

RETHINKING THE APIA WATERFRONT

**A Masterplan and Educational Facility for the Waterfront in
Apia, Samoa.**

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A Research Project submitted in partial fulfillment of the requirements for the degree of
Master of Architecture Professional.
Unitec Institute of Technology, 2014.

ABSTRACT

Many Small Island Developing States (SIDS) often rely heavily on tourism for their economies to prosper, and Samoa is no exception. The challenge is to balance the needs and desires of tourists against those of the residents and the environment. Environmental quality is a leading draw card for tourists, and is also essential in order for residents to maintain a living off the land. However, these activities in themselves are often at loggerheads with the needs of the environment itself. Climate change and urban development add to the challenges already being faced, with water quality and supply an important issue.

The purpose of this research project is to propose a way in which educating visitors and residents on the fragility of local ecosystems might both assist the local economy and ensure that Samoa's pristine environment can be enjoyed for generations to come. It proposes gentle urban development interventions, targeted at residents and tourists alike, and proposes an education centre in the heart of Apia with the aim of making that education accessible to as many as possible.

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ACKNOWLEDGEMENTS

Thank you to Christoph Schnoor, David Chaplin and Chris Murphy for overseeing the project and providing guidance where necessary. Also, Brendan Smith for helping to make the final product coherent.

To Alison: for putting up with the tears and tantrums over the last five years, when things did not always go according to plan – I could not wish for a better sister. And to Jennifer: thank you for getting me through some rough times, and for your undying faith in my ability.

Thank you, also, Jackie Frizelle and Kathryn Paton from the New Zealand High Commission in Samoa, and Jude Kolhase from PUMA. Your advice and insights into local matters proved invaluable.

This project would not have been started if it weren't for the support, advice and encouragement of Tony van Raat and Marshall Cook. They are a credit to their profession.

Finally, to all my friends and family: thank you for your support and encouragement, and being there to keep me on track when the wheels threatened to fall off. I am so very lucky to have you all.

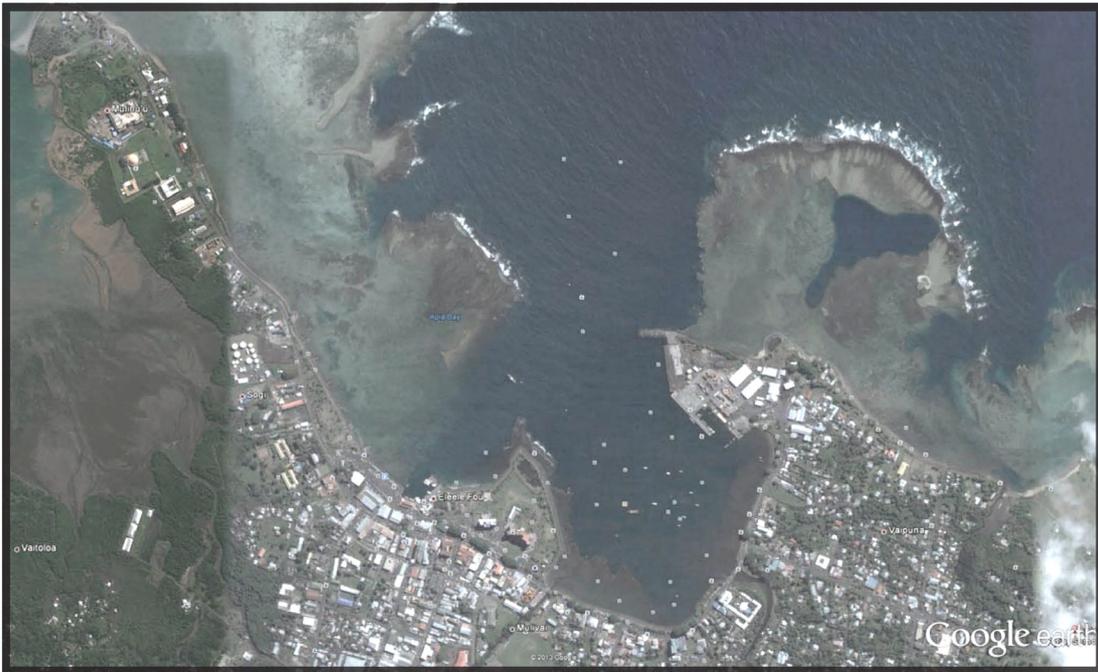


Figure 1.

Aerial view of Apia at 1:25,000 scale. Image courtesy of Google Earth (2013).

INTRODUCTION

RESEARCH QUESTIONS

How can critical regionalism be used to create a sense of identity in Apia, and how can it be used to create a modern building which provides a sense of connection to place?

And

How can the use of landscape, light and journey within a building create a sense of connection to the environment and facilitate environmental education.

OBJECTIVES

This project will propose means by which the Apia Waterfront may be developed in such a way that the social, historic and environmental fabric of Apia is sustained. The research problems to be addressed will include:

- Environmental and spatial evaluation of the Apia Bay area to ensure that any proposed development is both sustainable and beneficial in the long term.
- The cataloguing of existing buildings and sites, and identifying ways by which significant buildings may be positively integrated into Apia's development.
- Exploration of critical regionalism as it applies to Samoa, including traditional practices, and those which promote a resilient response to natural phenomena.
- While the urban planning intends to avoid making choices which may exacerbate flooding potential, it will not address any type of larger environmental engineering proposals for mitigating the existing flood risk, as these types of proposals are still being evaluated by the Samoan government.

DESIRED OUTCOMES

- A broad master plan will be proposed which incorporates cultural, economic and environmental factors.
- It is desired that the resulting building design should be climatically responsive and durable. The use of local materials will be favoured, provided they fulfil the previous two requirements, in the interest of maintaining a local flavour and relevance.
- Finally, it is hoped that the value of Samoa's natural assets, society and ecology can be recognised and enhanced, to the benefit of Samoa's residents and visitors alike.

BACKGROUND

Traditionally, Samoa has needed to rely on overseas aid, remittances from family members living overseas, and primary sector activities (such as agriculture and fishing) in order for its economy to survive.¹ As financial pressures increase globally, the need for Samoa to become self-sufficient also increases. In the financial year to 31 May 2012, Samoa operated at an economic deficit of 6.1%,² with the primary sector now only contributing 3.6% of the nation's GDP. With a trend developing towards smaller holdings of land,³ the opportunity for commercial-scale horticultural or agricultural ventures may also decrease accordingly.

Meanwhile, tourism has become the single largest activity on the islands over the last decade.⁴ According to Miller and Ditton,⁵ it is "recreational, educational and instrumental contrast" which draws tourists to a coastal location. Being an island nation Samoa provides easy access for tourists to many water-based activities, as well as land-based activities involving the nation's volcanic landscape and endangered wildlife. Both the educational and instrumental contrast elements provided to tourists, in the form of outdoor recreation opportunities and wildlife encounters, are already available but have the potential to become a much larger focus of the industry.

Of particular interest to this study is the instrumental contrast, and

1 "Samoa Economy Profile 2013" Index Mundi, last modified February 21, 2013, http://www.indexmundi.com/samoa/economy_profile.html

2 "Samoa Economy Profile 2013" Index Mundi, last modified February 21, 2013, http://www.indexmundi.com/samoa/economy_profile.html

3 R. Gerard Ward and Paul Ashcroft, *Samoa: Mapping the Diversity* (Suva: University of the South Pacific, 1998), 65-67.

4 "Samoa: Economy" Global Edge, last modified February 2012, <http://globaledge.msu.edu/countries/samoa/economy>

5 Marc L. Miller, "Ludic Challenges of Coastal and Marine Tourism," in *Proceedings of the Fifth International Coastal & Marine Tourism Congress*, eds. Michael Luck et al. (Auckland: AUT University, 2007), 6.

the dominance of buildings in the Apia urban fabric which fall under the umbrella of the International Style, resulting in what Gratz and Mintz describe as the “look of anywhere”.⁶ An examination of critical regionalism, and how this may be applied to Apia and its modern context, could provide tools to achieve an instrumental contrast in the built environment.

With Samoa’s dependency on the primary sector and tourism, it is essential that tourism development in Samoa be approached in a sustainable manner. Martin-Cejas states that “Sustainable tourism development requires that human-made systems and the ecosystem maintain a healthy state that is necessary for survival at a higher level of quality”.⁷ Tourists are willing to pay a premium for access to pristine environments.⁸

Apia’s relationship to water is of particular importance. The area contains four distinct types of water-based ecosystems, being streams, mangroves, coral reefs and the deeper waters within the bay. Also, the majority of the Apia urban area lies less than 10m above sea level, and flooding in the aftermath of Cyclone Evan in mid December of 2012 was responsible for significant damage in the area.⁹ Any plan developed for Apia needs to take into account the susceptibility of these low-lying areas to flooding.

Geologically, the area is of a terrain known as Salani Volcanics, which

6 Roberta Brandes Gratz with Norman Mintz, *Cities Back from the Edge, New Life for Downtown* (New York, NY: John Wiley & Sons, 1998), 34.

7 Roberto Rendeiro Martin-Cejas, “Ecological Footprint Analysis of Road Transport Related to Tourism Activity: The Case of Lanzarote Island (Full Paper),” in *Proceedings of the Fifth International Coastal & Marine Tourism Congress*, ed. Michael Luck et al. (Auckland: AUT University, 2007), 593.

8 Prabha Ranade, “Tourism in Marine National Park of Gujarat (Full Paper),” in *Proceedings of the Fifth International Coastal & Marine Tourism Congress*, ed. Michael Luck et al. (Auckland: AUT University, 2007), 229.

9 Unitar, “Report: Cyclone Evan Damage Assessment of Apia City, Samoa,” 02 January, 2012, 2, accessed 19 March, 2013, http://www.unesco.org/new/en/apia/about-this-office/single-view/news/cyclone_evan_in_samoa/

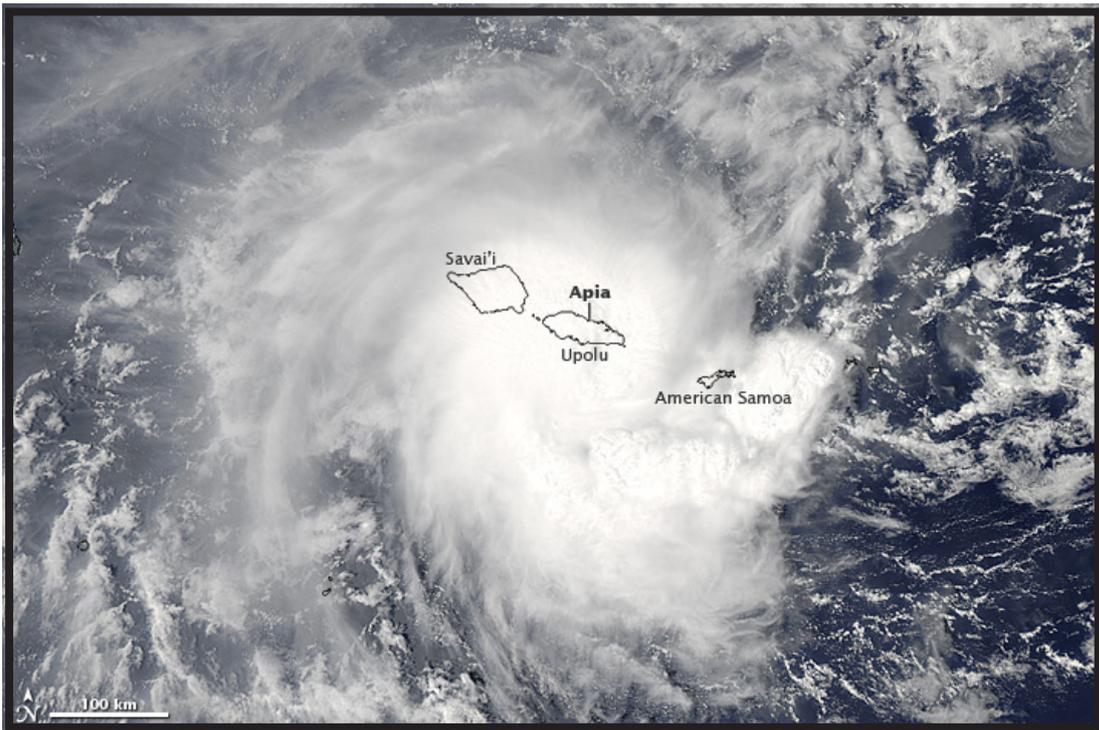


Figure 2.

Satellite view of Cyclone Evan as it passed over Samoa on 14 December, 2012. Image courtesy of PlanetSave.com, accessed on 11 July, 2013, <http://planetsave.com/2012/12/14/cyclone-evan-devastates-samoa-moves-on-to-fiji/>



Figure 3.

Residents of Apia assess the damage to their neighbourhood caused by Cyclone Evan. Image courtesy of Apna990FM, accessed 11 July, 2013, <http://apna990online.co.nz/?news=new-zealand-aids-upto-820000-for-fiji-samoa>

have been moderately to strongly weathered. This weathering means the soils retain water better than less weathered areas¹⁰ – this may explain why much of the area immediately inland of Apia falls under Land Class 1 (land most suitable for agriculture and forestry).¹¹

Agricultural use of the land upstream from Apia could have serious consequences for the water quality in the bay if it is not well managed. Contamination of waterways by agricultural run-off has been noted as a leading cause of coral reef destruction,¹² and has been found to collect in the sediment of mangrove swamps, affecting the health of resident fish colonies.¹³ Over-fishing is also known to be a contributing factor, as is urbanisation of the shoreline¹⁴ - this places particular importance on the sustainability of the waterfront plan, especially as fishing has historically played a large role in coastal villages economies, and there is evidence to suggest that fish stocks have been in decline since at least 1981.¹⁵

Apia itself is categorised as Land Class 4 (unsuitable for agriculture or forestry and including swamplands). Large areas of Apia's built environment are located on the flood plains of the two main rivers which discharge into Apia Bay, the Mulivai and the Vaisigano Rivers, the latter being the primary source of flooding in the area¹⁶. This

10 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 11-12.

11 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 23-25.

12 "Coral Reefs" United States Environmental Protection Agency <http://water.epa.gov/type/oceb/habitat/factsheet.cfm>

13 G. Kruitwagen et.al, "Status of Pollution in Mangrove Ecosystems Along the Coast of Tanzania," *Marine Pollution Bulletin* 56 (2008): 1022.

14 G. Kruitwagen et.al, "Status of Pollution in Mangrove Ecosystems Along the Coast of Tanzania," 1022.

15 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 129.

16 Ministry of Natural Resources and Environment in collaboration with Pacific Islands Applied Geoscience Commission, "Samoa Flood Management Action Plan 2007-2012," (Suva, Fiji: SOPAC, 2007), 1, accessed June 15, 2013. http://www.unisdr-apps.net/confluence/download/attachments/9110372/SAMOA+070329_Samoa.pdf?version=1

creates a conflict between the need to increase the density of the existing urban area, to prevent urban sprawl from encroaching on valuable Class 1 land, and the need to manage urban development within the floodplain in accordance with the guidelines set out in the Samoa Flood Management Action Plan 2007-2012 (SFMAP).¹⁷

Figure 4 shows the water catchment area for the Vaisigano River on its own, while Figure 5 shows the modification of the Mulivai and Vaisigano river systems since the turn of the century, and shows the progressive manipulation of the Mulivai River into a single channel, resulting in large volumes of water directed into the heart of the Apia urban area.

The SFMAP identifies deforestation and urban development upstream in the catchment areas as factors exacerbating the problem, by increasing the volumes and speed of storm-water runoff.¹⁸ As the catchment area predominantly falls under Land Class 1, limiting urban development in this area again becomes a priority. However, as only 14.2% of Samoa's total land area¹⁹ is made of up this valuable land type, there is again conflict between the essential type of land use (agriculture and horticulture) and the consequences of that use. Educating land users in the consequences and alternative methods is essential, combined with the SFMAP recommendation for design standards being applied to upland development.²⁰

Apia's vulnerability to tropical storms is another factor which needs

17 Ministry of Natural Resources and Environment in collaboration with Pacific Islands Applied Geoscience Commission, "Samoa Flood Management Action Plan 2007-2012," 13-14.

18 Ministry of Natural Resources and Environment in collaboration with Pacific Islands Applied Geoscience Commission, "Samoa Flood Management Action Plan 2007-2012," 4.

19 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 23-25.

20 Ministry of Natural Resources and Environment in collaboration with Pacific Islands Applied Geoscience Commission, "Samoa Flood Management Action Plan 2007-2012," 4.

