C as “the natural ambient conditions or the sound of nature”, has become increasingly threatened, and therefore increasingly more important to protect. There are two main threats to “natural quiet”: visitor numbers, and conflicting activities.30 Increasing visitor numbers (both individually overall and in tour groups) can not only lead to congestion within the natural heritage environment, but also destroy qualities of solitude and “natural quiet”. “People can visit sites in such large numbers they become a distraction to others.”31 Conflicting activities, including activities related to the experience (transport, tour presentations etc) and other nearby-unrelated activities, when carried out adjacent to the “natural quiet” experience spaces can also cause intrusive noise and acutely affect the opportunities to enjoy the natural heritage elements.

31 Alexander, Management Planning, Page 301.
32 Ibid, Page 301.
INTRODUCTION

The protection of natural heritage is the act of keeping safe the legacy of natural objects and environments. The term natural heritage protection is extremely broad; describing a highly variable collection of approaches & techniques dependent on the type of natural heritage element that requires protection. For example; the method of protecting a colony of native birds would be fundamentally different to the methods employed to protect a mountain range.

As a solely human activity, the act of natural heritage protection involves the process of decision making; what should be protected? Why should it be protected? How should it be protected? Because of this, the concept is rooted in values, and therefore an understanding of the fundamental ethical frameworks surrounding it is important.

“It is only through understanding ‘why’ that we are able to decide what we are trying to achieve and what we must do”31.

30 “No other species presumes to make decisions about our environment or the fate of the other species that inhabit the earth”.
31 Ibid, Page 77.

Figure. 12: Natural heritage boundary

“Objective” Purpose made predator-proof fence constructed along the land boundary to protect the Tawharanui Regional Park near Auckland, N.Z. It is to preserve the largely pest-free status of the park.

TWO VALUES / TWO ETHICS

There are two key ethical principles generally discussed regarding the motives of natural heritage protection; the ‘anthropocentric’ (human centred) principle, and the more holistic ‘biocentric’ principle. The distinction between the two relates to the recognition (and also denial) of certain values associated with the natural world, and the justifications for its protection.

Why should we protect natural heritage objects/environments?

- Because we have an obligation to future generations to not foreclose opportunities to the natural world.
   The above statement is one of the common responses when issues of natural heritage protection are posed. It assigns to the natural world an instrumental value (or resource value) only; as it is dependent on the interest humans have with it. This type of ‘subjective’ value is based on an anthropocentric (human centred) ethical principle32 – protecting it because we may need/want it later.

32 Alexander, Management Planning, Page 89.

- Because we are dependent on the natural world for our own survival / interest.
   Although this statement begins to recognise the interdependence humans have with the natural world, the motivation for protection is still founded on the ‘anthropocentric’ ethic and instrumental value – protecting it because of our own self interest for survival.

- Because these objects/environments have a right to exist regardless of human interest.
   This response differs from the previous two due to the recognition that the natural object/environment has an intrinsic value (value in its own right, not just a derivative value relating to human use)33. This concept then becomes an ‘objective’ value based on a biocentric ethical principle (or ‘ecocentric’ when involving an entire ecosystem).


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“A thing is right when it tends to preserve the integrity, stability and beauty of the basic community. It is wrong when it tends otherwise”34.

Two general models of protection derive from the dual values and ethics of natural heritage protection; conservation and preservation. The two terms are often used interchangeably when discussing environmental protection, and although a subtle distinction exists between their true meanings, the intentions of the models can be associated with values which are not generally inherent in the true meanings of the words.

Preservation seeks to preserve the natural world, saving it from damage and destruction (including human utilisation/consumption). This model recognises that natural heritage objects/environments do have intrinsic value and aligns with the biocentric ethical principle.

Conservation of natural heritage, in the true sense of the word, is the act of conserving it. It is the saving of the natural heritage object or environment (or perhaps the sustainable use of it) which will ensure its availability for later utilisation/consumption. In this strictly defined sense of the model, natural heritage is described as having instrumental value and based on the anthropocentric ethical principle.

The conservation model can also be hybridised in a sense and associated with the biocentric ethic when intrinsic values are expressly linked to the classification of the term. An example of this type of developed or hybrid classification can be seen with the definition of conservation in the NZ Conservation Act 1987:

Conservation - means the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations.

Here we see both intrinsic and instrumental values recognised, and perhaps a blurring of the “anthropocentric/biocentric divide”. This hybrid definition of conservation provides a basis for an integrated approach to natural heritage protection, and enlarges “the ethical boundaries of the human community to include soils, waters, plants, animals, or collectively: the land”.

Conservation is about context, about the relationship between species and habitat, and where humans might fit.

AN INTEGRATED APPROACH

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Conservation is about context, about the relationship between species and habitat, and where humans might fit.

36 Ibid, Page 36.
38 Alexander, Management Planning, Page 77.
39 Ibid, Page 86.
40 Young, Our Islands, Our Selves, Page 18.
2.3 ARCHITECTURAL BOUNDARY

**Introduction**

In its most fundamental sense, the architectural boundary is a spatial boundary; an element that defines space. It is the common condition that both defines two spaces from one another, but also relates the two spaces through their mutual connection.

In this respect, the architectural boundary can be recognised as one of Venturi’s ‘Both-And’ elements, with “contradictory levels of meaning and use”\(^{41}\). As opposed to ‘Either-Or’ elements, which are either one thing or another (either open or closed), the Both-And element involves an implied paradoxical contrast (both open and closed), creating tension, ambiguity and allowing multiple readings or understandings to exist\(^{42}\).

The architectural boundary element itself is a flexible device; not only can it be both a formal element, and a spatial element, but it can be both rigidly defined, and alternatively, soft with ambiguous limits and connections. It can also manifest at varying scales in architecture; from an entire building, to a single building component, and even as an implied barrier through formal manipulation.

The following review explores the architectural boundary following the three basic principles derived from Ching’s influential text; Form, Space and Order. Throughout the review, common interpretations of these principles are described, and contradictory variations are introduced, providing the basis for later investigation of an uncommon boundary in the “research by design” work.

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\(^{42}\) Ibid. Page 23.

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The following review explores the architectural boundary following the three basic principles derived from Ching’s influential text; Form, Space and Order. Throughout the review, common interpretations of these principles are described, and contradictory variations are introduced, providing the basis for later investigation of an uncommon boundary in the “research by design” work.
As space begins to be captured, enclosed, moulded and organised by the elements of mass, architecture comes into being. Much like the figure and ground relationship, form and space both oppose and define each other. Together they are the realities of architecture that are inseparable, as one cannot be defined without the context of the other. If we are concerned with space, and the defining of different spaces from each other, form (as the polar opposite architectural element to space) provides the absolute spatial boundary.

Form can be configured to achieve levels of both definition and connection between the spaces it separates through manipulation. This manipulation can be broadly divided into two types; attribute manipulation and formal manipulation. Where attribute manipulation pertains to the attributes of the formal element (e.g. colour, texture, opacity, etc), formal manipulation involves the arrangement of form to effect relationships between spaces.

Ching provides a useful framework to explore and analyse these arrangements by categorising the formal manipulations into two fundamental types; Horizontal elements that define space, and Vertical elements that define space, each with different variations and implications. This framework not only accounts for the three different building surfaces we tend to deal with in architecture (the floor, the wall, and the ceiling/roof), it also covers the spectrum of spatial definition from the fully enclosed and defined space, through to spaces where the boundary is only implied.

**Figures 19:** Horizontal elements defining space.
- Opposite: The four types of horizontal elements that define space.

**Figures 20:** Vertical elements defining space.
- Far opposite: The six types of vertical elements that define space.

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Ibid. Page 94.

Ibid. Page 121.

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**Figures 21:** Form and Space relationship.
- Left: Example of the Figure and Ground relationship describing form and space.
In his influential text, *Complexity and Contradiction in Architecture*, Venturi introduces the formal manipulation technique of contradiction through contrast. Although primarily focused on the role the architectural boundary plays between ‘the inside and the outside’ (the title of the chapter), the technique could justifiably be used to define any two spaces with individual spatial needs. Venturi describes two methods of contrast as a “means of differentiating and relating inside space and outside space” — containment and intricacy. Both work on the premise that “interior configurations can contrast with its container”, be it through the separateness of the interior space to the exterior (containment), or by the difference in shape between the interior space/s and the form that contains it (intricacy).

Venturi introduces yet another method of defining and relating space via contradiction/contrast: un-attached linings. By completely removing the surface/layer of the interior from the surface/layer of the exterior, contrasts between the spaces can be achieved in “shape, position, pattern and size”. This method produces ‘in-between or interstitial space/s’ and begins to explore the role space can play as a boundary element itself by providing the common ground between interior and exterior, “where conflicting polarities can become twin phenomena”.

Again Ching provides a framework that identifies and categorises four different types of spatial relationships where the ‘in-between space’ is the architectural boundary condition.

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46 Venturi, *Complexity & Contradiction*, Page 70.
47 Ibid. Page 70.
48 Ibid. Page 71.
50 Venturi, *Complexity & Contradiction*, Page 74.

Figure 22: The Villa Savoye. - (Left top) Illustrating the contradiction between inside and outside through intricacy - rigid square exterior surrounding an intricate interior configuration.

Figure 23: The Johnson Wax building. - (Left bottom) Illustrating the contradiction between inside and outside through containment - fully enclosing the interior with walls.