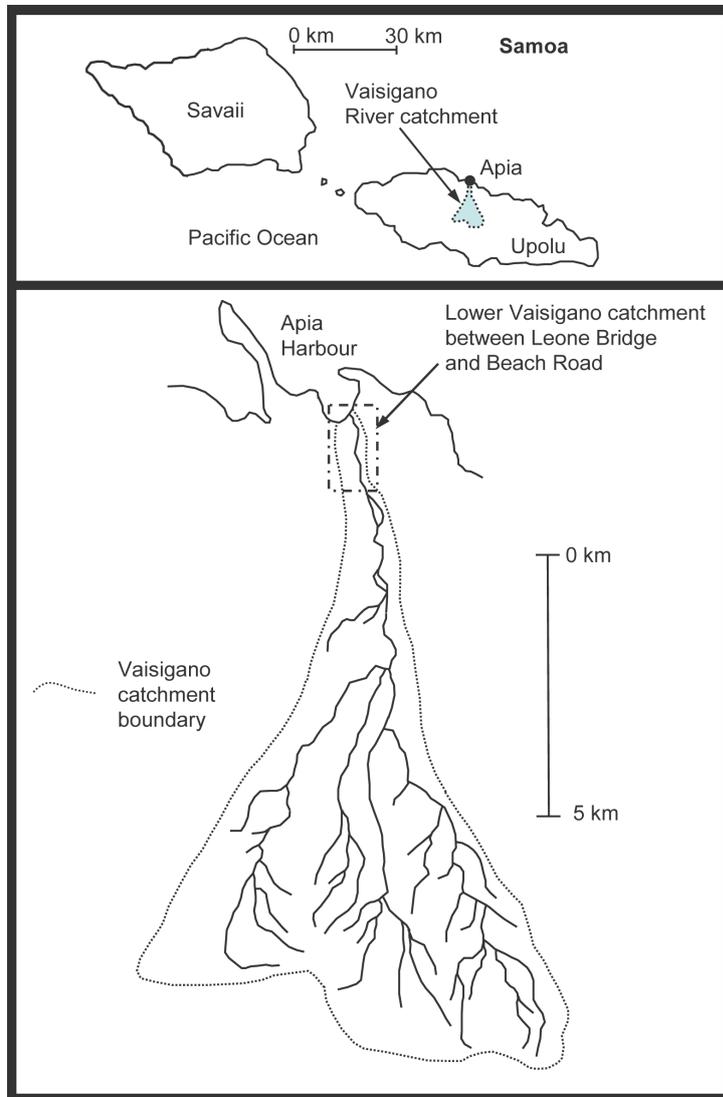


Figure 4.

Map of Samoa showing the location of the Vaisigano River catchment, which illustrates the concentration of water towards central Apia. Map courtesy of the Ministry of Natural Resources and Environment in collaboration with Pacific Islands Applied Geoscience Commission, "Samoa Flood Management Action Plan 2007-2012".

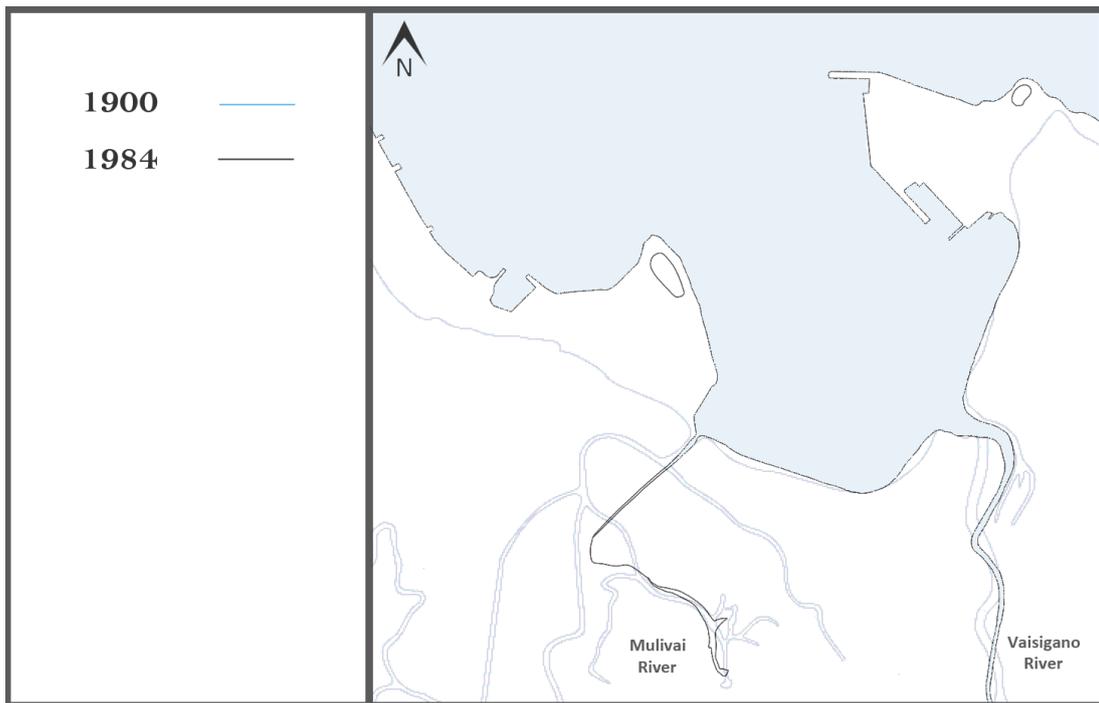


Figure 5.

Map showing the difference between the shore line and the paths of the Mulivai and Vaisigano Rivers in 1900 and 1984. 1900 map information courtesy of Archives New Zealand. 1984 map information courtesy of the Alexander Turnbull Library.

to be acknowledged in urban and building design. Typically, tropical cyclones pass over or close to Samoa in a south-western, southern or south-eastern direction.²¹ This makes Apia, positioned on the northern coast of Upolu, particularly vulnerable. It has been noted that the most devastating of the storms to hit Samoa have occurred during the El Nino climate patterns.²² Although studies have produced conflicting results, most scientists predict an increase in the occurrence of El Ninos as the global temperature increases.²³

For the purpose of this project, the definition of “sustainable development” as stated by the United Nations report entitled “Our Common Future” (also known as the Brundtland Report) will be used. This requires that development is sustainable only if it “ensure(s) that it meets the needs of the present without compromising the ability of future generations to meet their own needs”.²⁴ The aspects of culture, ecology and economy all fall under this umbrella and getting the balance right may be the key to Samoa’s survival.

21 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 19.

22 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 19.

23 Bill Chameides, “El Nino, La Nina and Global Warming”, *Scientific American* (2013), accessed May 18, 2013 <http://www.scientificamerican.com/article.cfm?id=el-nino-la-nina-and-global-warming>

24 World Commission on Environment and Development, “Our Common Future” (Washington, DC: United Nations 1987), 15, accessed 18 May, 2013, http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf

EXISTING LITERATURE SURVEY

ENVIRONMENT AND TOURISM

Due to the fragility of Samoa's volcanic soils, deforestation of the upper slopes of the islands has the potential to endanger water supplies. Deforestation, urban development and agriculture also contribute to pollution and sedimentation in the river and harbour systems, and, when combined with destruction of mangrove areas, this negatively impacts on both water quality and fish stocks.²⁵

Education is an important strategy, for locals and tourists alike. Visitors to Samoa need to understand the impact their activities could have on the country's fragile ecosystem. Schaffer, Foster and Lawley describe environmental impact as "individual actions that influence the present condition or state, have an immediate or cumulative effect, and may be the indirect and direct consequences of human

²⁵ Malama Meleisea et al., *Lagaga: A Short History of Western Samoa* (Suva: University of the South Pacific, 1987), 164-165.



Figure 6.

The Malua Turtle Ponds, a short bus trip from Apia, provide opportunity for tourists to get close to turtles.

actions on the natural environment.”²⁶ Research suggests that this education should be delivered through a variety of mediums, including signage and brochures, but that personal contact through trained staff is the most effective.²⁷

A wealth of natural attractions provide plenty of opportunities for people to view and interact with wildlife throughout Samoa, many of them a within a short drive from Apia. The negative effects of human encounters on wildlife are well documented, with problems such as habituation (the animals no longer see humans as a threat) and disease transmission among the most commonly cited.²⁸

However, other research suggests that these interactions, if managed well, can have long term environmental benefits through improved human behaviours and attitudes towards wildlife and the environment.²⁹ Many tourists lack strong scientific knowledge of the biology and normal behaviours of most species targeted for wildlife tourism, and because of this Valentine and Birtles³⁰ advocate precautionary behaviours, and Higginbottom argues that wildlife tourism has been an essential stimulus in the creation of wildlife reserves.³¹ If the tourism aspect is essential to the preservation of

26 Vikki Schaffer, David Foster and Meredith Lawley, “Environmental Impacts and Indicators for Marine Based Sporting Events (Full Paper),” in *Proceedings of the Fifth International Coastal & Marine Tourism Congress: Balancing Marine Tourism, Development and Sustainability*, (AUT, Auckland: School of Hospitality & Tourism and New Zealand Tourism Research Institute, 2007), 522.

27 Christian Wittlich, “Environmental Education on Rangitoto Island: What Do Visitors Learn From Auckland’s Marine Volcano? (Working Paper),” in *Proceedings of the Fifth International Coastal & Marine Tourism Congress: Balancing Marine Tourism, Development and Sustainability*, (AUT, Auckland: School of Hospitality & Tourism and New Zealand Tourism Research Institute, 2007), 424.

28 Michael J. Manfredo, *Who Cares About Wildlife: Social Science Concepts for Exploring Human-Wildlife Relationships and Conservation Issues* (New York, NY: Springer Science+ Business Media, 2008), 6.

29 Heather Zeppel and Sue Muloin, “Marine Wildlife Tourism: Education and Conservation Benefits (Full Paper),” in *Proceedings of the Fifth International Coastal & Marine Tourism Congress: Balancing Marine Tourism, Development and Sustainability*, (AUT, Auckland: School of Hospitality & Tourism and New Zealand Tourism Research Institute, 2007), 430.

30 Peter Valentine and Alastair Birtles, “Wildlife Watching,” in *Wildlife Tourism: Impacts, Management and Planning*, ed. Karen Higginbottom (Victoria, Australia: Common Ground Publishing Pty Ltd, 2004), 29.

31 Karen Higginbottom, *Wildlife Tourism: Impacts, Management and Planning*, ed. Karen Higginbottom (Victoria, Australia: Common Ground Publishing Pty Ltd, 2004), i-ii.



Figure 7.

Le Corbusier's plan for Paris showing zoning of areas. Image courtesy of <http://craigmurphyviscomm.blogspot.co.nz/>

habitat areas, then it would seem that education of visitors is a high priority and, ideally, the education should take place prior to interaction in order to reap the benefits of improved behaviours towards wildlife.

URBAN PLANNING

With water management and environmental education being such an integral issue for Apia, both environmentally and socially, it makes sense for these issues to be addressed over and above the master-planning stage. A “marine and natural environment education centre” would be the ideal platform for this, and could also serve to facilitate tourist visits to areas of natural beauty. Potentially, income derived from tourist visits to the centre could be directed towards education programmes at a local level, benefitting schools and other community programmes which, in turn could result in improved environmental quality.

Approaches to urban revitalisation can be vastly different. For a large part of the twentieth century the separation of activities, originally espoused by Le Corbusier in *Towards a New Architecture*,³² were heavily favoured. We have come to know this as “Zoning”, industrial, commercial, residential and retail areas being separated out to create hubs of activity (Figure 7). It has now long been accepted that this method of planning has led to, in the words of former Modernist Peter Blake, “hundreds of millions of wheels, millions of miles of highways, and the wholesale destruction of the natural environment that goes with this.”³³

More recently, urban design strategies have focussed on a school of thought called New Urbanism, which promotes mixed use (opposing the zoning prescribed by Modernism), with the focus being on a

32 Le Corbusier, *Towards a New Architecture*, trans. J. Rodker, (New York, NY: Dover, 1986).

33 Peter Blake, *Form Follows Fiasco: Why Modern Architecture Hasn't Worked* (Boston, MA: Little, Brown & Company, 1974), 100.



Figure 8.

A typical New Urbanist development: planned with an emphasis on social spaces and mixed use. Image courtesy of <http://blog.luxuryproperty.com/luxury-condominium-community-defines-new-urbanism-with-highstyle/>



Figure 9.

Mixed use neighbourhood, with a variety of old and new buildings, and an emphasis on pedestrian friendly streets, in the Urban Husbandry style. Image courtesy of <http://www.vancouver.sun.com/homes/Open+dialogue+affordability+choice/7564828/story.html>

global, multicultural society with small regional peculiarities. The structure of the plan is usually highly ordered (Figure 8). Although there appears to be a heavy emphasis on social spaces, and the mixing of different classes and cultures, the large scale planning has the potential to remove existing positive features in the area, resulting in a contrived replacement, if not done carefully.³⁴

Another contemporary approach is sometimes referred to as “Urban Husbandry” (Figure 9). It not only opposes the large scale zoning of Modernism, but also the large scale planning of New Urbanism. Gratz and Mintz use the metaphor of a garden to describe places, where the basis of a good garden is already in place, by virtue of the existing organic growth in the area. Occasionally, weeds or dead plants may need to be removed, other plants nurtured back to health. Ploughing over of the existing fabric is not considered, as the naturally occurring, sometimes spontaneously developed good aspects of the locale do not need replacing.³⁵ They view the large scale planning practices of New Urbanism as “the killing of place in the name of saving it.”³⁶

A New Urbanist approach may seem appropriate, given the large area being looked at in the planning, but it could run the risk of erasing the local character Apia has developed over time. Given the often high costs associated with large scale planning projects, the Urban Husbandry approach seems to be the best fit for Apia – however, it needs to be remembered that this approach does still rely on local financial stimulus and initiative. A combination of broad planning, allowing for the development of public spaces, and gentle “tending of the garden” to provide opportunity for local growth would seem to be the best way forward for the master-

34 Roberta Brandes Gratz and Norman Mintz,, *Cities Back from the Edge, New Life for Downtown*, (New York, NY:John Wiley & Sons, 1998), 71.

35 Gratz and Mintz, *Cities Back from the Edge, New Life for Downtown*, 65.

36 Gratz and Mintz, *Cities Back from the Edge, New Life for Downtown*, 73.



Figure 10.

Apolima Village around the turn of the last century. The image illustrates the emphasis on the central open space. Image courtesy of http://commons.wikimedia.org/wiki/File:Apolima.village,Apolima.Island.circa_1890-1910.jpg

plan. Both methods promote density and mixed use, discourage car dependency, and focus on the social aspect of places.

SAMOAN SPACES

In order to select a design strategy which will be appropriate for the Samoan context, one must look at how traditional Samoan spaces have been laid out. Historically, villages were laid out around a central, open space (the malae³⁷), with the most prominent buildings occupying the periphery of the central space. Radiating out from this, the buildings continued outwards in a hierarchical manner with the lowest status buildings on the edge of the settlement, bordering the forest. Villages on the coast would use the same hierarchy, radiating back from the sea, and the same sense of hierarchy permeates through much of the spatial organisation in villages, right down to seating positions in the fale.

Anne E. Guernsey Allen describes this spatial arrangement as “a linear hierarchy with paired oppositions.”³⁸ The paired oppositions refers to the seating arrangement within a fale where members of equal rank are usually seated opposite each other, whilst still being arranged in a linear hierarchy (with the highest ranking located at each end of the space). Guernsey Allen also notes that boundaries within the village are more often marked visually, for instance with plantings or small stones, rather than by physical barriers.³⁹ She goes on to describe the overlapping concepts of seaward (i tai) and inland (i uta), front and back, centre and periphery, and how these provide the basis for spatial organisation in traditional Samoan

37 Schnoor, Christoph and John Taliva'a. "Samoan Village Space in Transition." In Audience: roceedings of the Twenty-Eighth Annual Conference of the Society of Architectural Historians, Australia and New Zealand (SAHANZ 2011), edited by A. Moulis and D. Van derPlaat, CD-ROM.

38 Anne E. Guernsey Allen, 'Architecture as Social Expression in Western Samoa: Axioms and Models', *Traditional Dwellings and Settlements Review* 5.1 (1993), 36.

39 Anne E. Guernsey Allen, 'Architecture as Social Expression in Western Samoa: Axioms and Models', 34.



Figure 11.

Diagrammatic view of Apia, showing in green the areas which have been prone to becoming swamp during wet periods in the past. Map not to scale.

villages.⁴⁰

UNESCO has expressed concern that current urban planning models and disaster relief plans do not adequately protect aspects of traditional Samoan culture.⁴¹ Figure 11 shows areas designated as swampland in a 1983 NZMS Topographical Map⁴², overlaid onto a present-day figure-ground map of the area. Predominantly, areas of swampland fall under customary land tenure and are, consequently, occupied by people who often do not have the economic resources to substantially improve their situation on a day-to-day basis, or make repairs post-disaster.

REGIONALITY IN ARCHITECTURE

Not everyone regards local building traditions as being of value: Henry-Russell Hitchcock claims the architect should aim for an “ideal standard,” and “disregard entirely the peculiarities of local tradition.”⁴³ However, Rem Koolhaas portrayed this standardisation of style as apocalyptic, the city that is no longer, in his description of the Generic City.⁴⁴ Certainly, this standardisation seems to deny the history of a place and its people, and would seem inappropriate in a country where connection to the land has been so important, historically. Lefaivre and Tzonis recognise that applying universal norms in design process can have its benefits, but not when regional

40 Anne E. Guernsey Allen, ‘Architecture as Social Expression in Western Samoa: Axioms and Models’, 36.

41 “Cyclone Evan in Samoa: Response and Participation of UNESCO”, UNESCO Office in Apia, last modified February 5, 2013, http://www.unesco.org/new/en/apia/about-this-office/single-view/news/cyclone_evan_in_samoa/

42 New Zealand Dept. of Lands and Survey, *Apia*, courtesy of Alexander Turnbull Library, Wellington, New Zealand.

43 Henry-Russell Hitchcock and Philip Johnson, *The International Style* (New York, NY: W. W. Norton & Company, 1966), 93-94.

44 Rem Koolhaas, Bruce May and OMA, *Small, Medium, Large, Extra Large* (New York, NY: Monacelli Press, 1995), 1264.



Figure 12.

The MESC building in Apia lies outside of the designated area for the waterfront design, but provides an example of Roberto Segre’s “middle ground”, combining contemporary global architecture with local features to produce a regional building. Image courtesy of <http://archive.wmia.com.au/projects?projectCategoryId=11&projectId=18>

scope and regional values fail to be considered.⁴⁵ Meanwhile Roberto Segre recommends finding a middle ground by integrating a universal avant-garde with local peculiarities in order to achieve contemporary regional architecture.⁴⁶

The idea of integrating the modern with traditional, regional architecture was explored more fully by Lewis Mumford during the first half of the twentieth century. He opposed rigorous imitation of traditional styles, and advocated only applying traditional methods when they are the best solution for the building problem. He promoted ecological sustainability, long before it became a catchphrase, and encouraged people to think of communities as being diverse and multi-cultural, rather than mono-cultural.⁴⁷

Mumford's approach to regionalism was summed up well when he said:

"...every regional culture necessarily has a universal side to it. It is steadily open to influences that come from other parts of the world, and from other cultures, separated from the local region in space or time or both together."⁴⁸

As European and western influences have been present and adopted in Samoa since the 1800's, perhaps this melding of the traditional with the global is appropriate for Apia. Although tourism may be a strong driving factor in the revitalisation of the waterfront, creating

45 Liane Lefaivre & Alexander Tzonis, "Tropical Critical Regionalism: Introductory Comments," Alexander Tzonis, Liane Lefaivre & Bruno Stagno, *Tropical Architecture: Critical Regionalism in the Age of Globalization* (John Wiley & Sons, Chichester, 2001), 1.

46 Roberto Segre, "Architecture and City in the Caribbean: the Reinvention of Paradise," Alexander Tzonis, Liane Lefaivre & Bruno Stagno, *Tropical Architecture: Critical Regionalism in the Age of Globalization* (John Wiley & Sons, Chichester, 2001), 114.

47 Liane Lefaivre & Alexander Tzonis, "The Suppression and Rethinking of Regionalism and Tropicalism After 1945," Alexander Tzonis, Liane Lefaivre & Bruno Stagno, *Tropical Architecture: Critical Regionalism in the Age of Globalization* (John Wiley & Sons, Chichester, 2001), 25-28.

48 Lewis Mumford, *The South in Architecture* (New York, 1941), 95.

new architecture which adheres faithfully to traditional Samoan buildings, likened by Lefaivre and Tzonis to a mass media product,⁴⁹ is unlikely to provide an authentic experience to visitors of modern-day Samoa. As Gratz and Mintz have pointed out:

“Authentic places have become tourist attractions because of their rarity.”⁵⁰

49 Liane Lefaivre & Alexander Tzonis, “Tropical Critical Regionalism: Introductory Comments,” Alexander Tzonis, Liane Lefaivre & Bruno Stagno, *Tropical Architecture: Critical Regionalism in the Age of Globalization* (John Wiley & Sons, Chichester, 2001), 6.

50 Gratz, *Cities Back from the Edge, New Life for Downtown*, 148.

PRECEDENT STUDIES

ISLE OF DOGS: LONDON'S DOCKLANDS

The Isle of Dogs is a former docklands within the greater London area. An industry decline in the 1970's saw the area fall into near dereliction,⁵¹ During the 1980's the London Docklands Development Corporation was formed to oversee revitalisation of the area. Exemptions were made to the statutory planning regulations which saw large-scale commercial development on the old dock sites. In addition to this, large developments of luxury executive homes and apartments were constructed along the waterfronts.⁵²

51 "The Isle of Dogs – History at a Glance" The Island History Trust, accessed 04 July, 2013, <http://www.islandhistory.org.uk/index.php?p=2&c=0&x=3792755>

52 Richard Rogers, *Cities for a Small Planet* (New York, NY: Basic Books, 2008), 110.

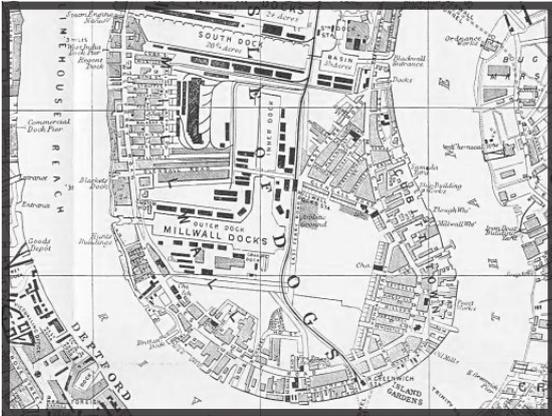


Figure 13.

This map of the Isle of Dogs from 1952 shows the area before the revitalisation during the 1980's. **Map not to scale.** Image courtesy of <http://www.islandhistory.co.uk/zen/index.php?album=historic-maps&image=1952.jpg#>. 1952



Figure 14.

Aerial view of the Isle of Dogs today. The old wharf areas have been replaced by high-rise commercial buildings and upmarket residential suburbs. Image courtesy of <http://wharferj.wordpress.com/tag/isle-of-dogs>

Many of the long-term residents believed that rising house prices in the area were pushing them out, and there was discord between the luxury homes neighbouring the housing estates.⁵³ In addition, the housing estates were recently moved from government ownership to private ownership. The residents had been told they could form the boards which would run the estates, but in reality this did not happen, leaving the residents feeling powerless and disenfranchised.⁵⁴

The recent global recession showed how vulnerable the area is to market forces. Recently, new change of use regulations were instated to allow the empty office blocks in the area to be converted to other uses, including schools, retail and residential, to reduce low occupancy rates.⁵⁵

The Isle of Dogs illustrates the necessity for diversification in uses, to protect against market fluctuations. It is also a good example of what happens when the needs and desires of existing residents are not taken into consideration, or are regarded as a lower priority.

ST GEORGE'S, GRENADA

St George's, the capital city of Grenada, is a major port, exporting local products. The Grenada climate is similar to that of Samoa. Grenada too relies on agriculture, tourism and foreign aid to

53 R.Kennedy, Re-urbanisation in London Docklands" Slideshare, accessed 04 July, 2013, <http://www.slideshare.net/year12blanchgeography/reurbanisation-in-london-docklands-powerpointppt-rkennedy>

54 Editors Choice, *East London News*, August 2, 2012, <http://www.eastlondonnews.com/new-issue-editors-choice/>

55 John Geoghegan, "17 Authorities Gain Exemption From Office Conversion Rules", *Planning Resource*, May 9, 2013, <http://www.planning-resource.co.uk/news/1181767/>



Figure 15.

The St George's waterfront in Grenada. Many of the buildings are built almost to the waterline, making them particularly susceptible to damage from tropical storms. Image courtesy of http://www.allposters.com/-sp/Carenage-Harbour-St-George-S-Grenada-West-Indies-Caribbean-Posters_i3169997_.htm

survive.⁵⁶

St George's is interesting in two respects. Firstly, in 2004, the region was devastated by Hurricane Ivan. Like Apia, its coastal position means that when a hurricane makes landfall it is vulnerable to the full force of the storm, and is, therefore, susceptible to wind damage, storm surge, flooding and coastal erosion. It is estimated that 50% of Grenada's major tourism assets and 80% of hotel rooms in the primary tourist area of Grand Anse were damaged by Ivan.⁵⁷

This led to Grenada introducing a Policy and Operational Framework for Mainstreaming Disaster Risk Reduction. This requires new developments to be placed "a prescribed distance landward of a coastal feature, such as the high water mark or the line of permanent vegetation", so that damage to beachfront property is reduced. The framework also provides guidelines to structural resilience and the environmental impacts of development.⁵⁸

The second point of interest is the retention of historic buildings within the waterfront area. Brian J. Hudson notes that in the West Indies, there is a growing appreciation of the value of historic

56 Encyclopaedia Britannica s.v. "Saint Georges", accessed on 04 July, 2013, <http://www.britannica.com/EBchecked/topic/517175/Saint-Georges>

57 Roche' Mahon, "The Role of Physical Planning in Linking Disaster Risk Reduction to the Development Process: Coastal Tourism Reconstruction in Grand Anse, Grenada", in Proceedings of the Fifth *International Coastal & Marine Tourism Congress: Balancing Marine Tourism, Development and Sustainability*, (AUT, Auckland: School of Hospitality & Tourism and New Zealand Tourism Research Institute, 2007), 546.

58 Roche' Mahon, "The Role of Physical Planning in Linking Disaster Risk Reduction to the Development Process: Coastal Tourism Reconstruction in Grand Anse, Grenada", in Proceedings of the Fifth *International Coastal & Marine Tourism Congress: Balancing Marine Tourism, Development and Sustainability*, (AUT, Auckland: School of Hospitality & Tourism and New Zealand Tourism Research Institute, 2007), 551.



Figures 16 and 17.

St George's (left) has retained many of its older buildings which lends a historic character to the location. While Kingston (right) has retained a few older buildings, it lacks the same historic character.

Image 16 courtesy of http://www.allposters.com/-sp/St-Georges-Grenada-Caribbean-West-Indies-Posters_i3022387_.htm

Image 17 courtesy of <http://karadier3.blogspot.co.nz/>

buildings to the tourism industry.⁵⁹ He goes on to point out that tourists do not tend to flock to downtown Kingston, which lacks historic architecture, and, therefore, the qualities of charm and uniqueness that many tourists seek when they go overseas⁶⁰ (largely due to an earthquake in 1907)⁶¹. Conversely, St George's is a popular tourist destination, regularly visited by cruise ships⁶² and provides an eclectic mix of buildings from old colonial to industrial port buildings, to newer buildings constructed in the aftermath of Ivan. It has been described as bustling on weekdays, with much street life, quiet and peaceful on the weekends.⁶³

The two key items which can be taken from the St George's example are the retention of historic buildings and features to enhance tourism, and the implementation of planning policies to mitigate impacts from tropical storms.

59 Brian J. Hudson, "Waterfront Redevelopment, Heritage, and Tourism in the Caribbean," in *Recreation and Tourism as a Catalyst for Urban Waterfront Development: An International Survey*, ed. Stephen J. Craig-Smith and Michael Fagence (Connecticut, CT: Praeger Publishers, 1995), 93.

60 Brian J. Hudson, "Waterfront Redevelopment, Heritage, and Tourism in the Caribbean," in *Recreation and Tourism as a Catalyst for Urban Waterfront Development: An International Survey*, ed. Stephen J. Craig-Smith and Michael Fagence (Connecticut, CT: Praeger Publishers, 1995), 97.

61 United States Agency for International Development – "Chapter 5: Discussion and Recommendations," *Final Report: Kingston Metropolitan Area Seismic Hazard Assessment* (Washington: USAID: 1999) <http://www.oas.org/cdmp/document/kma/seismic/kma5.htm>

62 Encyclopaedia Britannica s.v. "Grenada" accessed 04 July, 2013, <http://www.britannica.com/EBchecked/topic/245745/Grenada>

63 TripAdvisor.com accessed 04 July, 2013, http://www.tripadvisor.com/ShowUserReviews-g147296-d148382-r123656892-Carenage-St_George_s_Saint_George_Parish_Grenada.html#REVIEWS

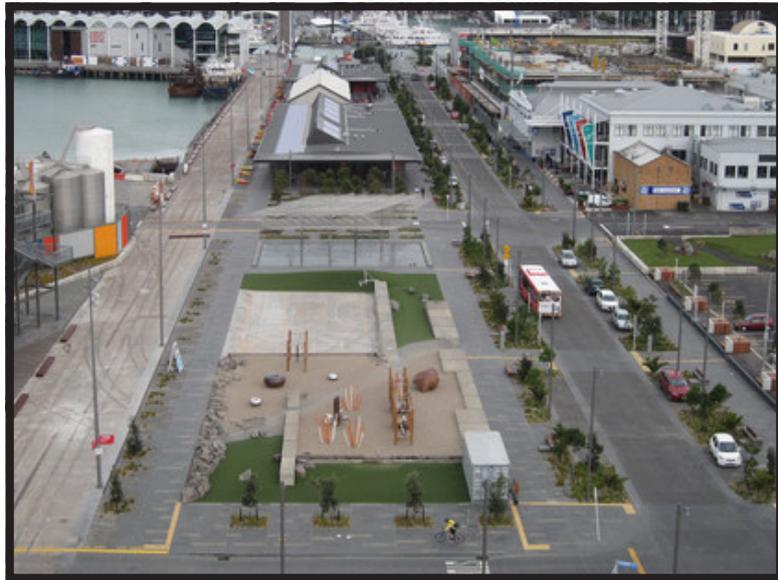


Figure 18.

The Jellicoe Precinct of the Auckland waterfront. There is a heavy emphasis on shared public spaces and a strong axis running through the site. Image courtesy of <http://www.waterfrontauckland.co.nz/Waterfront-Auckland/What-s-Next/Planning.aspx>

AUCKLAND WATERFRONT

Auckland is New Zealand's largest city. Its main port is a vital trade and tourist gateway to the city. In 2007 Waterfront Auckland released its Urban Design Framework for the Wynyard Quarter and neighbouring waterfront sites, to be delivered over a 30 year period.⁶⁴ The plan was based around establishing "a working and recreational waterfront linked by a sequence of engaging public spaces",⁶⁵ in order to draw people into the area, while retaining the port functions.

Spatially, the plan acknowledges three major axes through the site and looks to develop distinct "precincts", each with their own character. Historic landmarks (such as the cement silos and the historic sheds on Queens Wharf) have been retained and their industrial nature given a new lease of life as exhibition and event spaces.⁶⁶ Queens Wharf itself, previously a private domain, has been reopened to the public and now holds international events (such as the World Triathlon Series).

Although not yet completed, the initial stages have been successful, with locals and tourists alike now regularly using the area. The focus on pedestrian movement and recreation (both active and passive)⁶⁷ means the place is frequently used by people exercising (on foot or by bike) and by others who sit, lounge or stroll in the public spaces.

64 Waterfront Auckland, *Wynyard Quarter – Urban Design Framework* (last modified June 2007), <http://www.waterfrontauckland.co.nz/Waterfront-Auckland/What-s-Next/Planning.aspx>

65 Waterfront Auckland, *Wynyard Quarter – Urban Design Framework* (last modified June 2007), <http://www.waterfrontauckland.co.nz/Waterfront-Auckland/What-s-Next/Planning.aspx>

66 Waterfront Auckland, *Wynyard Quarter – Urban Design Framework* (last modified June 2007), <http://www.waterfrontauckland.co.nz/Waterfront-Auckland/What-s-Next/Planning.aspx>

67 Waterfront Auckland, *Wynyard Quarter – Urban Design Framework* (last modified June 2007), <http://www.waterfrontauckland.co.nz/Waterfront-Auckland/What-s-Next/Planning.aspx>



Figures 19 and 20.