Figure 24: Space as the boundary. - (Right) The four categories of space as the Architectural boundary.
As an architectural boundary element, the in-between space also introduces both the opportunity of occupation within the boundary condition, and also commutation, the transition across boundaries – “a moment when one substance, one kind of information discovers a gateway, a flaw, a line of connection to another system”. Leatherbarrow discusses this topological role of ‘in-between spaces’ with two separate examples; the veranda and the breathing wall. Each describes the in-between space as behaving both as space-definers, and also as “instruments of intertwining”, where the qualities/forces of the interior and the exterior (light, shade, climate, enclosure etc) are exchanged, modified, modulated and bound together.

56. Leatherbarrow, Uncommon Ground, Page 186
57. Ibid, Page 186.

The use of the ‘in-between space’ can be developed further with the technique of spatial stratification; the organization of formal elements to “describe a succession of planes or spatial sequences”. This stratification both isolates and combines the spatial by identifying the individual strata, and at the same time combining them in a layered configuration. Here we see the architectural boundary perhaps at its most permeable, as formal definition becomes almost secondary. Form is manipulated to define layers of ‘in-between spaces’ with differing/contrasting spatial qualities (orientation, volume – shallow space & deep space, enclosure etc) and creating “an impression of spatial complexity and distance”.

60. Ibid, Page 10.
61. Ibid.
62. Ibid.

The layering of spatial strata can also be achieved by separating the functions of construction; structure, enclosure shell, shading elements etc, and shifting them horizontally to cause a layered additive arrangement. What is critical with this technique is that the spatial layers overlap, as it is the reading of the succession of layers (one on top of the other) that achieves the effect of depth.
Just as both form and space play significant roles in the defining and connecting of spatial relationships, so too does order. In the context of architecture, order refers to the positioning and organization of formal and spatial elements, and how each part relates not only to other parts, but also to the architectural whole. With regard to the architectural boundary specifically, order can manifest at varying levels; how the building as a boundary element itself relates to its context, how a series of boundary conditions relate to each other within the building, and also how a single boundary condition is defined. Ching introduces the concept of order in architecture with six basic principles, providing a framework to identify and analyse architectural compositions.

Venturi also describes the role of order within the architectural context, with specific focus on the relationship between order and inconsistency. Continuing his overall thesis of contradiction in architecture, Venturi states, "order must exist before it can be broken", providing two justifications for breaking it; the complexities of program and environment, and the inherent limitations of order composed by man.

Another example of how order can be manipulated to affect the architectural boundary is the concept of phenomenal transparency. Unlike literal transparency which describes a material condition (an attribute manipulation of form where the element can be seen through), phenomenal transparency refers to the organisation of overlapping elements, and how "they are able to interpenetrate without an optical destruction of each other". Similar in nature to the well known rabbit/duck drawing, phenomenal transparency allows more than one truth to exist by inviting simultaneous readings through the ordering of overlapping elements, each claiming for itself the common overlapped part. This implies an ambiguous spatial order, as one element can be read both in-front and behind the other, with a continual fluctuation of spatial depth.

These transparent organisations can manifest at the larger planning level also, where architectural form can be manipulated to achieve both forms and spaces attributable to two or more systems of reference. This not only both connects and defines the two system of reference, but also activates and involves the spectator as they become part of the composition through participation, entering the architectural dialogue with possible readings.
2.4 ARCHITECTURAL PRECEDENT STUDY

The following section explores and analyses a series of architectural precedents that engage in visitor experience and/or environmental protection of natural spaces. The precedents can be broadly divided into two lines of enquiry:

Visitor Centres/Facilities
- Waitomo Glowworm Cave Visitor Centre
- Te Mata Trust Park Proposed Visitor Centre
- Aniwaniwa Visitor Centre

Experience Interventions
- Ruakuri Cave Entrance
- Te Rewa Rewa Pedestrian Bridge
- Redwood (Yellow) Treehouse

Particular importance has been placed on a local NZ focus for the architectural precedents. This is in part due to the inherent similarities of program & experience types, but also provides the added opportunity to visit them (where possible) & gain direct firsthand experience of their performance.

Each precedent is briefly described, including the type of natural tourism experience, the R.O.S setting, and the Visitor group associated with it. Precedents are also analysed within a diagrammatic framework (refer to Appendix 7.3) based on Ching’s Five basic systems of Architecture:

- Context
- Spatial system
- Circulation
- Enclosure
- Structure

The graphical format is derived from an analysis system used in Clark & Pause’s Precedents in Architecture. The system utilizes a set of diagrams to “convey essential characteristics and relationships” in various architectural works, and establishes a standard so that comparisons can be made between studies.

74 Ching, Architecture – Form, Space, and Order. Page XII
2.4.3 RUAKURI CAVE ENTRANCE

DESCRIPTION

The Ruakuri cave is a popular tourist attraction in the Waitomo limestone caving network. It was first opened to visitors in 1904, and is now the longest guided caving attraction in the country (approx. 1.6km long) with several notable features including large caverns, subterranean rivers, waterfalls and close encounters with Glow-worms & cave formations. New work to the cave system commenced in 2004 to provide a redeveloped walkway and a new visitors entrance, protecting the original cave entrance which was a Wahi Tapu site containing an old Maori burial site.

The new entry to the cave (called the drum) was created by boring down from the surface at a predetermined spot where the cave system was particularly shallow. This 10m dia. hole extended 12m below ground level to meet the cave, and was covered over at the surface level and finished to appear as a natural limestone bluff, with large doors set in a shallow cave entry & exit spaces.

Inside the drum a 160m long suspended spiral walkway was constructed, not only providing an accessible ramp for visitors to enter the cave with, but also a dramatic man-made cavern space to begin the guided journey.

76 http://www.waitomo.com/ruakuri-cave.aspx (accessed on 05/11/2012)
77 http://hawkinsconstruction.co.nz/ruakuri-cave/ (accessed on 08/11/2012)

Figures. 32: Cave entrance exterior
- (left top) Exterior of new Cave entrance detailed to appear as a limestone rock outcrop

Figures. 33: Cave entrance ramp
- (left bottom) View from the bottom of the spiral ramp looking up

Figures. 34: Cave entrance interior
- Photo looking down into the spiral ramp entrance for the Ruakuri Cave. Water is continuously dripped onto the limestone rock located in the centre of the space to illustrate to visitors how the caving network was formed.
The Te Rewa Rewa bridge is a pedestrian and cycle bridge spanning 68.7m across the Waiwhakaiho River on the outskirts of New Plymouth. It was officially opened in 2010 as part of the extension to the existing coastal walkway system, linking the New Plymouth port & city centre to the neighboring suburb of Bell Block. The bridge is steel tied–arch type design and displays a series of cultural references and contextual relationships specific to its setting. The 19 curved steel ribs run along the western side of the bridge deck, not only creating a sense of shelter from the prevailing coastal wind direction but also, as the ribs open up to the south, they provide and direct an unobstructed view to the nearby Pa site on the sacred Rewa Rewa Reserve. The large steel arch (which supports the curved ribs) crosses the bridge from right to left, signifying a Waharoa (gateway) to visitors as they cross into sacred Maori land. The bridge is further connected to its wider context by its orientation, directly aligning to the peak of Mt Taranaki, and framing it for visitors as they cross towards New Plymouth.


79 Ibid, Page 490.


Figure 35: View crossing the Waiwhakaiho River.
- (Left centre) Design of the bridge framing the view of Mt Taranaki. Relationship between bridge and mountain also emphasised with the use of colour.

Figure 36: Connection through axis.
- (Left centre) Bridge with walkway and connection to the reserve carpark area.

Figure 37: Aerial view of the bridge.
- (Opposite) Bridge spanning the Waiwhakaiho River.
The Redwoods Tree house (formerly known as the Yellow Tree house) is a 10m wide timber framed and covered platform supported approximately 10m above the ground by a large Redwood tree located in its center. The design and construction of the tree house was part of a ‘reality TV-type advertising campaign for Yellow in 2008 – 2009. The campaigns followed the progress of Tracey Collins, who was challenged to build a restaurant using only the Yellow pages (incl. also online and mobile applications) to assemble the team and source the materials to complete the project.

The tree house is accessed via a 60m long elevated walkway that zigzags between platforms, supported both by timber poles and nearby Redwood trees. The internal space of the tree house is split in two along the central axis with half of the floor raised 600mm. The separation between the spaces is further defined by the bar area cabinetry, the central supporting tree trunk, and a small flight of steps between levels.

Careful consideration of the relationship between the building and its context is evident, with its organic pod-shaped form and scale, creating a memorable statement without dominating its setting. Design decisions in both material and architectural detailing can be seen to further reinforce this relationship with the enclosure fins that “mimic verticality of the redwoods and allow the construction to blend naturally with its surrounding.”
2.4.4 Waitomo Glowworm Caves Visitor Centre

Description

The new Waitomo Glowworm Caves Visitor Centre designed by Architecture Workshop provides a contemporary example of the relationship of public experience and natural heritage. The Centre, which opened to the public in May 2010, “serves as an open ended shelter leading to the main attraction”86, and mediates between the open public entry and the enclosed spaces within the Glowworm caves.

A key design component of the visitor centre is the large vaulting canopy constructed of laminated veneer timber supporting inflated translucent EFTE (Ethylene Tetrafluoroethylene) air-pillows, allowing both natural light and shadow into the covered spaces. The canopy structure, with cultural references to a “woven hinaki or narrow-necked eel trap”87, has been described as an innovative display where “architecture and engineering meet seamlessly”88.

Under the large floating roof structure, the building contains an “arrangement of paths, enclosed spaces and decks”89 that gently organises the flow of visitors (up to 500,000 per year) to the caves90. The grid shell canopy not only shelters and maintains connection between the collection of deck and path spaces, but also provides an “intriguing blur of interior and exterior”91 between the centre and the surrounding Kahikatea forest.

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90 Ibid, Page 62.

91 Ibid, Page 62.

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Figure 41: Visitor centre entrance.

- (Above) Photo looking from the carparking area towards the main entrance of the visitor centre.

- (Right bottom) Raised timber walkway leading from the Glowworm cave back to the visitor centre cafe, gift shop and exit.

- (Right top) Tunnel crossing under Waitomo Caves Road leading from the carpark area to the Visitor Centre entry.

Figure 42: Return walkway experience.

- (Right bottom) Raised timber walkway leading from the Glowworm cave back to the visitor centre cafe, gift shop and exit.

Figure 43: Road crossing circulation.

- (Right top) Tunnel crossing under Waitomo Caves Road leading from the carpark area to the Visitor Centre entry.
The Te Mata Visitor Centre is an unbuilt proposal for the Te Mata Trust Park in the Hawkes bay, home to the Te Mata peak, and 98 hectares of forest park. The peak, at 399 metres high above Hawke’s Bay allows unobstructed panoramic views of the wider context.

The Proposal, designed by Architecture Workshop, will provide “a meeting place for park user groups, space for education programs, a cafe and facilities, such as toilets, for the more than 200,000 visitors the peak attracts each year”. The Te Mata peak site is described as “a theatre of far looking”, and the proposed design for the new visitor centre responds to this with its ‘circular-jetty’ type form. Visitors can walk along the roof/viewing level & experience a multi-varied outlook as they circulate.

The lower / Ground level, occupies approx. half of the circular plan, the internal spaces open out onto a central open space courtyard that maintains the existing contour, and connects to the wider landscape. The building is accessed from the carpark via a sunken trench that withholding the panoramic view so it can be celebrated by the visitor as they enter the building.
The Aniwaniwa Visitor Centre, formerly the Te Urewera National Park Visitor Centre was designed by renowned NZ Architect John Scott in the early 1970’s. The centre sits amongst the forest in Te Urewera National park, located on a small ridge leading towards the nearby Lake Wairakei, and adjacent to the Aniwaniwa Falls. Since 2010 the building has remained vacant due to an Earthquake Pron/Immunary Building Notice being placed on it by the Wairau District Council, with DOC services relocated to a converted cottage across the road.97 Amid indications that the building maybe demolished in 2009, local iwi, Architects, and heritage professionals protested for its survival98, and in 2012 the building was listed as a Category 1 historic place.

The building is described as “a series of pavilions built on a sloping site in the bush. The centre is both a tree hut and another church”99. The design of the centre is particularly notable for its relationship to the surrounding context; “the Aniwaniwa Visitor Centre connects us with the spirit of the Urewera - the bush, the water, the sounds and smells, the light”100.

Approaching the centre, visitors are directed via an elevated walkway that winds through the bush before directing them to the entry, highlighting the surrounding environment. This connection is further reinforced within the building by the series of considered outlooks directing and framing the visitors gaze back out to the forest.101

“Architecture is an experience, not a thing”102

Figure 49: Aniwaniwa entrance shelter.
- Top photo: Looking towards the entrance shelter with the position type forms of the centre disappearing into the forest context.

Figure 50: Entry walkway in the forest.
- Right top: Photo looking along the entry walkway, separated from the building by interstitial forest space.

Figure 51: Building entry.
- Right bottom: Photo looking from the entry walkway landing up the steps, towards the centre building entry.

98 Ibid. Page 3.
100 Ibid.
102 http://www.johnscott.net.nz/pages/aniwaniwa.html (accessed on 08/04/2013)
2.4.7 ARCHITECTURAL PRECEDENT STUDY SUMMARY

The following is a brief summary of key aspects from the Architectural precedent study that have been influential in the ‘research by design’ section of the project.

BUKURUCAVE ENTRANCE
- Circulation: Although the cave entrance is used both to enter and exit the cave, the circulation experience differs. There are separate entry and exit points from the same space, providing differing experiences for the visitors.
- Spatial: The interior surface of the entrance is not detailed or finished to look like a cave, however the spatial quality is reminiscent of the large cavernous spaces that the entrance leads on to.
- Enclosure: The enclosure of the cave is detailed to look like a natural cave, providing a contradiction between inside and out through intricacy.

TE RERIA PEDESTRIAN BRIDGE
- Context: The bridge uses the ‘axis’ principle of order to connect the two natural features of the site, the river and the mountains.
- Spatial: The opening of the rib forms create two distinct spaces with corresponding experiences; one of a threshold, and the other of prospect over the immediate context.

REDWOODS (YELLOW) TREE HOUSE
- Circulation: Entry via raised walkway with large expressed landing areas to stop and view out.
- Enclosure: Strong circular form that has undergone manipulation (cracked and shifted horizontally) to allow entry into the tree house, and connection (view out) to the surrounding forest (refer to sequence sketch below).
- Context: The use of organic form and vertical detailing to connect to the forest context.

TE MATA TRUST PARK VISITOR CENTRE
- Circulation: Defined entry (also exit) between the two main internal spaces.
- Enclosure: Strong circular form that has undergone manipulation (wedge removed) to allow connection to the natural setting - both wide contextual views out, and intimate courtyard experience with the forest penetrating the circular shape (refer to sequence sketch opposite).
- Context: Pure geometric form, no attempt to hide/blend in with the context. Instead the building is a datum, independent of the immediate context, but strongly related to the wider views.

REDWOODS FIGURE 52: House formal manipulation.
- (Left) Sketch sequence of formal manipulation.

WAIKAWA VISITOR CENTRE
- Circulation: The building acts as a collection of built forms that purposefully direct visitors in and out of the cave attraction. At the entry the visitors are funnelled through a corner defined by the ticketing offices and the bathrooms. As they exit, the visitors are then directed through the cafe and gift shop.
- Spatial: Although the planning of the building may begin to suggest some sort transparent organization, the singular roof form negates this, providing a continuous surface over all spaces. The contradiction of inside and outside through containment in the bathroom area leads to spatial qualities reminiscent of the caves themselves, achieved via the design of the openings and the lighting.

REDWOODS FIGURE 53: To Mata Visitor Centre formal manipulation.
- (Right) Sketch sequence of formal manipulation.

WAIKAWA VISITOR CENTRE
- Circulation: Entry via raised walkway with large expressed landing areas to stop and view out.
- Enclosure: Strong circular form that has undergone manipulation (cracked and shifted horizontally) to allow entry into the tree house, and connection (view out) to the surrounding forest (refer to sequence sketch below).
- Context: The use of organic form and vertical detailing to connect to the forest context.

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- Circulation: Defined entry (also exit) between the two main internal spaces.
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- Context: Pure geometric form, no attempt to hide/blend in with the context. Instead the building is a datum, independent of the immediate context, but strongly related to the wider views.

REDWOODS FIGURE 54: Waitomo Glowworm caves visitor centre Bathrooms.
- (Right) Interior view of the visitor centre bathrooms illustrating the containment of the space, and the opening detailing.

Aniwhana Visitor Centre
- Circulation: Developed entry system that not only doubles back on itself, but also sets up small exterior spaces that allow connection to the context.
- Enclosure: Overall form is broken up and appears not as one built element but perhaps several connected elements. This allows for multiple readings depending on location.
2.5 PROJECT LOCATION: WAIPOUA KAURI FOREST

The project site is located within the Waipoua Kauri Forest Sanctuary, on the western coast of Northland. This Sanctuary, which covers an area of 12,544.7 hectares, includes “the largest remaining tract of old-growth Kauri forest in New Zealand – a type now reduced to less than 2% of its original extent”\(^{103}\).

The Forest is a key tourist destination along the west coast of Northland, an area marketed as the Kauri Coast. It is experienced by international and national visitors alike, with overseas tourists (62%) making up the majority of overall visitors, and visitors from Auckland (38.5%) making up the majority of domestic travellers\(^{104}\). State Highway 12 traverses through the forest (generally in a north / south direction), offering up-close views of magnificent stands of tall Kauri, Rimu, Northern Rata, and at certain places, expansive views over the forest and the nearby coast.\(^{105}\) Several public walkways have been formed through the forest, including tracks leading to the 1st, 2nd and 7th largest living Kauri trees in the world (Tāne Mahuta, Te Matua Ngahere & the Yakas Kauri respectively), all within approx. 2km of each other.


\(^{104}\) Ibid, Page 23.

\(^{105}\) http://www.doc.govt.nz/parks-and-recreation/places-to-visit/northland/kauri-coast/waipoua-forest/activities/ (accessed on 02/03/2013)
The New Zealand Kauri tree (Agathis australis) has been described as a “Ghost of Gondwana”\(^{108}\); a living remnant of the Gondwanan super continent which today’s New Zealand split from over 80 million years ago. With the potential to live for thousands of years, these trees can attain giant proportions with known examples of trunk girths up to 66 feet, and clean bole lengths of 100 feet\(^{109}\). Although neither notable for overall height, or age, what makes the Kauri tree distinct from other large trees around the world is the tendency for uniform trunk girth, from the base of the tree through to the first branches (often well above the surrounding forest). This characteristic, which allowed tremendous yields of straight grained, millable heart timber with little wastage due to tapering\(^{110}\), together with the favourable qualities of the timber itself, made the Kauri such a valuable resource/commodity for the early New Zealand inhabitants.