The Goat Island Marine Discovery Centre has strong connection with the surrounding landscape. The building itself nestles against the hillside, while the windows are positioned to provide views of the surrounding marine reserve.

Because the development has focussed on mixed-use, the area is popular on both weekdays and weekends.

Although it is still early days for the Auckland waterfront, and the longevity of its success has yet to be proven, the fact that it is a long term plan means that any areas which cease to perform can provide lessons, and it gives opportunity for changes to the plan to be made in order for the area to maintain its new lease on life.

GOAT ISLAND MARINE DISCOVERY CENTRE, LEIGH

The Goat Island Marine Discovery Centre is the public portion of the Leigh Marine Laboratory, a research centre affiliated with the University of Auckland. The centre offers a number of displays which educate visitors about the species found within the park, as well as marine conservation. Guided tours for all ages are provided around the centre to ensure visitors receive a comprehensive educational experience, School holiday programmes also run, targeted at younger visitors. Interactive tours and a focus on fun are key elements of the centre's educational programme.⁶⁸

The focus of the centre is very much on education, so the usual commercial trappings of public aquariums, such as cafe and gift shop, are absent (the centre relies on public donations to supplement income from ticket sales). However, ample parking for buses and cars is provided. The building has been designed to provide views out across the marine reserve, giving visitors a connection between

68 Goat Island Marine Discovery Centre, accessed on 05 July, 2013, <http://goatlandmarine.co.nz/leigh-gallery/?show=gallery>



Figures 21 and 22.

Kelly Tarlton's Sea Life Aquarium is mostly subterranean. The only visual connection to the surrounding landscape is through the window in the cafe area (right).

the environment and what they are learning about it. The centre provides a good staging point from which visitors can go out and enjoy the marine reserve in a more knowledgeable and conscientious manner.

KELLY TARLTON'S SEA LIFE AQUARIUM, AUCKLAND

Kelly Tarlton's is a public aquarium situated on the waterfront in Orakei. It has extensive tank displays, including an underwater viewing tunnel, and features a large Antarctic section with exploration displays and a penguin enclosure. There are interactive displays, as well as "touch pools" where gentle contact with marine creatures is available. There are daily scheduled talks (usually coinciding with feeding times), and behind the scenes tours and animal encounters are available at an additional charge.⁶⁹

The building is very inward looking in comparison to Goat Island, most of it being subterranean, and it does not have the benefit of a marine reserve in the immediate vicinity for visitors to go out and explore, limiting its function as a staging point for real-world experiences. There is, however, a cafe and large gift shop, providing additional revenue to the centre.

69 Kelly Tarlton's Sea Life Aquarium, accessed on 05 July, 2013, <http://www.kellytarltons.co.nz/explore/interactive-zones/>

DESIGN APPROACH

URBAN DESIGN

The literature survey outlined various approaches to urban design, and a key aspect of the approach taken here has come from the urban husbandry writings of Gratz and Mintz who state:

Without the variety of common grounds on which a diverse people mix and mingle in an unplanned manner, the health of the commonwealth is undermined. Genuine “public places” – whether a town square or downtown sidewalk – are where planned, chance, formal, and informal meetings occur, the opportunity for people to come together, to hear about new ideas, share concerns, understand the dilemmas of others, listen to differing opinions, debate proposals for change, and, perhaps, even resolve differences.¹

70 Gratz and Mintz, *Cities Back from the Edge, New Life for Downtown*, 34.

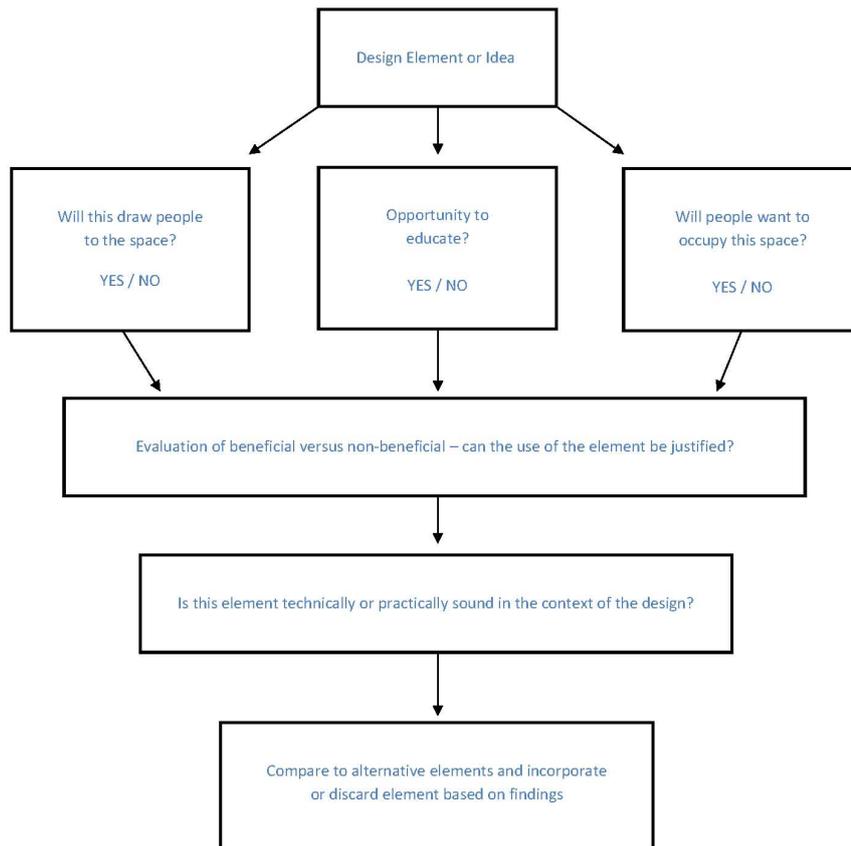


Figure 23.

A mind map diagram showing the urban design process for the park area around the Education Centre.

The primary methods for creating these “genuine public places” to be used in this design will focus on the following:

- Creating a focal point which draws people into an area (if one does not already exist)
- Providing areas for people to gather and sit or recline
- Giving respite from the heat through increased shade
- Finding opportunities to educate both tourists and locals

As described in the literature survey, a combination of urban husbandry and new urbanist principles will be employed. In areas with a strong existing urban fabric, small “tending of the garden” measures will be implemented, with the addition of beneficial elements and the occasional replacement or reconfiguring of existing elements. In areas where the existing urban fabric is sparse, or dysfunctional in some way, bolder moves can be made.

The “mind map” in Figure 23 was created as a basis for decision making during the urban design process.

BUILDING DESIGN

Mumford’s approach to what is now known as “critical regionalism” will be one of the over-riding factors in the design of the education centre. Evaluating a building feature with regards to true climatic benefit enables a designer to resist the urge to include a regional characteristic into the building based on aesthetic preference alone.

At all times the location of the building influences the design decisions made. Climate and the susceptibility of Samoa to tropical storms, its location in a seismic zone and the ground conditions on which it is sited are all critical factors which are acknowledged throughout the process.

A similar mind map to that proposed for the urban design was created, but the key evaluation points regarding the ability to draw people to a space and facilitating use of the space were replaced with the questions:

- Does this provide any environmental or climatic benefit?
- Does this provide a quality experiential benefit to the visitor?

The question of whether a proposed element would facilitate education was retained, as this is essential to the design of the building. The ability of the building to engage with and benefit people is paramount otherwise it has failed in its purpose.

All other steps in the mind map remained the same.

ANALYSIS OF LOCAL BUILDING FORMS

In order to decide which regional building characteristics can be incorporated into the education centre, it is important to first assess the characteristics which are present and evaluate their climatic benefit.

TRADITIONAL SAMOAN

Samoaan fale are usually open-sided structures characterised by high domed, thatched roofs (Figure 24). The following is a summary of the description of the form of construction used in fale building, provided by Te’o Tuvale:²

Large central posts (poutu) support the centre
of the structure – the poutu also support large

71 “Te’o Tuvale, *An Account of Samoan History up to 1918*,” Filmed by the Public Library of New South Wales, July 1968. Chapter: The Samoan House, 2-3. <http://nzetc.victoria.ac.nz/tm/scholarly/tei-TuvAcco.html> accessed on 23 June 2013.

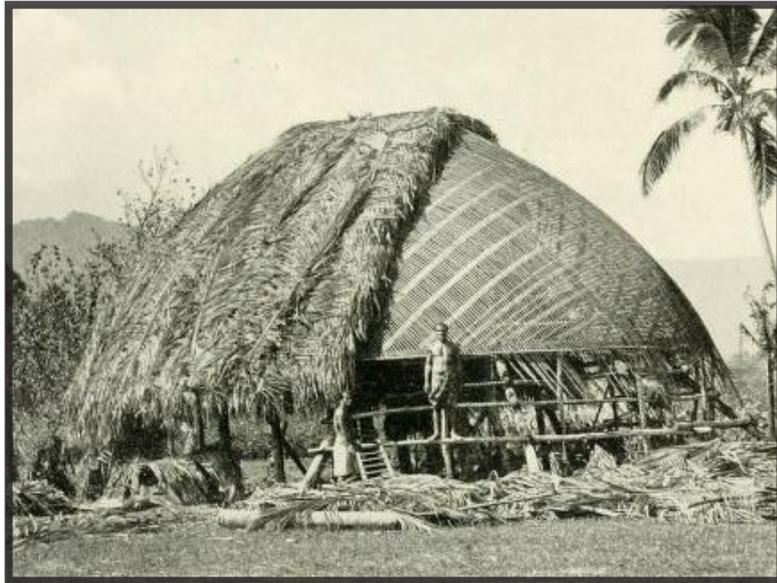


Figure 24.

Image showing a traditional fale under construction in 1902. Image courtesy of http://commons.wikimedia.org/wiki/File:Fale_Samoa_Construction_1902_.jpg

cross-members (so'a) which extend to the internal circumference of the roof and attach to further cross-members at the ends (la'au fa'alava) and there are further cross-members which rest upon to poutu (the auau). These, in conjunction with the faulalo – thick tubular pieces of wood which run around the circumference of the building and form the lower edge of the roof, and are supported on large posts (poulalo) at 3-4 foot intervals – provide the main framework for the lattice structure which forms the roof. This lattice structure is made up of a layered system of tubular members which run from the faulalo to the auau at the apex of the roof which in turn carry two perpendicular layers of timber strips – the aso and paeaso – which create a grid-like pattern in the underside of the roof. The entire structure is bound together with a string made from coconut fibres called afa. It is this lattice structure to which the thatch, or lau, is secured. Sugar cane leaves are considered the best quality lau, but leaves from other local trees may be used if supplies are low.

Due to the construction materials and techniques used, these buildings have a transient existence. A combination of tropical storm activity and natural biodegradation of the materials means that these buildings are rebuilt on a regular basis. They are, however, well suited to the climate. Being open sided, they allow the tropical breezes to flow through (woven mats can be lowered along the sides if privacy or rain protection is desired), and the large roof not only provides welcome shade but the height of the roof allows the warmer air to rise away from the occupied space. In addition to this, they are as environmentally friendly as one can get, being built almost entirely from biodegradable and fully renewable materials, the exception being the coral or volcanic rock raised platforms some fale are built on. The bound lattice-work on the underside of the roofs can also be quite beautiful (Figure 24), with the variation in size between the layers of the lattice adding visual interest to the pattern. There is also a certain beauty in the craftsmanship of the whole building. Traditionally, property boundaries were not fenced, and were implied through other means, rather than strongly



Figure 25.

The old courthouse on Beach Road which shows examples of a gable end above a verandah roof and formal demarcation of the boundary.

demarcated.³

EUROPEAN COLONIAL ERA BUILDINGS

Few colonial buildings survive in the Apia area. However a comprehensive account of the buildings which were there is provided by Gary Pringle.⁴ He states that masonry construction was almost exclusively reserved for ecclesiastic buildings, and that light timber construction was the dominant building type, due to the supply of building materials largely coming from Australia and New Zealand, where this form of construction was also dominant at the time.

Most domestic buildings followed the detached cottage style prevalent in rural areas of Europe, with a steeply pitched hipped roof. Deep verandas were common, often on the front and back of the building, but also sometimes on all sides. The roof structure for the veranda was sometimes part of the main roof structure, but was often separated (and often sat just below the main roof line) due to the depths of the verandas. The benefit of deep, open verandas was such that a roof form known as the “Sumatra roof” became common, where a gable end was placed above the veranda which enables the roof to be ventilated, as can be seen on the old courthouse on Beach Rd (Figure 25). Standard gable ends were rare.⁵

Commercial buildings were often two-storey, and verandas were again a common feature, although standard gable ends were sometimes used in these buildings.⁶ Formal demarcation of property boundaries was used during the colonial period for both commercial and residential properties, often with English-style picket fencing,⁷ and an example of this introduced style of formal boundary-marking can still be seen outside the old courthouse (Figure 25).

72 Anne E. Guernsey Allen, ‘Architecture as Social Expression in Western Samoa: Axioms and Models’, *Traditional Dwellings and Settlements Review* 5, no. 1 (1993), 6.

73 Gary Pringle, *Heritage Assessment Apia, Western Samoa* (master’s thesis, University of Sydney, 1989), 74-77.

74 Gary Pringle, *Heritage Assessment Apia, Western Samoa*, 74-77.

75 Gary Pringle, *Heritage Assessment Apia, Western Samoa*, 79.

76 Gary Pringle, *Heritage Assessment Apia, Western Samoa*, 72.

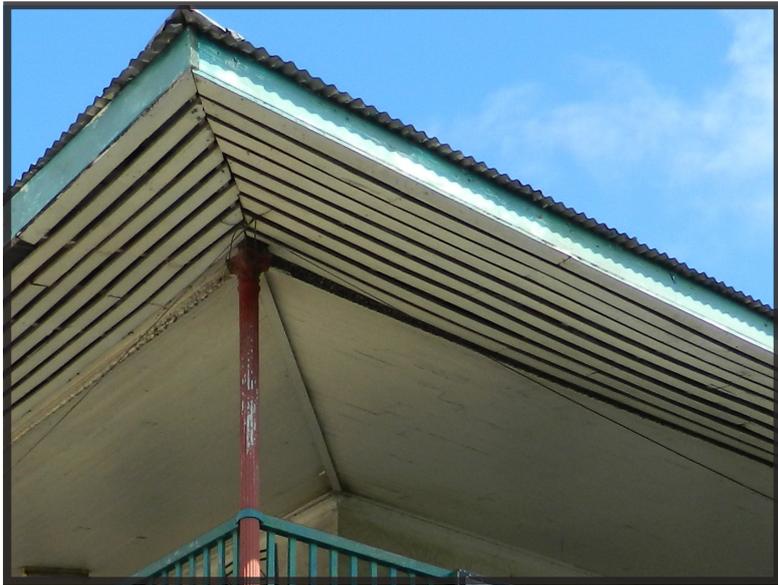


Figure 26.

Ventilated soffit on an accessory building to the Roman Catholic Cathedral on Beach Road.

Ventilated soffits (Figure 26) can be seen on two surviving colonial buildings in Apia (buildings 63a and 82 in the building survey), and distinctive crossed timber bars (Figure 27) can also be found on the verandas of surviving colonial buildings (buildings 63a and 80 in the building survey). Four of the surviving early buildings (36, 37, 47, and 63a) are of masonry construction and contain either arched windows or arched colonnades (Figure 28). However, it is notable that three of these buildings are of ecclesiastical origin.

MORE RECENT BUILDING TYPOLOGIES

(Based on observations made during the building survey and travels around Apia).

The vast majority of the commercial buildings in the surveyed area of Apia show little in the way of regional style. Most are of the post-International Style, and could be situated in any of a number of western countries. While efforts have been made on some buildings to acknowledge their context, most lack contextual relevance. In almost all cases, these modern buildings shun the possibilities of traditional natural ventilation and require mechanical climate control. Seemingly the only concession to past architectural styles in the area is the retained use of the veranda to provide shade to many commercial premises. One notable exception to this is the NESC building, which is located just outside of the focus area. Both horizontal and vertical louvres have been used to shade the interior of the building, reducing the mechanical ventilation needed. The formal demarcation of boundaries has continued with regards to commercial properties, with hurricane fencing the most common form of barrier. Some residential properties have continued this also (though most notably it is the western style houses which seem to adopt this, on the occasions when it is adopted).