Once covering the length of the country\(^{111}\), Kauri trees retreated to the Northern half of the North Island (southern limit defined by a notional line between Tauranga and Kawhia) due to a series of changes in climate during the last ice age\(^{112}\). This last vestige of primeval Kauri forest (which existed nowhere else in the world) was then further reduced with the arrival of humans, first the early Maori, and then later to a much greater extent by European colonists. Now only small pockets of old growth Kauri forest remain, and even these areas have generally been subject to some sort of human interference; either through selective logging, gum recovery, or disruption from introduced animals.

Although native only to New Zealand, the Kauri forest has been described as bearing striking similarities in compositional structure to the tropical jungles of Australia & the Malaysian archipelago\(^{113}\) (perhaps not surprising, due to their common Gondwanan ancestry). It is this highly mixed composition (both in individual species and in their age/lifespan) of the Kauri forest that allows such clear stratification of the forest structure to be evident\(^{114}\). This vertical layering of the Kauri forest becomes a common principle when viewed at the wider structure of the Waipoua Forest, with altitudinal separations in forest composition, from the high Eastern plateau, through to the low Western coast line.

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\(^{109}\) The Kairaru Kauri tree was found in the Tutamoe forest around 1870, and lost to forest fires in the area around 1900. - Source: G.E. Adams, *Kauri – A King among Kings*, (Auckland, N.Z: Wilson & Horton Ltd, 1977), Page 10.


\(^{111}\) Studies have found evidence of historic Kauri forests throughout the country. Examples include kauri wood found in lignite strata near Cape Maria van Diemen, and fossilised Kauri gum found among coal deposits from Kaitangata in Otago, to Hikurangi in Northland at depths of up to 300 feet. - Source: A.H. Reed, *The Story of the Kauri - in Word and Picture*, (Wellington, N.Z: A.H & A.W Reed, 1953), Page 17.

\(^{112}\) Reed, *The Story of the Kauri*, Page 18.


\(^{114}\) Ibid, Page 22.
KAURI NATIONAL PARK

Since the publishing of Leonard Cockayne’s botanical report in 1908, there have been calls for the Waipoua forest to be designated as a National Park.115 Currently New Zealand has 14 National parks, four in the North Island, one on Stewart Island (Rakiura National Park - the latest to be designated in 2002), and the remaining nine in the South Island. Although much smaller than any of the existing National Parks (unavoidable due to fragmentation of old growth forests containing Kauri), the proposed Kauri National Park (13,887.9 Ha) would be the only one to include distinctive Northern flora and Fauna (notably Kauri), and a ‘mountains to sea’ sequence of natural forest116.

After the 2008 treaty settlement between the Crown and Te Roroa, the main obstacle identified in the previous 1988-1995 National Park investigation/proposal was removed117. In 2011 a new proposal for a Kauri National park was prepared by the Department of Conservation which would include the Waipoua Forest Sanctuary and two smaller neighbouring reserves (Trounson Kauri Park Scenic Reserve & Maitahi Wetland Scientific Reserve), with the potential to add to the park later as further treaty settlements are resolved118. The proposal has passed several milestones in the process of becoming a potential reality, and the country’s 15th National park.

117 Ibid, Page 8.

The Waipoua forest is broadly categorized as a Kauri Dieback (P.T.A) highly contaminated site, with several confirmed positive tests (including two areas adjacent to the iconic Tane Mahuta)119. To date, most of the confirmed positive test sites have been located on the Western, more accessible side of the Highway, with only one positive test site located well within the Eastern side, adjacent to the historic Toronui Tree walking track120. Such is the threat from this fast spreading fungus-like disease; there have been calls to place a Rahui (or ban) on the public entering the forest in order to protect the Kauri121. Although drastic, this is in keeping with a leading P.T.A study on the Waipoua forest which has concluded that an “emphasis must be on keeping the environment of the existing kauri as healthy as possible, and restricting the spread within (to key sites) and from the forest”122.

Current measures undertaken within the forest include new raised board walks along certain popular walkways, and several signs along the walking trails. A single disinfecting wash station is located at the entry to the main Kauri walks area, and two tracks; the Rickers walk & the Yakas link walk have been altered/shortened.123

120 Beauchamp, A.J, “Preliminary assessment of the relationships between symptomology and detection probability of the targeted sampling of Waipoua forest for Phytophthora Taxon Aegata”, Page 3.

Refer also to Appendix 7.1 for general description of Kauri Dieback disease/P.T.A.
SITE DESCRIPTION

The Project site is adjacent to the iconic Tane Mahuta, the largest living Kauri tree in the world. Estimated at over 2000 years old, this giant tree displays a trunk girth of 13.77m, and towers above the surrounding forest at 51.2m high. It is located along State Highway 12 in the upper plateau region of the Waipoua Forest Sanctuary, just North of where the Wairau stream intersects the Highway and leads out to the Tasman Sea. The site is a busy tourist stop, visited by up to 200,000 people a year generally during the peak summer period from December through to February. Along with visitors arriving by individual cars & vans, several guided tour bus operators also frequently stop at the site.

123 http://www.kauricoast.co.nz/Feature.cfm?wpid=6337 (accessed on 20/05/2013)

Figure 63: Tane Mahuta

In Maori cosmology, Tane is the son of Ranginui the sky father and Papatuanuku the earth mother. Tane tore his parents apart from their primal embrace, to bring light, space and air and allowing life to flourish. Tane is the life giver. All living creatures are his children.

Figure 64: Tane Mahuta car park / rest Area.

- (Opposite) Photo of the Existing rest area site looking over the Highway & carpark area towards Tane Mahuta and the surrounding Kauri Forest.
Initially, the research project looked at the redevelopment of the existing rest area/car park site which (in its existing configuration) incorporates the car park area, a grassed rest area, public toilets, and the raised walkway & viewing platforms associated with Táne Mahuta.

The site is divided by the Highway, with the rest area, toilet facilities and kiosk (caravan located on the side of the road) on the eastern side, and a small interpretation shelter, walkway entrance on the western side. During the busy summer season, with visitors continually crossing the road (between facilities and attractions), vehicles pulling off from the road to park, and higher rates of overall traffic, safety around the road becomes a serious issue.

The walkway to Táne Mahuta is approx. 100m of raised timber boardwalk. It is a two-way type track (serving as both the entrance and exit circulation), which begins by crossing the Wairau stream and leads off in two viewing platforms near ‘The Tree’.126

The first platform is the larger of the two and is only 25m approx. from the base of the giant. Visitors approach the platform from the East and enter obliquely to Táne Mahuta, and in front of the viewing area often causing

126 The board walk is a recent development as the former gravel path that it replaced was causing an adverse effect on the site’s water table. Track maintenance would require fresh gravel to be laid every few years, and with the numbers of visitors compacting the track, a subsurface draining of the water table had begun to have a detrimental affect on the surrounding forest.

crowding when visitor numbers are high.

The second smaller platform is accessed via a small track leading from the other side of the first viewing area (again causing crowding when visitor numbers are high). It is located further back from the ‘tree’ and provides a more contextual prospect with Tāne Mahuta framed by the forest either side, and low shrub layer growth between the first and second viewing areas.

The original gravel walkway to the ‘tree’ was a one-way loop type track, where visitors would approach Tāne Mahuta from the furthest platform, then wind around the track to the closer platform and follow the walkway back to the entry and car park area. This experience progression, from contextual view to ‘up close and personal views’ seemed more appropriate compared to the current configuration, and also seemed to better control the circulation flow to the Giant tree, however this was reconfigured when the boardwalk was installed.

Figure 70: Northward view of car park area.
- (Opposite top) Google Street View Image of the Existing rest area site - View North.

Figure 71: Southward view of car park area.
- (Opposite bottom) Google Street View Image of the Existing rest area site - View South.

Figure 72: Raised boardwalk to Tāne Mahuta.
- (Right top) Timber boardwalk leading up to the first viewing platform.

Figure 73: Main viewing platform.
- (Right bottom) View of first, larger viewing platform located at the base of Tāne Mahuta.

Figure 74: Second viewing platform.
- (Far right) View of the second, smaller viewing platform with Tāne Mahuta in background.
NEW QUARRY SITE

As both the ‘research for design’ and ‘research by design’ components of the project developed, an alternative project site was introduced to address issues of ‘natural quiet’. Located just 400m approx. from Tāne Mahuta & the existing site, the new site was formerly a small quarry used during the construction of the Highway in 1926127, and is now in a state of natural regeneration.

The site includes a small plateau area approx. 35m at the widest point, with the Highway bounding it on the Northern side, and a former section of the original road (abandoned during the realignment and sealing of the Highway in the early 1990s) towards the south. Below the plateau area, a steep bank covered in regenerating ‘shrub layer’ and ‘sub-canopy layer’ forest growth leads down to Wairau stream, and to the extent of the original forest canopy.

The elevation of the plateau area is similar to the highest point of the rest area at the existing site, and allows views over the immediate surrounding forest canopy towards several emergent Kauri canopies, with potential for a distant view of Tāne Mahuta.

SITE ANALYSIS

- Nature tourism experience: BIOTIC
- R.O.S Setting: BACKCOUNTRY DRIVE-IN

“These areas are easily accessible by car or bus but are further away from the city than rural areas.”

- Visitor group: S.S.T (SHORT STAY TRAVELLER)

The S.S.T visitor group is described as a priority group, which uses the ‘natural edge’ (for up to one hour’s duration) along main access routes as part of a stop along a journey to a destination. It is considered that this group will include large numbers of visitors with low levels of experience/ability; therefore considerations of safety and the potential for high environmental impacts need to be addressed. Due to the inherent short duration of the visit, an ‘instant immersion’ into the nature experience is sought, along with a high standard in facilities (aesthetics and durability), and a high degree of accessibility.

131 Ibid, Page 32.
Figure 81: Quarry site panorama.
- Panoramic photo of the quarry site showing SH12 to the left, sub-canopy forest growth in the foreground, and emergent Kauri canopy behind.
3. RESEARCH BY DESIGN
3.1 PROJECT DESIGN BRIEF

OUTLINE BRIEF:

The design programme will provide a series of architectural interfaces within a redeveloped plan of visitation to Tāne Mahuta, the largest living Kauri. The design proposal will locate a series of new built elements within the Waipoua forest, developed with a focus on the architectural boundary conditions, to both enhance the visiting public’s experience of the giant tree, while ensuring the great Kauri’s (as well as the surrounding forests) protection.

SPATIAL REQUIREMENTS:

Based on the recognised cognitive states visitors go through when visiting a natural heritage experience, the following spatial requirements have been set out in the following three areas:

PRE-CONTACT STATE:
- Redeveloped/New car park area adjacent to SH12 – capacity to allow for 2x Tour bus spaces & approx. 25 Car/Campervan spaces. (based on Existing usage).
- Covered entry space to the Tāne Mahuta walk with provision for interp.
- Kiosk space for full time Staff (1-2 people max.). Staff role is dual focused providing: overall surveillance for the facility and a local source of information for visitors. Potential to include a small Gift shop / gallery space as part of the kiosk.
- Staff work area for maintenance staff (1 person) including staff office area, staff ablutions area & workshop area/garage to take maintenance vehicle and supplies.
- Public Ablutions space
- Covered or uncovered spaces that allow the visitors to rest, picnic or simply engage with the forest
- Covered open space to accommodate guided tour presentations.

CONTACT STATE:
- Developed accessible raised walkway system with dedicated areas to stop and engage with the forest; bridge crossing over the Wairau stream, and Encounter space at base of Tāne Mahuta.

POST-CONTACT STATE:
- Covered Interp. space specific to the return trip.
- Links back car park area, Kiosk space, Bathrooms space & covered / uncovered visitor spaces described in the pre-contact state requirements.
- Small Gift shop / gallery space.

S A T I A L   R E Q U I R E M E N T S :
DESIGN ISSUES:

Based on knowledge gained from the previous ‘Research for design’ section of the project, the following investigation explored the potential design of the boardwalk, and its role as the boundary between the uncommon issues of protection and experience of the Kauri forest. The guiding design problems faced centered on: the protection of the Forest from P.T.A dispersion, and the enhancement of the experience with issues of safety, accessibility, and immersion into the experience.

Much like any typical bridge, the boardwalk allows two contrasting planes to exist (each with their own requirements), and creates a flexible in-between space that both connects and separates the two surfaces (refer to Figure 84). Removed from the uneven ground plane, the new floor plane can address issues of accessibility, comfort and allow visitors to experience the forest from varying heights with a clearly defined path. With its minimal ground work required during construction, the boardwalk also allows the natural ground plane to remain generally untouched. Often described as “hardening the site”133 it minimizes the visitor impacts (vegetation trampling, soil compaction / erosion, and in the context of a Kauri forest, the potential for P.T.A to be spread), providing protection to the forest.

MODEL INVESTIGATION:

By lifting and separating the floor plane from the ground, issues regarding safety from falling arise. Typical responses to this include vertical barriers / balustrades designed in accordance with NZBC-F4 ‘Safety from Falling’. These barriers are commonly used and have many benefits; they can be leaned on, gripped as a handrail when on a ramp, and provide a sense of security when up quite high. However these vertical barriers are not suited to all situations, and at certain points along the journey, where a more connected experience between the visitor and the forest is required, this barrier could be more subtle. This design problem prompted the following investigation, where several iterations were explored through detail modelling, focusing on both formal manipulation and spatial stratification techniques.

The initial model which started the process was based on a detail from the Rotheram House in Auckland, designed by Bruce Rotheram in 1951134. Within this building, on the upper floor loft, the floor plane is slightly raised at the edges to suggest a boundary to the loft space. Further model investigations continued to focus on base plane, and how the stepping of the plane could achieve a stratum of in-between spaces between the walkway and the surrounding forest.

The difficulty found with only using the base plane to define the ‘in-between’ spaces is the potential for people to occupy them, negating their role as the boundary condition. In response to this, the agricultural cattle stop provided a potential answer, by manipulating the floor plane and making it un-trafficable, the stepped base plane maintains its role; defining the ‘in-between’ spatial boundary condition. The investigation models continued along this direction, using an open weave light-steel grating system.

**Figure. 85:** Detail model - Rotheram house concept. (Left top) Initial design model of the Rotheram House Loft barrier.

**Figure. 86:** The cattle stop. (Left bottom) Example of the typical cattle stop – the uneven ground plane creates an inaccessible surface for stock to.

**Figure. 87:** Explorative design models. (Opposite) Exploration models investigating the un-trafficable spatial boundary condition.
SYSTEMS OF REFERENCE:

From here the investigation shifted direction, and other techniques of spatial stratification were tested, including the separation of construction elements. Not only was the separation of structure and enclosure looked into, but also the separation of structural elements themselves, with the timber truss explored through digital modelling as a balustrade element. The truss was found to set up two edges, with potential for overlap between them, creating a more ambiguous 'in-between' spatial boundary.

This direction was expanded further when the investigation started to look at including an overhead plane to the boardwalk element (for the more exposed areas). Geometrical relationships between the different formal elements that defined the 'in-between' boundary spaces were explored in an attempt to achieve multiple systems of reference. The initial separation of structure and enclosure started to blur, and individual elements began to achieve ‘both - and’ roles.

Figure 88: Boardwalk investigation with construction separation.
- (Above) Investigative boardwalk sketch exploring construction separation.

Figure 89: Boardwalk investigation with overhead plane.
- (Opposite) Photomontage of investigative boardwalk model.
3.3 INVESTIGATION 2: THE VISITOR CENTRE - EXISTING SITE

DESIGN ISSUES & LAYOUT:
Following the initial Boardwalk investigation, the design of the new visitor centre at the existing site was explored. Again, the guiding design problems addressed in the first investigation were used: protection of the Forest from P.T.A dispersion, and the enhancement of the experience with issues of safety, accessibility, and immersion into the experience.

Initial site planning/layout investigations favoured locating the building on the southern side of the existing cleared rest area. This not only allowed the building maximum solar gain\(^{135}\), but also the Kiosk/office space potential surveillance over the area, and creates a large open space to the North for a developed 'accessible' walkway from the car park areas. This proposed site layout also formalised the Car parking arrangements, separating them from the, at times, busy Highway, and ensuring a safer experience. Above the car parks and highway, a walkway bridge would lead visitors from the new visitor centre into the forest. This would provide not only more controlled access to 'The Tree', but also the opportunity for visitors to experience all of the layers of the Kauri forest as they descend down to the viewing area at Tane Mahuta.

With no grid supplied power to the site, any new building would have to be self-sustaining in its electrical needs. Small scale solar generation would most likely be the favoured choice due to the sheltered nature of the site (wind generation), and the potential opposition to utilizing the nearby stream for hydro generation.

INITIAL PLANNING DESIGN:
Planning design then focused on the centre building itself, setting up internal spaces that could control the circulation of the visitor, in much the same way that was found with the Waitomo Glowworm Caves Visitor Centre Precedent. Visitors would enter from the North via a walkway contained by the Kiosk space on one side and the Gallery/Dining area on the other. Beyond this spatial compression, the circulation space would open into larger areas with stairs on one side (leading to the lookout area above the gallery space), the Bathrooms, and the walkway leading out over the road and to the forest. This preliminary planning arrangement situated the Bathrooms on the Southern end of the facility, with opportunity to open the internal spaces into the adjacent forest with private views.
FORMAL RESPONSE:
The form of the proposed design started off as a response to the site. Seeking to continue the vertically layered composition of the forest, the new visitor centre emerged above the lower architectural elements (entry canopies and walkway Bridge into the forest) allowing uninterrupted views out to Tane Mahuta. The elevated walkway bridging the road, car park areas & the Wairau stream continued this vertical stratification, separating the required crossing of the road with the Highway and addressing the issue of visitor safety.

Following the initial design of the proposal, subsequent work (to both the plan and form of the centre) was carried out to achieve transparent relationships between the internal spaces and the wider context. In the plan, two axis were used: the road and the orientation toward ‘The Tree’. The massing of the proposed design was revised to reflect these two influences, with the splitting of the proposal into two distinct buildings; the kiosk & gallery areas, and the bathrooms. The use of opposing orientations was explored further with the entry walkway ramps leading up from the car park area.
Figure 97: Visitor centre sketch plan proposal. (Opposite) Preliminary sketch plan of the proposed design with the forest walkway indicated. Note the locations of the walkway landings aligning with the current boardwalk to minimise ground works disturbance to the forest floor.

Figure 98: Sketch design section/models. (Right) Investigating the stratification of space between interior and exterior using ‘U’ shaped space defining elements of varying scale, enclosure and orientation to describe a stratification of spaces from interior to exterior.