There are, however, a small collection of buildings in the downtown area which directly reference the traditional fale buildings of Samoa. Most are part of a model village set up next to the Samoa Tourism Authority, a building which quite successfully marries the traditional building form with the requirements of a modern, commercial building typology (Figure 27). Both the Tourism Authority building and the largest of the model village buildings have had the traditional thatched roof substituted by timber shingles, probably for durability



Figure 27.

Crossed timber bars on the veranda of the old police station on Ifi'ifi Street. It is one of the few surviving colonial buildings in the focus area, but suffered damage to its west side during Cyclone Evan.



Figure 28.

St Mary's Convent, with an associated primary school next door, on Fugalei Street. The deep arched colonades provide shade to the interior of the building.



Figure 29.

Samoa Tourism Authority Building (right) and the main fale building which is part of the replica village on the seaward side of Beach Road.



Figure 30.

Overview map of Apia showing the different building uses found within the target area (based on visual appraisal during the building survey in Appendix I). Commercial buildings dominate central Apia, while other areas show a mixture of uses.

reasons. The substitution is quite a successful one, as the shingles mimic the heavy texture created by thatch. Shingles have also replaced thatch on other fale and fale-style buildings outside of the survey area.

A typical contemporary residential building in Apia tends to follow the western building tradition, in the style of the detached cottage with a pitched roof, though the traditional windows are almost always replaced by glass louvres to enhance cross-ventilation. Mosquito screens on windows are also a common feature. The heavily pitched roof with deep eaves is still common, and might be considered a regional feature. Verandas still appear on some residential buildings, tending to add a sort of presence to the buildings. Both single- and two- storey buildings are common, with the ground level commonly constructed from concrete block and upper levels timber framed, with either timber or fibre-cement board cladding. In the case of two-storey buildings, it appears the upper level is often used as sleeping quarters, possibly to access night breezes. In suburban areas of Apia, more traditional-style residential buildings still exist, though these are usually now of concrete construction, and the traditional woven mats used to screen the open sides have frequently been replaced with the ubiquitous blue tarpaulin. All residential buildings observed in the survey area were of the western style. No photographs have been supplied of private, residential buildings out of respect for their occupants. Both types of residential building are often painted in pale, vibrant colours which, along with their brightly coloured tropical gardens, create a riot of colour in some suburbs. Corrugated iron is almost universal as a roofing material.

The various types of building use found within the target area are shown in Figure 30. Figure 31 outlines the various types of buildings, common forms associated with these types, and whether those forms provide a climatic advantage. It is important to remember that these are generalisations based on the most common examples of each of these building types and that there will be exceptions in each case.

Feature	Traditional	Colonial	Modern Commercial	Modern Residential	Climatic Benefit?
Steep Roof Pitch	X	X		X	X
Deep Eaves	X	X		X	X
Flat roof			X		
Ventilated roof cavity		X			X
Open Sided	X			X	X
Verandas		X	X	X	X
Naturally Ventilated	X	X		X	X
Louvre windows		X		X	X
Few Internal Divisions	X			X*	X
High Visual Landscape Connection	X			X	
Boundaries Implied Rather Than Marked	X			X	

* Traditional Samoan families have retained the shared internal space of the traditional fale in their western-style homes

Figure 31.

Table outlining common building features in Apia and the typologies they are associated with.

MATERIALS

The locally produced timbers used in building production can be divided into two categories: those which are resistant to termite attack, and those which are not. Opposite is a table showing the native timbers most commonly harvested in Samoa⁸ for construction, and some characteristics of these timbers.

While Samoan timbers are able to be used structurally and ornamentally, and can be processed into ply and veneers, the author was unable to establish how much of the timber used in modern Samoan construction is sourced locally, due to concerns regarding over-harvesting of some species.⁹

Concrete blocks and reinforced concrete were both introduced to Samoa after German colonisation.¹⁰ Resistance to termite damage, longevity even with ground contact, and superior strength in a seismic and tropical storm area, are all benefits these materials have over traditional timber construction. However, negative consequences of their use can be reduced building permeability, reducing the opportunity for airflow through buildings, reduced capacity for individuality between buildings (particularly with standard masonry units), and their inevitable industrial aesthetic being applied to domestic architecture.

Concrete blocks are manufactured in Samoa, including locally in Apia, from a combination of imported and local materials.

Supply of materials for reinforced concrete construction is also available locally in Apia, again a combination of imported and local materials.

This material has been used since the early years of European settlement, when it was imported from Europe. It is now the most common roofing material in Apia. Although confirming the origin of supply for this material has been difficult, it is likely that it is still imported.

Fibre cement boards are commonly used as exterior cladding

77 W. Arthur Whistler, *Plants in Samoan Culture; The Ethnobotany of Samoa* (Honolulu: Isle Botanica, 2000), 93.

78 "AgroForestry Tree Database" World AgroForestry Centre, accessed on 22 June 2013, <http://www.worldagroforestry.org/SEA/Products/AFD-bases/AF/asp/SpeciesInfo.asp?SpID=17930#Uses>

79 Gary Pringle, *Heritage Assessment Apia, Western Samoa*, 76.

Material	Traditional	Colonial	Modern Commercial	Modern Residential	Climatic Benefit?	Seismic Benefit?
Timber (Structural)	X	X		X	X	X
Timber (Non-Structural)	X	X		X	X	
Concrete/Reinforced Masonry (Structural)		X	X	X		X
Concrete/Reinforced Masonry (Non-Structural)		X	X	X		X
Fibre-cement Board		X	X	X		
Glass		X	X	X		
Corrugated Iron		X	X	X		X
Thatch	X				X	X
Shingle			X			

Figure 32.

Table outlining common building materials in Apia and the building typologies they are associated with.

on residential buildings, and a few commercial buildings also. Increasingly, commercial buildings following the international style are being clad using composite panels and curtain wall systems. Again, it has been difficult to ascertain the origin of these materials but, given Samoa's size and the scale of its industrial sector, it is likely that these materials are sourced from international suppliers. No manufacturers of glass were to be found in Samoa, and companies which supply products made from iron, steel and aluminium do so by cutting preformed imported materials to client specifications.¹¹

Figure 32 outlines commonly used materials in Samoan buildings, which typologies they are usually used in, and whether or not they have a climatic or seismic benefit. In the case of corrugated iron and shingle, they have not been classed as climatically beneficial as they do not mitigate heat gain through the roof, but it is recognised that they do shed water effectively and can be utilised for rain-water harvesting.

The scarcity of local manufacturing makes choosing building materials for the Environmental Education Centre based on locality potentially quite difficult. Ideally, from a sustainable perspective, locally sourced materials would be chosen in order to minimise the amount of carbon emitted during transportation. However, it is accepted that in this instance some materials will need to be used which are not available locally.

The two materials which are able to be sourced locally, timber and concrete, will form the core of the design. It is therefore serendipitous that these materials also perform well in seismic events, as Samoa is in a seismic zone.

80 Small Business Enterprise Centre of Samoa , "Manufacturing Sector Profile," (Apia: SBEC, 2010), 24 <http://www.sbecsamoaweb.com/publications/Sector%20Profile%20-%20Manufacturing.pdf>

DESIGN PROCESS AND OUTCOMES

URBAN DESIGN

During the final week of May, 2013, a research trip to Apia was undertaken. The most immediate impression formed was that the downtown area lacked adequate shade. This was compounded by the prevalence of hard, impervious surfaces such as tarmac and concrete which reflect the heat.

Richard Rogers outlines the importance of parks, gardens, trees and other landscaping which

provide vegetation that shades and cools streets, courtyards and buildings in summer. Cities are generally 1-2°C warmer than their hinterland. The overall effect of rich urban landscaping is to reduce the heat “bloom” of cities, measurable reducing the need for air-conditioning. Plants dampen noise levels and filter pollution, absorb carbon dioxide and



Figure 33.

The south side of the SNPF Plaza. The covered plaza is a popular spot for those seeking respite from the heat. The sea breeze is channelled and amplified between the two buildings.

produce oxygen... Urban landscape absorbs rain, reducing the discharge of urban rainfall and storm water. Landscape plays an important psychological role in the city and can sustain a wide diversity of urban wildlife.¹²

This led to the initial design motivation for the waterfront to focus on the addition of shade and the breaking up of the hard surfaces with porous surfaces and landscaping, to reduce the heat impact.

A conversation with a member of the Planning and Urban Management Agency (PUMA) revealed that the roots of the large banyan trees, which had previously lined the streets of the downtown area, had been negatively impacting on infrastructure in the area. This makes providing shade through larger trees difficult, as shallow-rooted trees with large canopies would be susceptible to storm winds. Alternative methods of providing shade needed to be investigated.

Various forms of free-standing structure were examined and coordinated shade structures and street furniture were designed in an attempt to provide a level of consistency in the area, given the diverse forms of building, as it would be a cheaper alternative to renovation of multiple buildings to achieve continuity. A catalogue of the shading devices and street furniture can be found in Appendix III.

Along with freestanding shading structures for open spaces, additional shading around the buildings is also desirable. The Amau Building is one of the few buildings downtown to provide effective shading over the footpath, and is a welcome relief on a hot day. A shading system which could be incorporated into the store fronts may also serve to tie together diverse building styles. Additional shading in the downtown area would not only protect people from direct solar impact, but also reduce the level of radiated heat from the, now shaded, hard surfaces.

In the same way that the open sided facade allows the free-flow of air through the building, ensuring that there is adequate spacing between the modern buildings also becomes important. In areas of Convent Street where the sea breeze is blocked by large volumes of building, heat again becomes an issue. Shaded areas between buildings are popular resting spots for locals, such as the arcade between the two sections of the SNPF Plaza (Figure 33), providing

81 Richard Rogers, *Cities for a Small Planet*, 50.

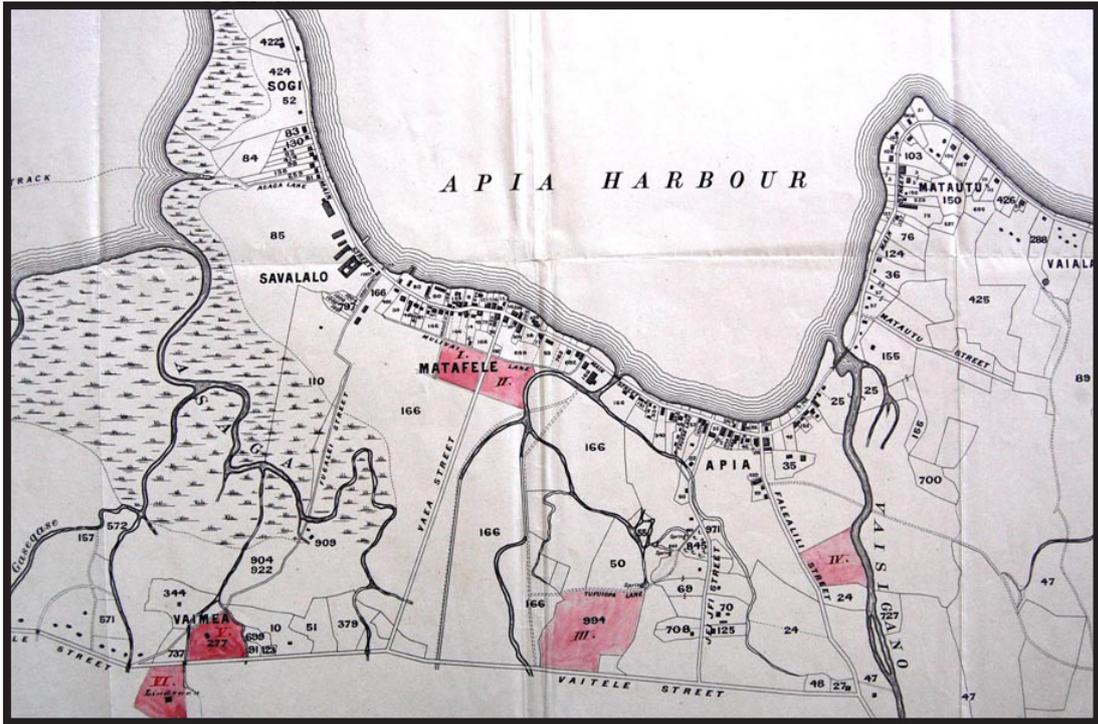


Figure 34.

Turn of the century map showing the collection of villages which have merged to become the Apia we see today. Map courtesy of Archives New Zealand.

shade and access to cooling breezes. Permeability of the built environment to enable sea breezes to penetrate further into the city will be a core focus for design.

The Apia which we see today is in fact the expanding and merging of multiple villages. The location of the villages in our focus area at the start of the twentieth century is shown in Figure 34.¹³ This map also shows the concentration of buildings along either side of what is now Beach Road. Over time, the built environment has tended to expand inland, rather than continue to spread east along the waterfront. It is also notable that the buildings on the seaward side of Beach Road have disappeared. From 1907 onwards, under German occupation, Governor Solf oversaw the clearance of this area to enable improvements in sanitary conditions and townscape (including the widening of the road).¹⁴

As shown in the Grenada precedent study, preservation (and, in some cases, restoration) of the remaining historic fabric of the city may be beneficial to tourism. A few buildings still remain in the target area (see Building Survey in Appendix I). Incorporating these buildings into a heritage trail, along with Vailima (Robert Louis Stevenson's residence, just outside of Apia), and other heritage sites such as those outlined in the tourism map, may encourage tourists to spend more time in Apia.

Richard Rogers attributes the success of London as a city to the fact that, it too, is a collection of villages which have expanded to meet one another.¹⁵ Everything a community needs (schools, civic buildings, markets, workplaces and homes) are found in the immediate area. Many of his urban designs have been based around the idea of groups of self-contained villages (or communities) forming the

82 *Municipal District of Apia (1900)*. Courtesy of Archives New Zealand, SEP 66.

83 Christoph Schoor, "Reshaping of Paradise" in *History in Practice: Proceedings of the Twenty-fifth International Conference of the Society of Architectural Historians Australia and New Zealand*, eds. David Benyon and Ursula De Jong, (Geelong, VIC: SAHANZ, 2008), CD-ROM, p5.

84 Richard Rogers, *Cities for a Small Planet*, 113.

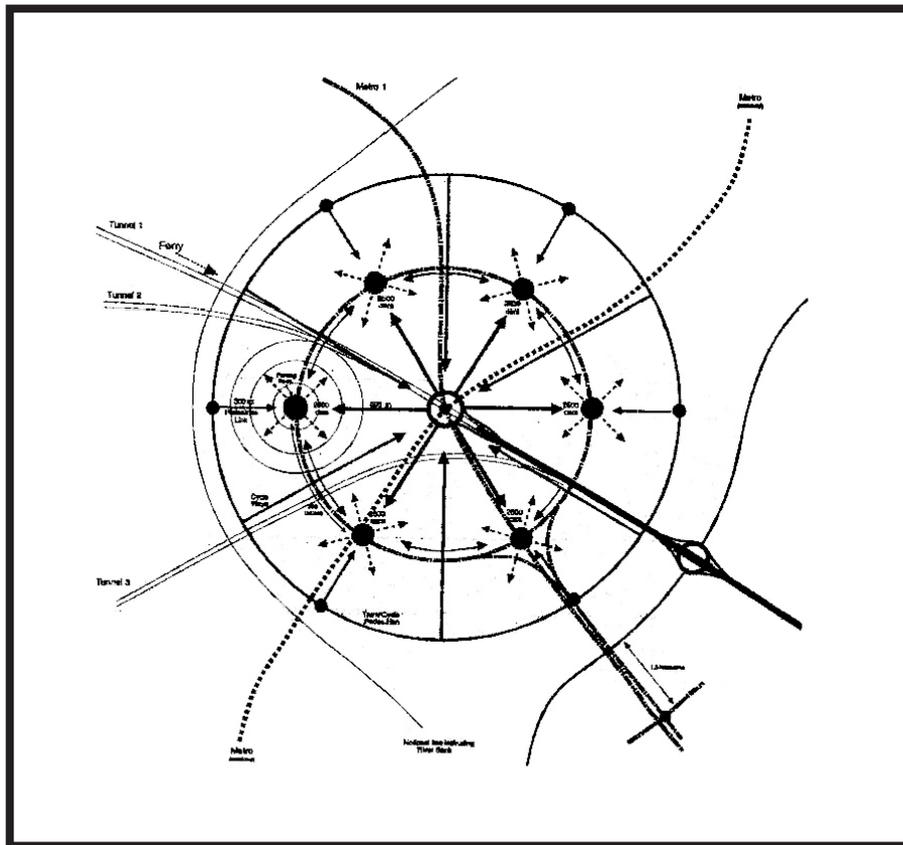


Figure 35.