Protecting the Experience:

During a visit to the site in the 2012-2013 Christmas holidays, it became evident that the proposed design lacked a suitable response for the threat to the natural quiet of the site. Large numbers of visitors flowed in, and 5-10 minutes later flowed out. Notably, it was the noise created by the stopping-starting traffic (especially buses) that caused the most offensive noise. Following this discovery, and based on the current knowledge previously studied, options to separate the Tane Mahuta experience from the transport noise were investigated. This led to the exploration of a new site for the visitor centre, removed further from ‘The Tree’ by approx. 300 metres, at the Former Quarry site north of the existing site.
SITE LAYOUT PLANNING:

With a shift in location to the quarry site came a renewed look at site layout options, and how the proposal could relate to its context. The abandoned quarry was analysed in relation to the requirements of the brief at the very outset to not only determine its suitability as an investigation site for the research project, but also to identify site characteristics that would have an influence on the design.

The existing plateau area, with access from the Highway on both ends, provided an appropriate location for the new car park area. This had the added benefit of being removed from the road, addressing traffic safety concerns during the busy tourist season. Checks on both the areas of the required parking numbers, and bus turning circle dimensions, favoured a drive in/drive out design. This also allowed for flexible parallel parking arrangements on at least one side, which could potentially be used by 2 - 3 buses, or several cars as required. This indicated that the location of the new visitor centre building would be on the hillside, amongst the regenerating sub-canopy forest.

Developing from the direction of transparent form organisation in the previous design (with the massing split into two separate buildings, each addressing an opposing orientation), the opposing axis of the road and the direction to ‘The Tree’ guided the revised layout planning. Sketch diagrams were used to explore various configurations, however upon evaluation, these initial attempts failed to...
identify the potential for a separate return walkway from the encounter space. By separating the walk in, from the walk out, the proposal would not only offer visitors the possibility of different types of experience walking through the forest, but it would also have a significant effect on how the visitors would interact with the proposed building.

This led to a broader exploration of the experience itself, and how not only it could be planned/ designed, but how the architectural response could enhance this. A photographic journey map was prepared, identifying key experiences along with a plan diagram illustrating the journey sequence. Initially the walk in was to be at the higher level - continuing from the plateau area, however this would force visitors to ascend the hillside on the return over a short distance. By reversing this flow of circulation, visitors would be walking down the steep section of the walk (between the building and the stream), and have a more gradual and comfortable return journey.

Figure 103: Initial experience diagram. - (Left top) Initial experience diagram / map prior to revising the circulation direction.

Figure 104: Typical site areas section. - (Left bottom) Illustrating the difference in level between the upper plateau area and the lower stream bed.

Figure 105: Photographic journey map. - (Opposite) Photographic study of the proposed sequence of experiences.
INITIAL PLAN DESIGN:

Planning of the building commenced with potential for greater connectivity to the car park and the forest due to the characteristics of the new site. Connection between the kiosk space and the car park area was given more priority (compared with the previous design) due to the surveillance role of the space. Potential for more covered/uncovered exterior spaces was also explored, allowed by the overall increase of potential site area compared with the existing site.

At this stage, the vertical location of the plan relative to the site was also explored. Instead of raising the floor (as in the previous design), the floor plate was lowered with the falling ground plane to provide a layered spatial boundary condition between the building and the car park area, and an instant immersion into the forest for arriving visitors.

The importance of the kiosk space was not fully realised until the Xmas-break site visit, following discussions with the staff at the existing kiosk/caravan, and also the ranger at the nearby Kauri walks car park. Their roles not only include Visitor relations, but also monitoring of the site – collecting visitor data (overall numbers, transport types, checking numbers in vs. numbers out), events and security.

Figure 106: Initial planning design.
- (Opposite top) Initial planning investigation of the visitor centre.

Figure 107: Vertical layering of the plan.
- (Opposite bottom) Sketch sectional investigation of layering the planning elements.

Figure 108: Separation of entry and exit journeys.
- (Right) Unlike the previous design (existing site) that had both entry and exit circulation passing between the kiosk/office & Gift shop/gallery spaces, the revised design utilized this location to split the journeys, allowing both paths access to each of the spaces.

136 The importance of the kiosk space was not fully realised until the Xmas-break site visit, following discussions with the staff at the existing kiosk/caravan, and also the ranger at the nearby Kauri walks car park. Their roles not only include Visitor relations, but also monitoring of the site – collecting visitor data (overall numbers, transport types, checking numbers in vs. numbers out), events and security.
As the planning arrangement continued to be developed it started to become too rigid, relating more to the orientation of the road, and less to the orientation of "The Tree", losing any transparent connection between the two. This evaluation was followed by a reflection on the architectural precedents, described in the "research for design" section of the project, and the recognition of circular planning arrangements in half of those investigated.

Revised exploration of planning followed using the circle as a base shape, however as it developed it became evident that the shape of the arrangements was not the problem (a circle being just as rigid and geometric as a square/rectangle); it was the cracking/manipulating of the arrangement that created the transparent connection sought.

Figure 109: Revised planning design sketches.
- Series of sketch plans developing the revised planning arrangement for the visitor centre.
Continued development of the revised arrangement became more rectilinear in response to the two orientation influences of the site (the road and 'The Tree'), with two distinct sets of spaces; the Kiosk & Gallery and the bathrooms & workshop area, separated by a central entry space. Based on the walkway entry at the Aniwaniwa Visitor Centre, the proposed plan included a ramped entry walkway, with a large open platform area at the central landing. This not only provided a layering of spaces between the lengths of the ramps, but also allowed visitors entering the centre contained views over the surrounding sub-canopy forest growth, providing an ‘instant immersion experience’.

Figure 110: Development sketches.
- Development sketches exploring the relationships between the spaces with the revised design.

Figure 111: Entrance ramp & platform design sketches.
- (Far right) Perspective sketches investigating the entrance ramps and platform.

Figure 112: Gallery space sketches.
- (Below) Sketch perspective of the gallery area looking toward the Kiosk space.
Despite the planning revision, the layout still lacked a transparent form organization, this time relating more to the direction of the tree, with little orientation / alignment to the road.

Aware that the shift in site (from the existing to the quarry) had added close to 300m each way to the visitor’s journey, ensuring an accessible route became a priority to enhance the experience. Using the requirements set out in the N.Z.B.C: Clause D1- Access Routes\textsuperscript{137}, the length and number of ramps caused an expansion of the circulation system. This further separated the two main forms as the kiosk/gallery needed to remain high enough to maintain views over the main canopy forest, and the bathrooms needed to lower into the main canopy height to provide secluded private views within the sub-canopy growth.

Digital modelling in Sketch-up was used to explore the 3D implications of the accessible ramps, and through continual development the ramp landing shifted and expanded to become more central between the two forms, and a separate space in itself. This not only created a stratification of shallow and deep space between the kiosk area, the new central platform and the bathroom area, but by aligning it to the entry ramp it also connected back to the road axis and increased the transparency of the arrangement.

\textsuperscript{137} Accessible ramp requirements:
- Max ramp pitch: 1:12
- Max ramp run between landings: 9m
- Max ramp rise between landings: 750mm
Figure 115: Developed design sketch plan diagrams. - (Left) Investigative planning layout sketches attempting to achieve transparent organization.

Figure 116: Developed plan design model. - (Above) Design model showing relationship of planning design to the site topography.

Figure 117: Developed design - plan revision. - (Opposite) Revised developed floor plan with site orientation axis shown.
**INITIAL FORMAL STUDY:**

Investigations into overall form of the visitor centre continued along two opposing directions. The first concentrated on extending the layers of the forest canopy with an single organic shaped floating roof plane, and the other explored the further development of the rectilinear plan with a series of small pavilion type roofs. At first the single organic roof form option seemed more fitting with the context (much like the organic form of the Redwoods tree house), however on reflection, the series of pavilion type roofs allowed a more ambiguous connection of the different spaces. Development of the pavilion forms continued, however this led to the overall formal arrangement becoming too broken up and losing the transparent qualities that the development planning had introduced.

Figure 118: Formal study Sketch-up modelling.  
- (Far left) Plan adn perspective views of sketch-up model during the initial formal study.

Figure 119: Organic shaped roof option.  
- (Left bottom) Sketch section of the single organic shaped roof option during the formal study.

Figure 120: Formal study Sketch-up Modelling.  
- (Opposite) Perspective view of pavilion type form option with journey through building indicated.

[Diagram showing different areas such as Car Park Area, Kiosk, Bathroom, Maintenance, Entry Platform (looking into Main Canopy), Car Park Area, Bathroom, Maintenance, View Platform (looking into Main Canopy), Low walk into the Forest]
Unable to resolve the overall formal issues, focus then shifted to two other small design problems; the bus/shelter adjacent to the parking area, and the bathrooms.

The key design issues for the shelter was the need to provide a defined separation between the road and the car park area (increasing visitor safety), and to provide a sheltered area for visitors getting on and off the buses (increasing visitor comfort/accessibility). With the benching of the plateau area/car park area to 340.5m, a level difference of about 1m between the road and the car park existed. To further define these a planted berm was introduced, providing a natural buffer as a solid formal boundary element.

Next the expansion of spatial experiences within the shelter was explored by way of stratification, both through contrasts in deep and shallow space (towards the separating berm), and with the offsetting of the floor and overhead planes (towards the bus & car park area). The technique of separating construction was also investigated in the shelter roof, with the unattached lining hung down from the structural truss. The relationship between the two elements was then further refined to achieve a transparent sectional arrangement, with the edges of the truss aligning with both the enclosure lining, and the edge of the raised floor plant.