Richard Rogers' diagrammatic plan for Shanghai, as illustrated in his book *Cities for a Small Planet* (New York, NY: Basic Books, 2008).

larger cityscape, as can be seen in his design for the redevelopment of Shanghai (Figure 35).¹⁶ This approach seems appropriate to Apia, as the basic structure is already in place.

Figure 36 shows the current urban density through figure-ground representation. This simplified representation enables potential spaces within the existing urban context to be identified without changes in surface pattern interfering with perception. Study of this map allowed identification of potential sites for parks and new buildings. Time spent in the area later served to refine these choices.

Using the Urban Husbandry principle of minor interventions within the existing fabric of the city, five key areas were highlighted for development. The first of these is an area bounded by the Mulivai River, with Beach Road to the north, Convent Street to the south, and the old courthouse to the east (Figure 36). The south-west corner of this area is currently vacant and of particular interest. While this vacant site was identified in the initial study, its full potential was not evident until the site visit.

Seaward of this area are the Australian High Commission (AHC) and Japan International Cooperation Agency, with a central driveway servicing the two, currently fenced and gated. By opening up this driveway, making it a public boulevard, access to the site can be gained from both Beach Road and Convent Street.

This site in its current state has the potential to follow a traditional layout, using the concept of Samoan open space, as described by Ann Guernsey Allen. The open space is flanked on three of its four sides by prominent buildings (the AHC and Japanese Friendship House to the north, and the Roman Catholic cathedral to the west). Across the road to the south is the Marist Brothers' school, a historic school of high standing. On the eastern side of the site is the abandoned Marist Brothers Old Pupils Association House, which no longer has a roof. Beyond this building is a residential area. In order to complete the circumference of spatial hierarchy, it was considered desirable to reinstate a building of community building of high status on the MBOPA House site (Figure 37). The current vacant space will be preserved and utilised as a park, preventing further encroachment on the river system in this area.

Raising the ground level of the site will bring it level with the road and help to mitigate further flooding. The use of a resilient, permeable surface (such as grass pavers) for the boulevard enables

85 Richard Rogers, *Cities for a Small Planet*, 46.



Figure 36.

Overview map showing the location of the first focus area. Map not to scale.



Figure 37.

Image of the site in its current state with the MBOPA House in the centre of the frame. Note the drop in ground level from the road and footpath in the foreground of the photo.



Figure 38.

Just down the road from the focus area is a site where the ground level has been built up, ready for the construction of a new building.

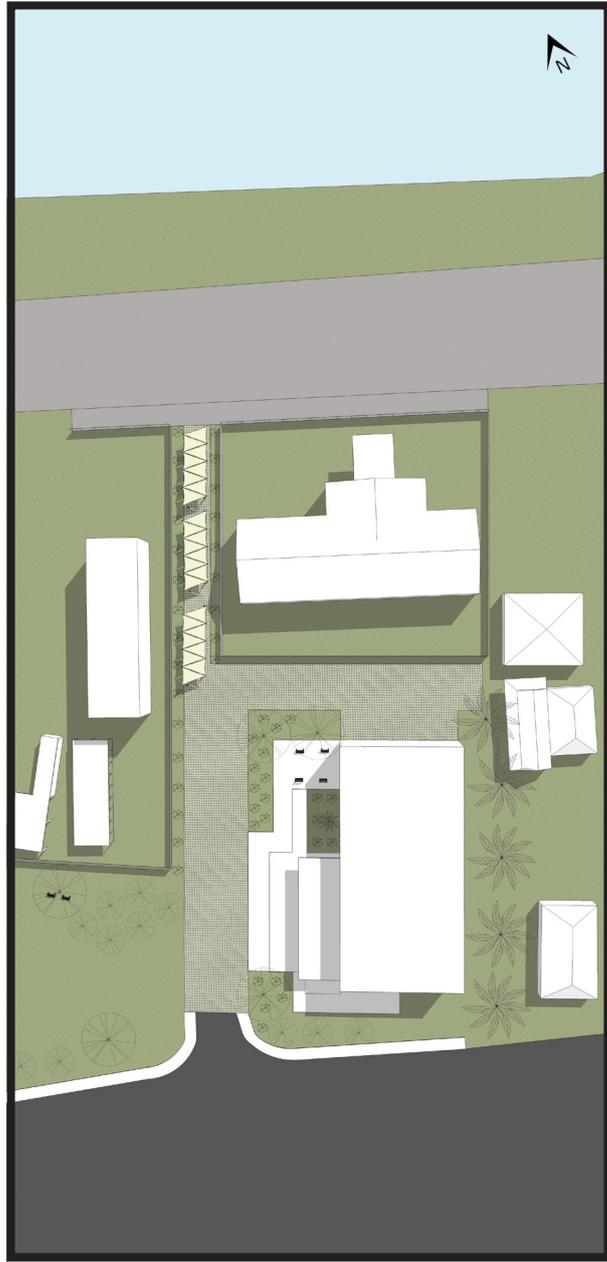


Figure 39.

Example of how the site could be used with a new community-focused building on the site of the MBOPA House. The driveway for the Japan International Cooperation Agency has been opened up to allow shaded access down a new promenade from Beach Road. Additional plantings in the area provide shade, while the open space opposite the building has been left free for impromptu sports activities.



Figure 40.

Perspective view of suggested community building and park area.



Figure 41.

Perspective view down the suggested promenade between Beach Road and Convent Street.

the path to be used by vehicles in rare circumstances, also reducing reflected heat and facilitating rainfall drainage. Generous plantings soften the landscape and provide shading, under which seating can be provided, and the changes in level leading up to the entrance provide further opportunities for people to congregate and relax.

The redevelopment of the flood-prone residential area is discussed in detail in Appendix II. Once this redevelopment is complete, the vacant lot provides opportunity to increase the density of the area, and provide areas of potential employment through retail, commercial and light industrial spaces (shown in red in Figure 44). This would compliment other features in the vicinity to produce a node like that described by Rogers.

It is proposed that the commercial building forms, particularly with regard to the Beach Road elevations, should be similar to the existing buildings in the area to achieve a sense of cohesion which is lacking in other areas along Beach Road. This does not necessitate the buildings being identical, only that they achieve similarity in scale and form. These buildings should be spaced to ensure penetration of the sea-breeze through the urban fabric. On-street angle parking is provided on both Beach Road and Convent Streets for customers, with additional access to the rear of the buildings for service vehicles.

At the eastern end of this first focus area stands the old courthouse building. During Cyclone Evan, flood waters reached the base of the Ifi'ifi Street wing of the building, highlighting the need to mitigate flooding in this area also. If the tactic of raising the ground level is again used, this would require the removal of the existing buildings, being a mechanical workshop for the police and the social services building. The master-plan provides for the relocation of these buildings to the empty lot in the middle of the focus area, placing them immediately next to the police station. The new position of the social services building is such that it is cocooned in amongst buildings belonging to the police and fire department, giving the occupants added security. These are shown in blue in Figure 44.

With these buildings relocated, and the single storey courtroom to the rear of the courthouse removed, a semi-courtyard area is created which could be turned into a public space. The colonial-style building across the road is the old police station, and it is from this building that shots were fired on peaceful protestors of the Mau movement on 28 December 1929, resulting in the death of 11 Samoans and 1 New Zealand police officer. Although there are



Figure 42.

The proposed site for the new commercial and light industrial buildings.



Figure 43.

View of the police vehicle workshop and social services building (partially obscured) behind the old courthouse. It is these two buildings that are proposed to be shifted to the site in Figure 42.



Figure 44.

Suggested interventions for the east end of the first focus area. New commercial and light industrial buildings are shown in red, while the new Police and Social Services buildings are shown in blue. This opens up the space south of the old Courthouse for a memorial park.



Figure 45.

Perspective view of suggested memorial (indicative form only - local artists could be commissioned to create the design for this) and shaded seating area. It is suggested that the concrete plaques within the seating area could have stories from Apia's history engraved into them.



Figure 46.

Perspectival view of memorial park area, looking towards the rear of the old courthouse and Beach Road.



Figure 47.

Overview map of Apia showing the location of the Vaea Street focus area. Map not to scale.

many monuments around Apia, there does not appear to be one commemorating the lives of the victims of this, the Black Saturday massacre.

On 27 May, 2013, during a meeting with Jackie Frizelle, the New Zealand High Commissioner, she was asked what she thought was missing in Apia. Her reply was that, apart from the small museum, there was nothing which really told Samoa's stories. Given the history of the courthouse site, having been occupied by the German, New Zealand and Samoan governments, this seems like the ideal location for telling these stories. In addition to the monument, a shaded area with seating could be provided. Inside this area, large engraved plaques or monoliths could tell some of these stories.

Ideally the site would be used by both tourists and residents alike, providing shade, shelter from rain, and open space for impromptu sports or play. Creating this open space behind the courthouse would also mean that the Ifi'ifi Street wing of the building was not hemmed in and over-looked by unrelated buildings, making it a more desirable candidate for adaptive reuse.

The second major focus area is in the centre of town: the area around Vaea Street for the first block back from Beach Road, the area around the Nelson Library, and the area of reclaimed land seaward of Beach Road (Figure 47). A conversation with a government official revealed that Vaea Street is considered an important focal point for the redevelopment. Meanwhile, the area of reclaimed land is the location for the proposed Environmental Education Centre.

The area immediately in front of the large governmental building seaward of Beach Road is currently used as a car-park (Figure 49). However, the area is sometimes used for festivals. Immediately behind (seaward) of this building is a fenced area where sewage treatment for the building takes place. It is understood that the building will be connected to the central sewage system, meaning this area will no longer be required. As there is a small risk of contamination of the ground in this area, it is suggested that it be paved (ideally with semi-permeable paving) and the car parking for the building be moved to this area. The area in front of the building could then be transformed into a quality festival space and general park area when festivals are not occurring.

A minor reconfiguration of the road is suggested to facilitate access to the new car park, as well as access to the proposed education centre. This involves extending the axes of Vaea Street and the next

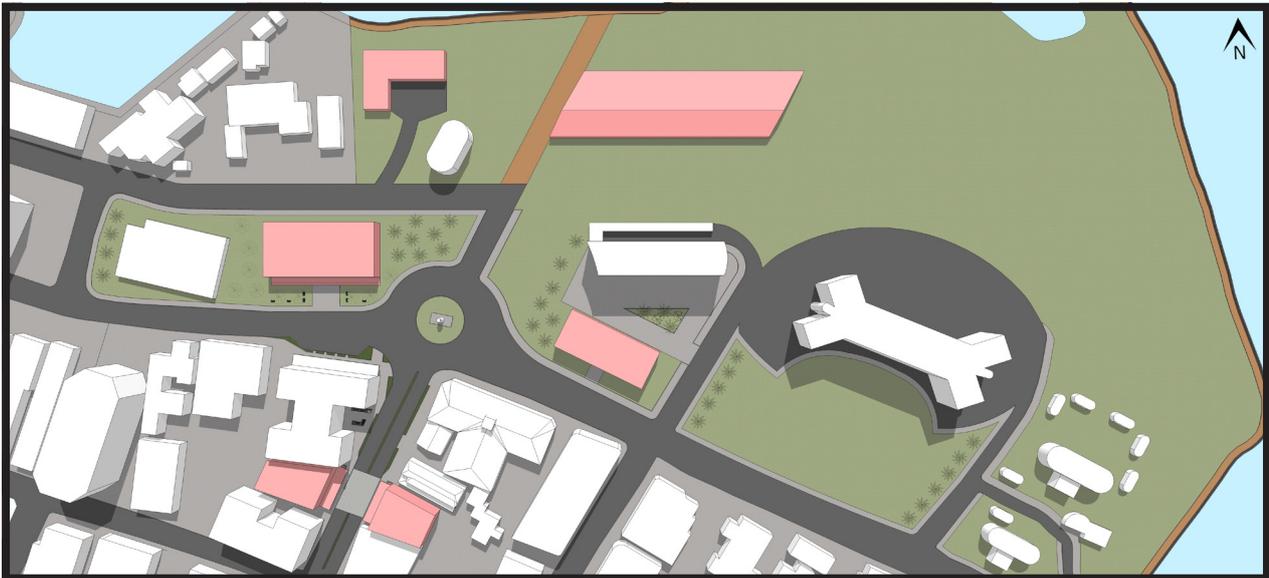


Figure 48.

The parking area which was in front of the bone shaped government building has been moved to the seaward side of the building, allowing for an improved festival space adjacent to Beach Road. The Vaea Street axis has been extended into the park creating a link to the proposed Environmental Education Centre. New buildings are shown in red.



Figure 49.

The stage in front of the government building. This area is the focal point for festivals in the downtown area but is currently surrounded by roads and carparks.



Figure 50.

The view down Vaea Street towards Beach Road. Image taken May 29, 2013.



Figure 51.

Perspective view down Vaea Street towards the clock tower showing additional landscaping and the crossing area where pedestrians are given preference over cars. Two proposed buildings face each other across the street in a mirror image .



Figure 52.

Proposed seating area in the shade of an existing building (corner of Vaea Street and Beach Road). There is currently no seating provided in this area and locals were seen sitting on any available ledge in the shade. The seating is designed to accommodate both sitting and reclining.



Figure 53.

Perspectival view from the corner of Vaea Street towards the proposed, larger library and public space surrounding it. Shaded seating again features along with landscaping to break up the heat reflective surfaces and buffer pedestrians from the moving vehicles.



Figure 54.

Overview map of Apia showing the location of the third focus area around the main bus station. Map not to scale.

street along (east) across Beach Road so that they enter the edge of the park area. The existing exit from the roundabout which runs parallel to Beach Road would be removed, liberating space for an additional commercial building for the area. Previous iterations of the plan designated this as park space, however, a main aim of the design is to encourage people into the larger park beyond and it was felt that this would counteract this goal. The third public space, the park area behind (seaward) of the governmental building, should be landscaped to provide additional shade and seating, with an enhanced promenade. This will be shown in more detail in the final design drawings.

The existing Nelson Library (building 8 in the survey in Appendix I) has a small collection of books and little potential for expansion should the collection increase. The existing configuration of roads provides little scope for quality public space. Potential exists for a larger civic library if the lane connecting the fish market and wharf is realigned to connect with the proposed extension of Vaea Street, rather than with the roundabout itself.

Vaea Street itself has two areas which serve mostly for car parking, but awkward layout results in a poor utilisation of space. Reconfiguration of the car parking (and perhaps the addition of a small parking building) could free up these areas for new buildings. As these sites are immediately opposite each other, the design of the buildings could be complimentary, creating a focal point to the street. Shading, seating and landscaping could be provided in these areas to create the feel of twin plazas, linked through a surface change in the road. This surface change would designate the location as a crossing point, where cars are allowed but pedestrians have priority. The addition of a slim planted median, through which the crossing point intersects, would also provide a buffer for pedestrians at the mid-way point. Additional planting is desired throughout the area to provide shade and break up the large volume of hard, heat reflective surfaces.

A small distance east of this area is the main bus station. Currently there is little shade in the area, and a prevalence of concrete and asphalt (Figure 55). It is proposed that all surfaces dedicated to parked vehicles be replaced with a semi-permeable surface, such as grass pavers, which will reflect less heat. The creation of a planted verge alongside the footpath again serves to break up the hard surfaces and provide opportunity for shade-giving trees to be established.



Figure 55.

View of the main bus station looking east. There is little shade in the area and an insufficient number of bus shelters to cater for the waiting passengers.



Figure 56.

The back of the “flea market” building. Note the locals pressed against the wall in order to remain in the shade. This image was taken at roughly 10am on May 27. The low sun finds its way under the overhang, and it is already hot and humid despite it approaching winter.

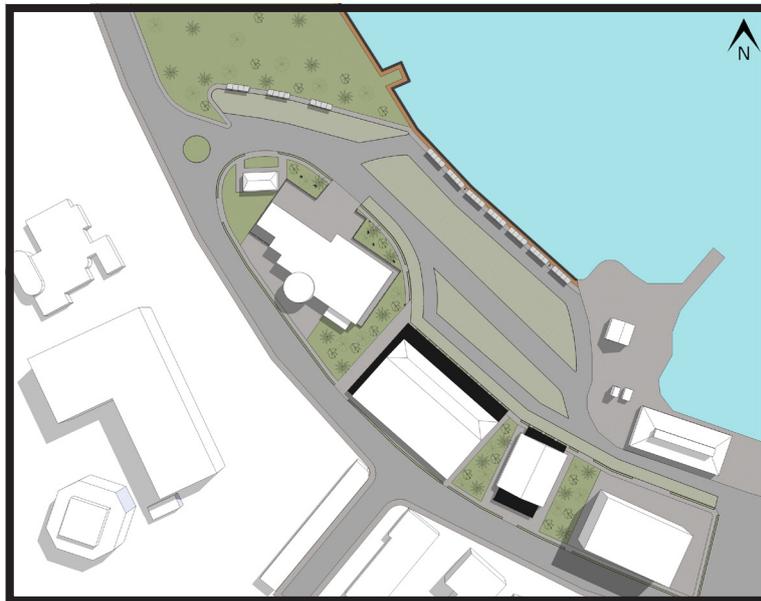


Figure 57.

Proposed changes to the area include semi-permeable parking areas, increased fixed shading to buildings and the addition of landscaping to provide natural shade and lessen heat reflection from the paved surfaces.



Figure 58.

The same view as shown in figure 55 but with proposed changes. The fence surrounding the Ministry of Women, Community and Social Development has been pushed back to create landscaped seating areas with plenty of natural shade.



Figure 59.

Deeper fixed shading and the addition of natural shade are proposed to provide respite from the heat. The tarmac where the buses and taxis park is changed to semi-permeable paving to reduce heat reflection and the potential for surface flooding during heavy rain.

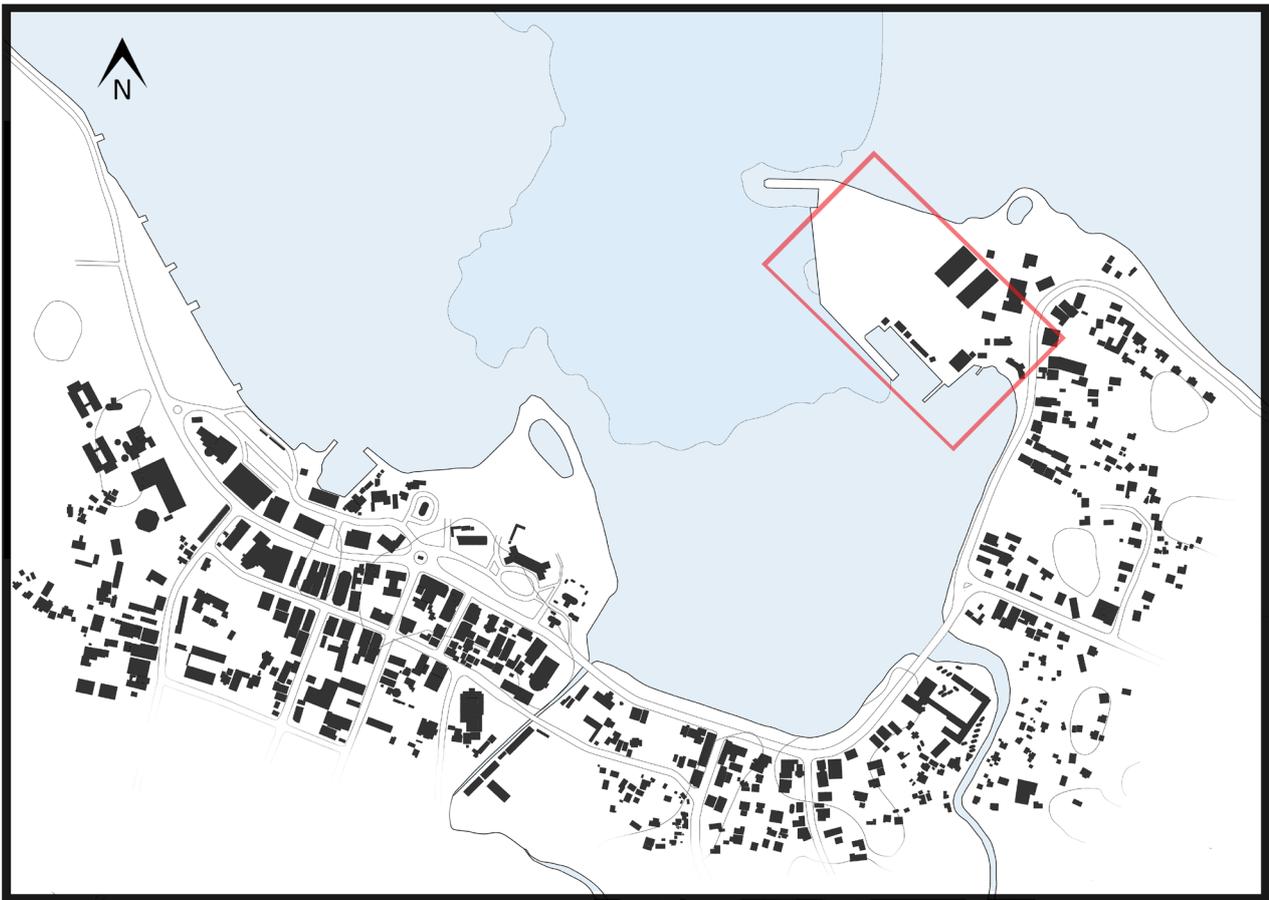


Figure 60.

Overview map of Apia showing the location of the Port focus area.

The existing fence around the Ministry of Women, Community and Social Development building (building 2 in the survey) reaches right to the footpath along the edge of the bus terminal, with landscaping inside the fence surrounding the car-parking area. It is proposed that this fence be pulled in towards the building in places to provide space for shaded seating areas, and a shaded grassed area alongside the driveway by the flea market, all accessible to the public (Figure 58).

Additional, deeper fixed shading should be provided along the north sides of the flea market buildings (Figure 59). New, and additional, bus shelters should also be provided, and there appeared to be insufficient seating for passengers. Using complimentary design for the fixed shading, bus shelters and other seating could help tie together the disparate building styles in the area. Addition of further landscaped areas between buildings would provide additional shade and reduce heat reflective surfaces.

An early design proposal for the area was to provide a designated ticketing office. This was discarded after the site visit, as the ad-hoc nature of the terminal, combined with the brightly coloured, often theme painted, buses with their blaring music add a real character and vibrancy to the experience of catching a bus in Apia. The locals are more than happy to provide information and direction, making a ticketing office redundant (especially as the custom is to pay as you leave the bus, not when you get on). The bike hire facility incorporated into this building was also abandoned. The shear heat and humidity deters even hardy locals from cycling.

The port area is the forth focus area (Figure 60). In this design it was important to balance the needs of a working commercial port with the facilities and aesthetic required for a port catering to cruise ships. New port buildings would provide additional warehouse space (increased capacity buildings to replace the existing warehouses), while also providing a new building specifically catering to disembarking cruise passengers. Placement of the new warehouse buildings was chosen so that the view of the port from the surrounding waterfront would not be that of shipping containers (Figure 61). The removal of the existing warehouses makes the container storage space in the centre of the port more flexible, potentially allowing space for more containers.

The main commercial port is separated from the smaller fishing port (which has its own exit past the quarantine building) by a landscaped promenade which leads from the cruise ship facility to the exit of



Figure 61.

View from the park on the reclaimed area of land towards the main port in Apia. Due to the shape of the shore, this industrial area is visible from most of the waterfront. It is proposed that the buildings be reconfigured so that the container storage area be obscured.



Figure 62.

Proposed plan showing the reconfiguration of the port buildings and newly centralised container storage area. A landscaped, shaded path leads cruise ship passengers out of the port area to waiting taxis or a stroll down the improved promenade.



Figure 63.

The current promenaed walk to the port. The large banyan trees which used to provide shade had to be felled when their roots began interfering with underground services. Pushing the sea wall further out means that trees can be planted on the new land, away from the infrastructure.



Figure 64.

The proposal shows a boardwalk replacing the heat reflective concrete path. Pushing out the sea wall allows for the planting of more effective shade trees and landscaping provides separation between vehicles and pedestrians.



Figure 65.

View from cruise ship disembarking area looking past the proposed reception building and towards the landscaped path which would lead out of the port area.

the port area, where waiting taxis can take passengers into Apia town centre, or they can choose to walk the new promenade into town (Figure 65).

A government official indicated that an improved promenade leading to the port was highly desirable, and that reclaiming additional land and rebuilding the sea wall were viable prospects. Currently the walk between port and town has little in the way of shade or landscaping, with the area closest to the port being predominantly paved surfaces reflecting the heat. During the site visit in late May, the sun angles were low enough for the shade trees planted next to the footpath to be ineffective. Additional space would allow more trees to be planted, slightly further from the path, so that shade is provided year round. The use of a boardwalk for the promenade walking surface would also reduce the amount of reflected heat, compared to the existing concrete and asphalt (Figures 63 and 64).

The fifth and final focus area is the main subject of this design.

SITE

Physical Site Analysis

The site chosen for the Environmental Education Centre is on an area of reclaimed land in central Apia, on the seaward (northern) side of Beach Road. The southern part of the site, closest to Beach Road, has two large, multi-storey commercial buildings, being the Central Bank of Samoa and a government owned and occupied building. These buildings are quite dominant, as they are above the scale of most of the buildings in the vicinity.

The Central Bank of Samoa has small, adjacent utility buildings which are contained in a small area surrounded by hurricane fencing. To the north of this building is a large, elevated fale which is used for meetings by the matai of the area. To the north of the government building bordering the park is a much larger fenced area, with a handful of small utilitarian buildings dotted within it, serving as the sewage treatment area for the building. However, it is likely the building will shortly be connected to the new centralised sewage system. Other residential scale buildings to the south west of the fale are also occupied by government departments, beyond those is the fish market and wharf associated with the market.

To the east of the government building is a cluster of more traditional looking buildings. The largest of these, closest to Beach Road, is the



Figure 66.

Site of proposed Environmental Education Centre, viewed from between the Central Bank of Samoa building and government building.



Figure 67.

Main area of the park in which the proposed building will be situated. The man made pond has an ornamental arch within it.



Figure 68.

The existing promenade which runs past the proposed site (far left of image). The promenade looks out towards Mulinu'u and the open sea.



Figure 69.

The Central Bank of Samoa (right) and government buildings, viewed from within the park. These two buildings are dominant elements immediately adjacent to the site.



Figure 70.

The other building immediately adjacent to the site is a large, elevated fale which is used for meetings held between the local matai. The area in front of the fale is currently a popular parking spot for taxis. The proposal would see vehicles moved away from the immediate vicinity of the fale.

Samoan Tourism Authority, a tourist information centre. To the rear of this is an example of a traditional village, with a larger central fale surrounded by smaller fale. In conjunction with the two larger buildings, these form a visual barrier between the town centre and the park area to the north.

The park area has a completely different feel to central Apia. The visual barrier of buildings also serves to block the traffic noise from Beach Road, and the most prevalent sound in the park is that of the sea. In the past this area was the site of aerobics classes, touch rugby and community gatherings. The park is now showing signs of neglect and disrepair and seems to be used by a handful of people.

Projecting from the shore as it does, the park gets the full benefit of sea breezes, and a walkway runs along the perimeter just inside the sea-wall. The view to the west from the park is of Mulinu'u Peninsula; to the east the view is of the Apia Port; and to the north is the open sea. There is a small pond at the northern end of the park, which has an ornamental arch projecting out of it. Some trees are dotted around the park, but shade is scarce.

Environmental Site Analysis

The annual variation in monthly mean temperatures at sea level in Apia is only 1°C, being 26°C in January and 25°C in July. The monthly mean maximum and minimum temperature variations are also very small, being 1°C and 1.5°C respectively. On a daily basis, the temperature only varies by 5.5°C in January and 6.3°C in July.¹⁷ Even during the site visit in late May, locals actively sought shade and access to sea-breezes wherever they could find it. Respite from the heat will need to be taken into consideration at every step of the design process.

With such little seasonal temperature variation, finding shade is important year-round, but more difficult during the winter months due to the low sun angles (52.5° at midday on June 22).¹⁸ Most of the Apia urban area is less than 10m above sea level, with the bulk of the high ground due south of central Apia (as it rises to Mt Vaea). Figure 71 shows the azimuths for mid-winter and mid-summer. With the only high terrain lying due south of the site, there is little protection against the low solar angles of the mid-year months.

86 Ward and Ashcroft, *Samoa: Mapping the Diversity*, 15.

87 "Sun or Moon Altitude/Azimuth Table" The United States Naval Observatory, accessed July 29, 2013, <http://aa.usno.navy.mil/data/docs/AltAz.php>



Figure 71.

Area map of north Apia showing the azimuths for mid-summer and mid-winter (white overlay) as they relate to the site of the proposed Environmental Education Centre. The eastern and western aspects of the building will need to be protected from the setting and rising sun year round, due to the small difference in mean monthly temperatures. Scale 1:4000. Image courtesy of Google Earth (2013).

Samoa has been hit by several tropical cyclones, most recently Cyclone Evan in December 2012. Other recent storms to cause significant damage include Heta in 2004, Ofa in 1991 and Val in 1990. It is predicted that the occurrence of tropical storms will increase as El Nino weather patterns become more frequent. As these storms generally move in a south-west, south or south-east direction, this makes the site particularly vulnerable to these storms.¹⁹ The area is also subject to heavy downpours, usually from October to April, but these also occur at other times of the year.²⁰

PROGRAMME

As discussed previously, the quality of Samoa's water systems are of high importance to its economic and environmental survival in the future, so the main purpose of the building would be to educate locals and visitors alike on the fragility of Samoa's water systems. Each of the individual water systems would be focussed on individually, with an overview given of how these systems interact. Although the main focus of the education centre would be on the water systems, additional education areas would also be incorporated including a broad over-view of Samoa's native flora and fauna, the broader ecology surrounding the Apia area, and areas which focus specifically on Samoa's native birds and flying foxes, including the important role of these creatures in the pollination of native flora.²¹

The economic sustainability of this building is also important; ideally the centre would be able to maintain and develop itself through generation of its own income. It is proposed that income would be generated by the centre through two main sources: through admission charged to visitors to Samoa, and through a cafe incorporated into the building. Through the precedent studies, with visits to two of these centres, the author has chosen to incorporate a cafe (with its own kitchen) for revenue purposes, but not to include the cafe in the main part of the centre. It was felt that the noise and

88 R Gerard Ward and Paul Ashcroft, *Samoa: Mapping the Diversity*, 19.

89 R Gerard Ward and Paul Ashcroft, *Samoa: Mapping the Diversity*, 17.

90 Graeme Lay, Tony Murrow and Malama Meleisea, *Samoa* (Auckland: Pasifika Press Ltd, 2000), 6-9.

additional distractions of an operating cafe within the main body of the centre would be detrimental to the educational experience.

It is proposed that the two sources of income from the centre would assist in maintaining and developing the centre, but also allow for free admission and education to Samoan residents. A proposed seminar area could be used for both routine talks to visitors, and also more specific education sessions directed at target groups (for example, educating about more sustainable farming practices). Education should not be limited to the interior of the building, and opportunities to educate passers-by should not be overlooked.

In addition to this, separate areas would be needed for staff to meet and relax, with bathroom and storage facilities on site. A large plant room would be required to house the aquarium pumps and filters, along with the climate control and other standard plant fixtures required in large buildings.

CHOSEN STRUCTURAL METHODS

Samoa is a seismically active area, and the proposed site itself is on an area of reclaimed land. The site would therefore likely perform in a similar way during a seismic event to the reclaimed areas of Christchurch during the 2010 and 2011 earthquakes. Suitable foundation types and construction methods must be chosen to ensure durability of the structure during seismic events. The ability to withstand large wind loads is also necessary given the regularity of tropical storms in the area.

Reinforced concrete will be used primarily for the subterranean and ground floor areas – not only for its ability to withstand seismic and lateral loads, but also for its ability to act as a heat sink. If the concrete elements are suitably shaded from external solar gain, then their heat absorbing potential can be used to draw heat from the interior of the building, allowing for reduced mechanical ventilation.

In order to enhance performance under seismic and lateral loads, the roof structure will be isolated from the wall structure of the building. The roof structure will be comprised of- and supported by- timber columns and trusses. It is most likely that Laminated Veneer Lumber will be chosen for its superior strength-to-size ratio. Spliced joints will be minimised due to research showing the

tendency of these types of joints to fail under seismic loading with LVL construction.²²

A lightweight roof was chosen to minimise potential injury should the roof fail during a seismic event or under extreme lateral loading from storm winds.

DESIGN RESPONSE TO SITE

The initial location chosen for the centre, within the broader site, was north of the Samoan Tourism Authority complex, on the eastern side of the site. This initial choice was based on proximity to an area already frequented by tourists. However, this would do nothing to draw people further into the park, which was one of the design goals. The location of the building was then moved to the western side of the site, just north of the Central Bank of Samoa building.