Strongly influenced by the bathrooms at the Waitomo Glowworm caves visitor centre (which expresses cave like qualities in the openings and lighting), the bathroom design developed from the initial design introduced in the previous sites proposal.

Following from the progress with the bus shelter design, the separation of construction elements was again explored, separating the structure and enclosure. The roof truss was again used, however this time the enclosure surface was located above it, allowing the bottom chord of the truss to describe a smaller space than that contained within the enclosure system. The desire to provide an entire wall plane open to the forest was tempered by the need for a barrier for safety issues (another key design principle for the S.S.T Visitor group). In response to the deep bench for the hand basins with a large opening glass panel was developed. Together with the extension of the floor and overhead planes beyond this barrier, a spatial barrier was created between the interior of the bathroom and the forest exterior.

The separation of elements was taken further again with the overall form of the bathroom. A series of large timber structural frames set up a clear ‘datum’ type architectural order, and the bathroom space (and adjacent waiting space) is supported from them both structurally and formally. Following feedback from the third critique, the profile and shape of the portal frames were re-examined and developed, providing additional privacy to the entrance of the bathrooms from the entry platform and the car park area.

Figure. 121: Bus shelter cross section.

Figure. 121: Cross section of the proposed bus shelter design illustrating the natural buffer boundary, the sequence of spatial strata, and the separation and alignment of construction elements.
Figure. 122: Bathroom building spatial diagram—left sectional diagram describing the sequence of spatial experiences created.

Figure. 123: Bathroom building section—left sectional drawing showing the spatial connections and separation of construction elements.

Figure. 124: Bathroom building sectional perspective—left bottom sectional perspective showing the spatial connection between interior spaces and exterior views.

Figure. 125: Bathroom building external perspective—Developed bathroom building design as presented at the third critique, (01/05/2013).
**Revised Formal Study:**

The overall form of the visitor centre was revisited following the development of the separate structural frame during the bathroom design. Three sets of frames were incorporated throughout the overall plan arrangement, two orientated towards ‘The Tree’, and the final aligned with the entry and the road.

The overall sectional heights of the frame sets were shaped to provide a curved connection from the sub-canopy forest at one end, to the main canopy forest at the other, much like the single organic roof form investigated earlier. However, unlike that initial roof design, this new formal response not only related and reinforced the transparent quality of the planning, but also introduced a contradiction of intimacy with the rigid repetition of the frames, and the more intricate plan.

Continued development saw the spans of the frames increased, allowing the walkway ramps to be read as separate from them (although still supported by them), creating an intermediate space between the walkway and wider forest context. The frame solution, as the primary structure had the added benefit of minimal disturbance to the forest floor; reducing the major ground works to six discreet strip footings.

*Figure 126: Formal plan comparison.*
- (Left) Comparison plans of the earlier pavilion type form option above, and the new frame design below.

*Figure 127: Revised CAD Floor Plan.*
- (Opposite) CAD plan of revised design with new timber frame elements.
Figure 128: Long section through entrance. - Long section showing progression of experiences/space from the road, the bus shelter & carpark, the entrance ramp & platform, the presentation platform and the stream.
Further development:

Further fine tuning of both the planning and formal arrangements continued, based on problems identified in the final crit.

The walkway to the bathrooms was revised, with a ramp coming straight from the entry platform, and the connection back to the presentation platform removed, providing better accessibility from the car park and main kiosk area. This also allowed the presentation platform to be reconfigured with a defined presentation space removed from the main walkway, reducing potential for crowding along the circulation route. Both the kiosk space and gallery space were shifted slightly, allowing more covered dining/picnic area, and providing better engagement with the structural frames. The upper floor lookout space above the kiosk (which was tentatively introduced during the developed design) was also worked up further, with access revised to come from the gallery space. The spacing of the frames was increased to address the overly bulky profile, as well as the refinement of the individual frames themselves, taking on more of an open type truss configuration.

Figure 129: Revised model - Plan view.
- (Left) Revised model with frame elements included. Contrast in intricacy evident between frames and planning.

Figure 130: Revised model - South view.
- (Right top) Revised model with frame elements included. Heights of frames closest to the stream up to approx. 12m.

Figure 131: Revised model - North view.
- (Right bottom) Revised model with frame elements included. Kiosk area still to be revised.
3.5 INVESTIGATION 4: THE WAIRAU BRIDGE

DESIGN ISSUES & LAYOUT:

With a width of less than 3m, the Wairau stream creates a thin natural boundary between the proposed visitor centre site, and the Western half of the forest, including Tane Mahuta. Crossing the stream not only allows visitors to enter into the forest and visit ‘the tree’, but also provides the opportunity to engage with the stream itself. Added to this, both the ‘shrub’ and ‘sub-canopy’ layers of the forest become denser along the edge of the stream as the main canopy above thins, allowing for another key experience along the journey.

The design of the new bridge sought to rectify the deficiencies of the current bridge at the existing site, which denies the visitor a lot of these experiences with its simple linear-type crossing condition perpendicular to the stream, and no room to stop and view it without blocking the path for others.

Utilising the stratified boundary edge developed during the boardwalk study, the initial design included a planning arrangement that crossed the stream on a 30 degree angle. This not only allowed the bridge to hug the edges of the stream, but also provided opportunity to create defined viewing spaces on each side. Relationships between the two viewing areas were further investigated with conceptual modelling resulting in an offset planning arrangement.

Figure 132: Wairau stream - ‘View up stream. Dense ‘shrub layer’ and ‘sub-canopy layer’ forest encroach at the edges.

Figure 133: Wairau bridge sketch - (Right top) Initial concept sketch for the new Wairau stream crossing setting up two different type of interactions/experiences.

Figure 134: Wairau bridge conceptual models - (Right bottom) Concept models exploring the development of defined viewing spaces independent of the circulation path.
DESIGN DEVELOPMENT:

Continual development of the plan identified the bridges proximity to the lower platforms of the visitor centre, and the potential to achieve connection back to them with the viewing areas. Slight shifts in location and arrangement allowed the first viewing area to align with the presentation platform above, and the second to align directly over a small pool area in the stream. This not only creates an asymmetric planning arrangement, providing differing experiences for visitors as they cross the stream, but also extends the transparent planning organization achieved at the visitor centre.

The separation of construction elements was also investigated, with repetitive structural floor beams spanning/cantilevering over the stream independent of the planning above. These elements were later developed to crank vertically, and provide support for the overhead roof at the second viewing area (refer to Figure 139). The design was then worked up in Sketch-up which, given the inherent 3D nature of the software, allowed the heights of the bridge, both in relation to the site and also between the two viewing areas to be further refined.

Figure 135: Wairau bridge design sketch. - (Left) Revised design sketch illustrating connection back to the visitor centre through planning alignment.

Figure 136: Wairau bridge developed design sketch. - (Opposite) Developed design sketch with bridge design addressing the small pool area.
Further development:

Evaluation of the developed design identified the potential for further expression of the crossing by providing more definition between the two sides. Further investigation introduced contrast through containment by enclosing the walkway after the second viewing area. This forces the visitors view upwards to the overhead forest canopy, further contrasting the experience from the earlier lower forest layer experience.
3.6 INVESTIGATION 5: THE ENCOUNTER SPACE

DESIGN ISSUES:

The design of the encounter space at Tane Mahuta began with a study of the existing situation, identifying specific weaknesses that could be addressed in the new proposal. As identified in the ‘research for design’ section of the project, the primary objective of this type of nature-based tourist experience is the viewing of nature, and specifically in this case, the viewing of the mighty Kauri, Tane Mahuta.

Key problems of both existing viewing spaces include: the location of circulation space in front of the viewing areas causing crowding and general interference for the visitor, and the lack of experience diversity between viewing areas. Additional to this, the vertical barriers between the platforms/boardwalks and the giant kauri are easily accessible, and at some points, nonexistent.

To minimise disruption to the surrounding main canopy forest, the design of the proposed encounter spaces were confined to the extent of the existing clearing. This further constrained the possible planning arrangements along the approx. 30 degree orientation of the cleared area.

INITIAL RESPONSE:

Initial planning investigations focused on viewing area locations, and the visitor’s direction of travel. Following the original sequence of experiences, from the contextual view first, and then moving to the ‘up-close’ view later, these early sketches explored how these two spaces could be connected. Using the frame element from previous investigations (the Wairau bridge and the new visitor centre), these preliminary investigations divided the site in two, similar to the early conceptual designs of the proposed bridge.

The viewing areas were initially offset along the axis of the clearing, with the first, further away platform raised 3.0m above the other. This allowed for an uninterrupted view over the closer platform and walkway leading to it. This arrangement was later revised to the orientation axis used at the visitor centre as it allowed for better functioning spaces.
FURTHER DEVELOPMENT:

Influenced by the success of the General Sherman interpretation example discussed in the ‘research for design’ section of the project, the plan of the first platform was developed to include a similar element. Further development explored a more three-dimensional interpretation experience, creating an enclosed volume that stretched from the forest floor to the barrier height of the platform, allowing visitors to experience the girth of ‘The Tree’ both from the outside, as well as the inside. Further development also saw the refining of the frames, becoming more delicate in response to the immediate forest setting.

DESIGN PROGRESSION:

Development of the initial planning arrangement continued with the splitting of the frame element in two, one remaining aligned to the visitor centre, and the other to the North and the road. The central crossing between these two introduced the potential for another viewing area, spreading the number of visitors out, and maintaining the ‘natural spirit’ quality of the experience.

Revisions to the circulation ramps between the viewing platforms focused on achieving transparent organizations between the planning and the formal frame elements similar to the visitor centre design. Again, accessible ramp dimensions and pitches caused an expansion of the circulation system as the developed design continued, ensuring a variation in experience between each of the platforms. The frame elements were further developed to provide support for overhead canopies at the viewing areas, providing shelter to visitors during downpours and a more comfortable experience.

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CONCLUSION
This research project set out to investigate how Architecture can enhance the public experience of New Zealand’s natural heritage, while supporting its protection. A review of current knowledge was conducted to understand the key issues involved, providing a basis to further explore the research question through the process of architectural design.

The review including focused research into; natural heritage experience, protection, the architectural boundary condition, and the study of six architectural precedents that engaged in these three issues. The iconic Tane Mahuta in the Waipoua Forest Sanctuary was selected as the project site, further defining the experience and protection issues specific to the site’s characteristics.

The research then used the design process to further explore the research question, setting a brief to design a redeveloped plan of visitation to Tane Mahuta, including a new visitor centre and other forest encounter spaces. The design process utilized several concepts identified in the current knowledge review to develop a considered architectural response to the overall research question.

Objective 1 - Investigate issues involved in visitor experience & natural heritage protection.

Through ‘research for design’ the project not only introduced the different types of natural heritage experiences, and the associated visitor groups that tend to engage with them. It also explored particular elements of a natural heritage experience, including the application of interpretation, and the value associated with natural quiet. Issues surrounding natural heritage protection were also explored; first at the general level, identifying the types of protection and the values associated with them, and secondly at the detailed level, discussing the particular threats to natural heritage associated with the selected site.

Objective 2 - Explore the concept of the architectural boundary condition and identify methods of manipulating it to function as an interface between uncommon conditions: requirements.

Again ‘research for design’ introduced key principles of the architectural boundary, including it’s ‘both-and role’ of both defining and connecting space. The study further explored the architectural boundary following the three principles of form, space and order, each describing both common arrangements, and also concepts relating to contradictory and ambiguous manipulations of the boundary. These included formal manipulation techniques of contrast in intricacy and containment, spatial manipulations of stratification and modulation and transparent organizations of both space and form.

An architectural precedent study not only illustrated examples of concepts already established, but also introduced issues of connection to the context through manipulation of the architectural boundary condition.

With the submission of this document, two of the three objectives for this research project have been achieved. The last objective remains unfulfilled prior to the final examination where the final design proposal will be fully demonstrated. Until then, design work will continue to refine the proposals within the given time frame.

Objective 3 - Develop and demonstrate a series of architectural proposals that utilize the boundary condition as an interface between visitor experience and natural heritage protection.

‘Research by design’ developed four architectural proposals of varying resolution, each utilizing the architectural boundary as an interface between enhanced the visitors experience, and the protection of natural heritage. Visitor experience was enhanced by addressing issues of safety, accessibility, interpretation, natural quiet and providing an instant immersion into the Kauri forest through the design of the architecture proposals. Protection of the Kauri forest was achieved by the design proposals through removing the potential visitor impact of P.T.A dispersal, separating the visitor from the forest floor.

This research project set out to investigate how Architecture can enhance the public experience of New Zealand’s natural heritage, while supporting its protection. A review of current knowledge was conducted to understand the key issues involved, providing a basis to further explore the research question through the process of architectural design.

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4.1 SUMMARY

4.2 CRITICAL APPRAISAL.

As noted at the start of the document, this research is first and foremost an exploration. It identifies three key areas of study, and sets objectives to guide the direction of the 'research for design', and ‘research by design’ sections. The overall success of the research therefore resides in how well it addresses those objectives.

Objective 1 - Investigate issues involved in visitor experience & natural heritage protection.

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### Table of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Source</th>
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<td>2</td>
<td>Current visitor experience.</td>
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<td>3</td>
<td>Architectural boundary sketch.</td>
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<td>5</td>
<td>Abiotic nature-based tourist experience.</td>
<td>Reproduced from: <a href="http://farm3.staticflickr.com/2688/4412870931_a56c85446f_z.jpg">http://farm3.staticflickr.com/2688/4412870931_a56c85446f_z.jpg</a> (accessed on 06/05/2013)</td>
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<td>7</td>
<td>Cultural nature-based tourist experience.</td>
<td>Reproduced from: <a href="http://farm8.staticflickr.com/7270/7620242768_a7223cc44a_o.jpg">http://farm8.staticflickr.com/7270/7620242768_a7223cc44a_o.jpg</a> (accessed on 06/05/2013)</td>
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<td>11</td>
<td>Experience with natural quiet maintained.</td>
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<td>15</td>
<td>Resource/heritage value diagram.</td>
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Phytophthora taxa agathis, commonly referred to as P.T.A or Kauri Dieback, is a deadly plant pathogen that is specific to New Zealand’s iconic Kauri (agathis australis). Although similar in nature to a fungus, P.T.A is in fact a type of water mould that infects the roots of the Kauri and damages the tissues that carry nutrients within the tree. Infected trees can display a range of symptoms including “yellowing of foliage, loss of leaves, canopy thinning, dead branches and lesions that bleed resin at the base of the trunk”.138 Latest studies have also found positive infections of P.T.A amongst trees that present almost no symptoms, making it difficult to identify other infected sites by symptom observation alone.139 Much about P.T.A is still unknown, with unresolved questions regarding the pathogen's origin, precise areas of distribution, potential effects to the kauri forest system.

Despite the recent notoriety of the disease, and the recognition of it as a new species of Phytophthora in 2006 following DNA testing, P.T.A is not a recent phenomenon. As early as 1972, P.T.A was noted in plantation stands of Kauri on Great Barrier Island, but was inaccurately identified as Phytophthora heveae. This plantation stand, along with other infected stands in and adjacent to the Waipoua forest, were planted in the 1950s with seedlings supplied from the Forest Service Nursery in Waipoua, suggesting the Nursery itself as a potential vector for the disease.138 Additionally, this may also suggest that this deadly pathogen has been in our Kauri forests for over 50 years, well before any measures were taken to prevent the spread of the disease.

P.T.A is spread through soil disturbance/movement; waterborne spores are released & move within the water-film of soils and clays. It is believed the main vector for the disease is from people unwillingly spreading the infected soil on their boots/shoes.141 Another cause of soil disturbance that has also been identified as a potential cause of the spreading P.T.A is wild pig rooting at the base of the trees – particularly at the Waipoua.142 Current measures taken to combat the spread of P.T.A involve educating people visiting the forests why they must stay on the defined tracks, and installing signs near Kauri to remind them. Drainage work along the tracks have also been carried out to direct potentially infected surface water away from nearby trees. Where the tracks come into close proximity with Kauri, timber boardwalks have been built to further remove people's feet from the soil. Disinfecting-wash stations have also been established at the entrance to many walks and visitors are encouraged to disinfect the soles of their footwear prior to entering and exiting the walks, however the correct use (or even any use) of these stations have been ignored by some.143 Continued research into P.T.A is taking place to determine the origin of the disease, possible techniques to control its spread, and potential treatment procedures. One such study which has yielded promising results explored the susceptibility of P.T.A to Phosphorus Acid, an agricultural chemical used in the treatment of other Phytophthora species in horticulture.144 Although still preliminary, this study has found that P.T.A is highly sensitive to phosphorous acid, even more so than other Phytophthora species commonly controlled by this chemical.145

139 Beuchamp, AJ. Preliminary assessment of the relationship between symptology and detection of the targeted sampling of Waipoua Forest for Phytophtora Taxon Agathis. Page 8
140 Rudman, B. “Play it safe to protect kauri from rampant disease” N.Z Herald, March 12, 2012.
141 Ibid.
142 Beuchamp. AJ. Page 7.
143 Rudman, B. “Play it safe”, N.Z Herald.
145 Ibid.
At the beginning of this research project, I had not selected a specific site within the Waipoua. Following a reading of Ian McHarg’s *Design with Nature*, I began to try and map the forest, a much more difficult task than I first thought. Unlike many of the more developed sites throughout the country, which can be found complete with contours and other basic information after a quick G.I.S search, the Waipoua is a large relatively unknown quantity. A process of mining for information ensued, with visits to the National Archives Department, the local D.o.C offices, and more than a few trips to the Lands and Survey office in Whangarei. Next step was a process of checking and collating the found information into a comparable format, albeit creating my own set of GIS-type layers. Although this information was not used in the later design work (a result of the research becoming solely focused on the Tane Mahuta site), it remains a significant collection of work, and maybe one of the only/few instances where this information can be read and compared in one spot.

7.2 WAIPOUA FOREST ANALYSIS MAPS
wairau river
waipoua river

1km 2km 3km 4km
Streams / Tributaries
7.3 ARCHITECTURAL PRECEDENT ANALYSIS DRAWINGS
Te Mata Visitor Centre

circulation system
Te Mata Visitor Centre

structural system
Redwoods (Yellow) Treehouse
Ruakuri Cave Entrance
Waitomo Glowworm Caves Visitor Centre

circulation system
Aniwanwa Visitor Centre
circulation system
structural system

Aniwaniwa Visitor Centre
Te Rewa Rewa Pedestrian Bridge

structural system
7.5 FINAL DESIGN PRESENTATION