The original design response, which was made prior to visiting the site, also had the centre incorporated into the sea wall itself, with a below-water viewing room nestled into the coral reef. It was later decided that, while aquarium windows exist which are substantially thick in order to deal with wave motion, it is unlikely that the glass and sealant technology exists to cope with cyclone force, wind driven waves.

However, a physical connection to the sea was deemed essential, with the site being surrounded by water on three sides. The St Georges precedent illustrated the perils of constructing right to the water-line, and so the connection to water needed to be made in a way which enabled the building to be set back from the sea wall. Apia has a maximum tidal range of 1.37 metres, which is small enough that the tidal action could potentially be incorporated into the educational displays.²³ A channel running from the sea wall to the centre was proposed, which could be isolated at the entrance through the sea wall during storms, and which connects with the two water systems which bear a direct relationship to the tides (shore and mangrove). The channel meets the sea at an obtuse angle so that the tidal surge in the display areas is softened.

22 A.H. Buchanan and R.H. Fairweather, "Seismic Design of Glulam Structures," *Bulletin of the New Zealand National Society for Earthquake Engineering* 26, no.4, 1993, 415-435.

91 "Tide Times for Apia" Tide Forecast, accessed 26 January 2014, <http://www.tide-forecast.com/locations/Apia-Samoa-Islands/tides/latest>

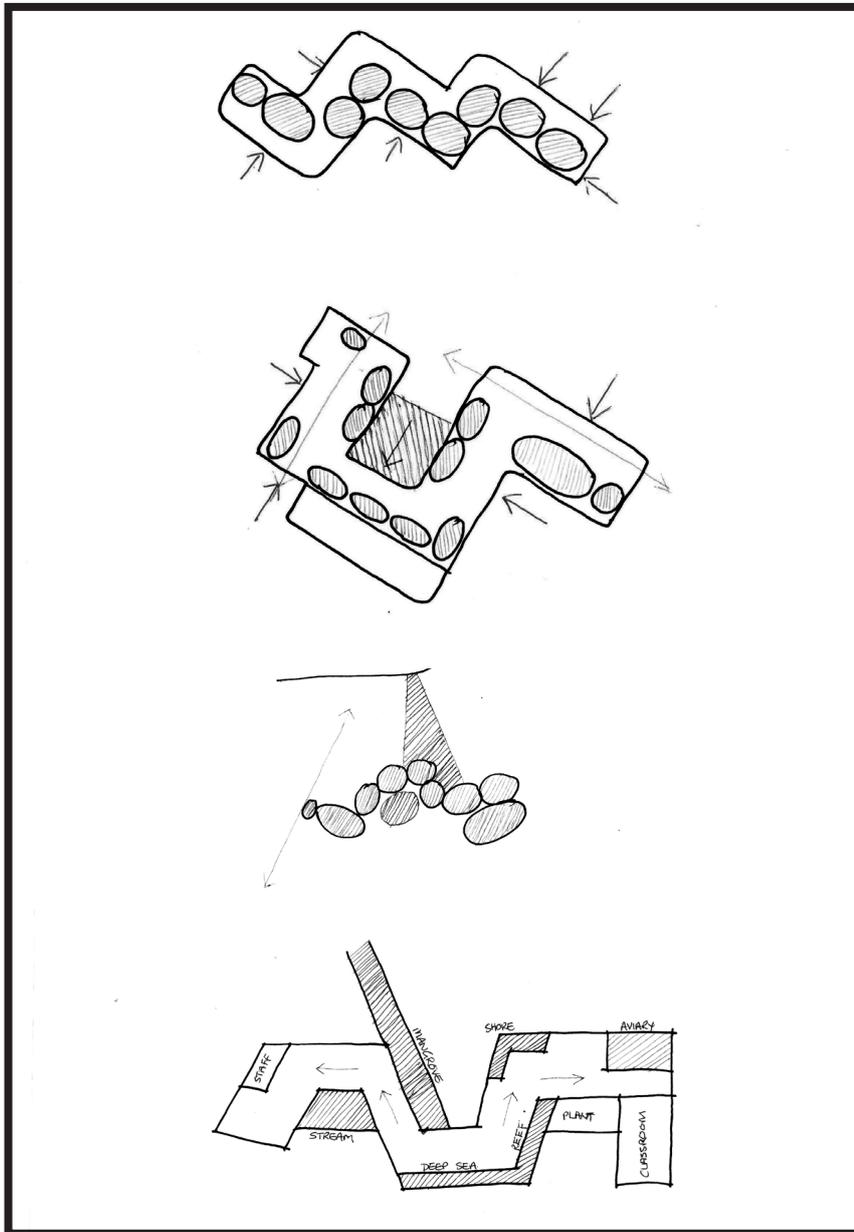


Figure 72.

Original sketch development leading to the form of the building. The external arrows on the top two sketches indicate areas where light enters the building while the internal arrows indicate view paths. The internal arrows on the bottom sketch indicate the direction of the ramped level changes.

One of the goals of the design is to bring more people into the park. If this was achieved there would be foot traffic passing the building on the promenade and other walking paths, and other leisure activities in the park. Ensuring that this movement of people does not distract from the educational material inside suggests an inward looking building would be suitable. However, one purpose of the centre is to make people more aware of the natural environment. A balance needs to be found between connecting people with the educational material and connecting people with the site and surrounds, particularly with the water surrounding the site. The approach taken was to select areas for exterior views away from or between displays, and restrict views in display areas to small glimpses.

DESIGN RESPONSE TO PROGRAMME

Early on in the design process, it was decided that an elongated building was preferable to a centralised building, so that visitors could be drawn through past individual displays, instead of being presented with one large space filled with various displays competing for attention. The idea of “journey” quickly attached itself to this elongated plan. Coupled with the desire to connect visitors to the environment, the concept of a journey through the different environments was formed (Figure 72). When the physical connection to the sea was decided upon, the idea of taking people on a journey where they could get a tangible snapshot experience of the environments they were learning about was cemented.

The design process then turned to the experiential qualities of these environments, with particular focus on the quality of light experienced in these environments and the changes in the textures and materials of surfaces, especially those under foot. Another major experiential factor decided upon was to play with the height relationships of these environments, and introducing the idea of moving down into the sea and up into the forest canopy. This helped decide the sequence of some of the displays, where being able to view both what is above and beneath the water is desirable.

The Monterey Bay Aquarium, while not listed in the precedent studies, was looked at extensively. It too has displays which are able to be viewed from multiple vantage points, and incorporates attributes from the site to enhance displays. This encouraged further exploration in to how visitors might be able to view displays from different vantage points. Viewing the plans of Monterey Bay

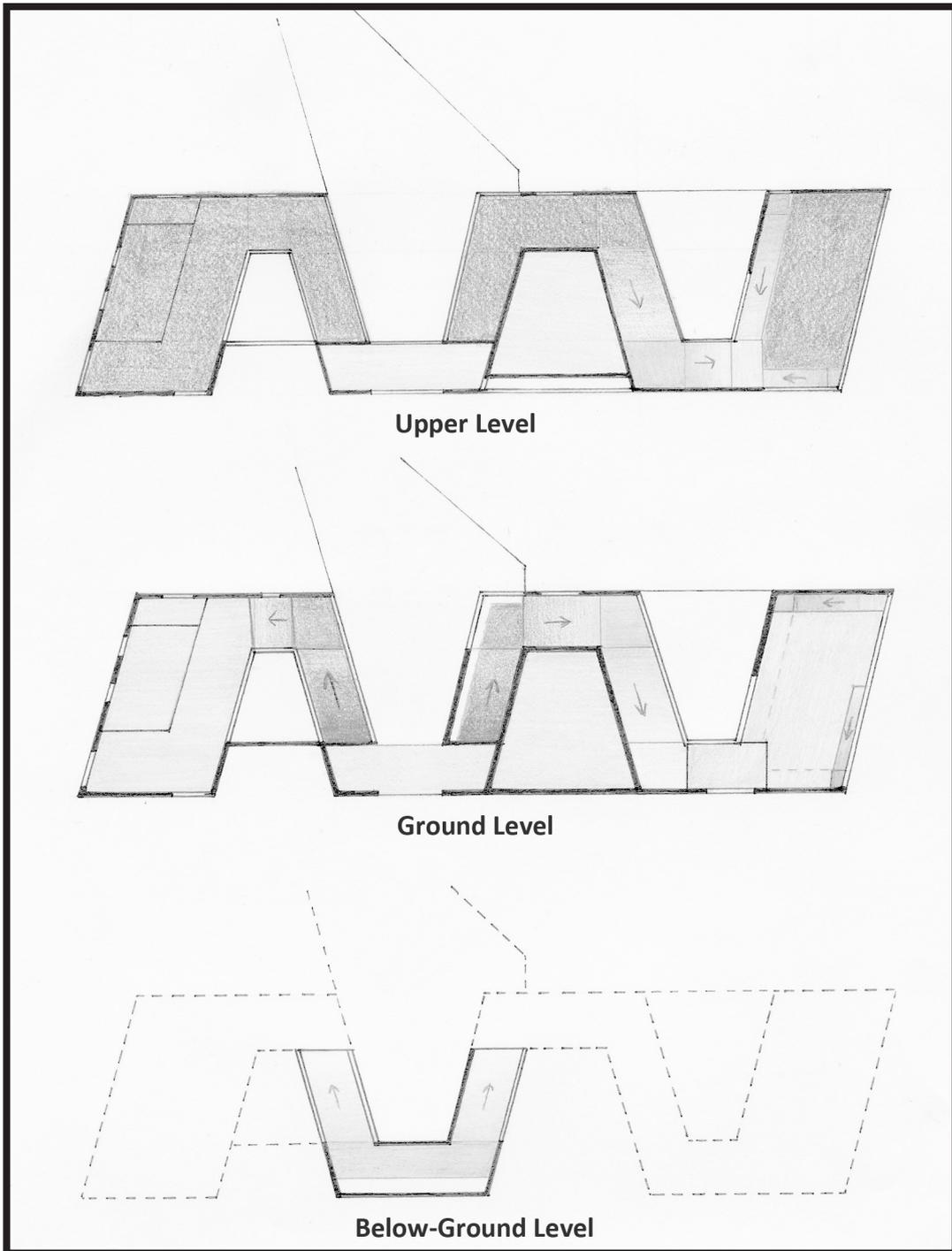


Figure 73.

Initial plan for the Education Centre. The winding circulation first takes visitors down past the stream and mangrove areas to the deep sea area, which is the lowest level in the plan. The circulation then leads visitors back up out of the depths, through the reef and shore displays, then up into the canopy of the aviary area, which is the highest level in the plan. Visitors then come back down, either exiting the building or going into the cafe. Scale 1:1000.

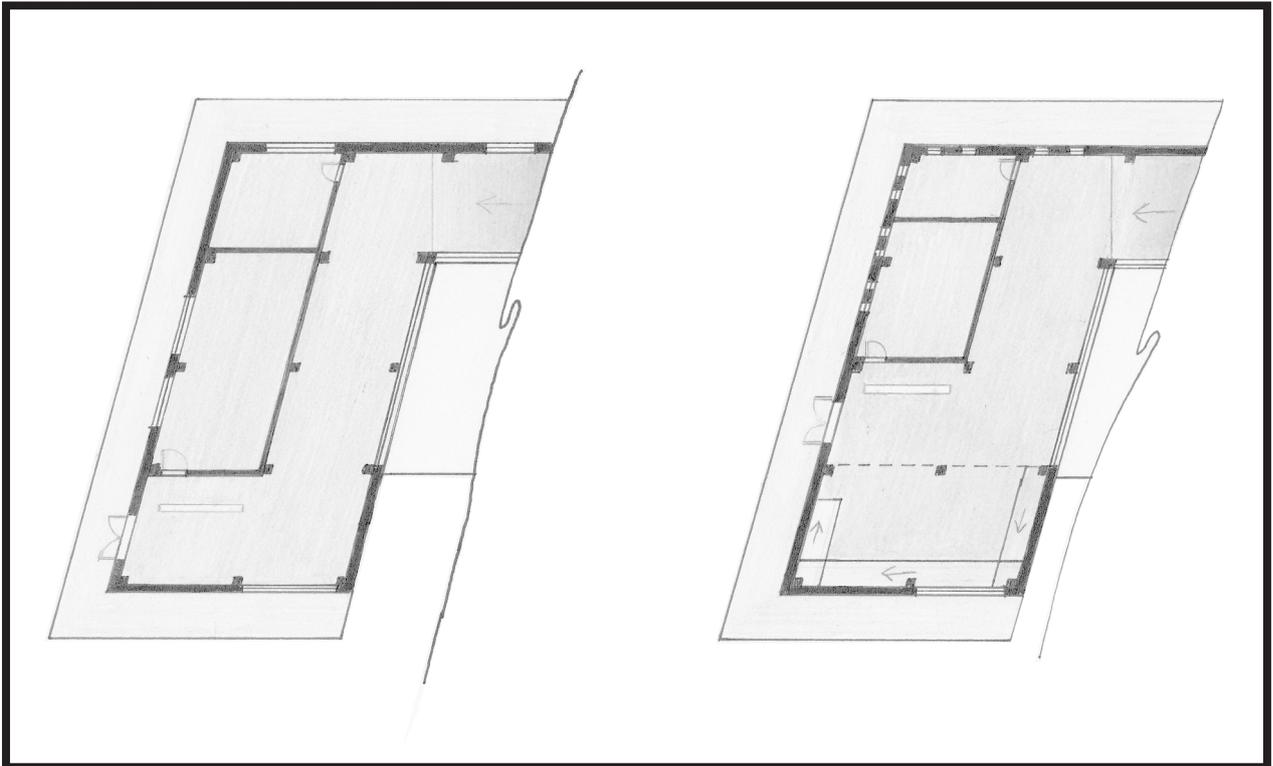


Figure 74.

Continued development of entrance portion of the plan which includes part of the stream display. The staff and storage areas are reduced to allow for a second level to be inserted into the space. This gives more space for displays and adds variation to the internal volume.

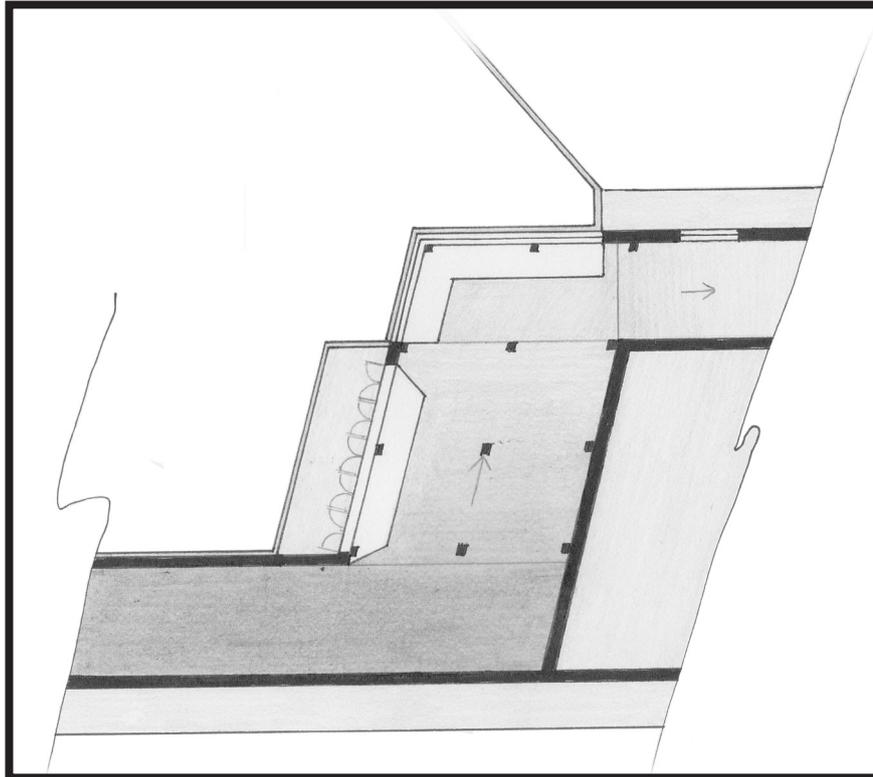


Figure 75.

Initial plan for the area containing the reef and stream displays. The deep sea display area moves from subterranean with a 2.5m ceiling height out to a brighter area open to the full height of the two storey roof. Maintenance of the tanks for the coral reef display is performed from the exterior of the building. Scale 1:500.

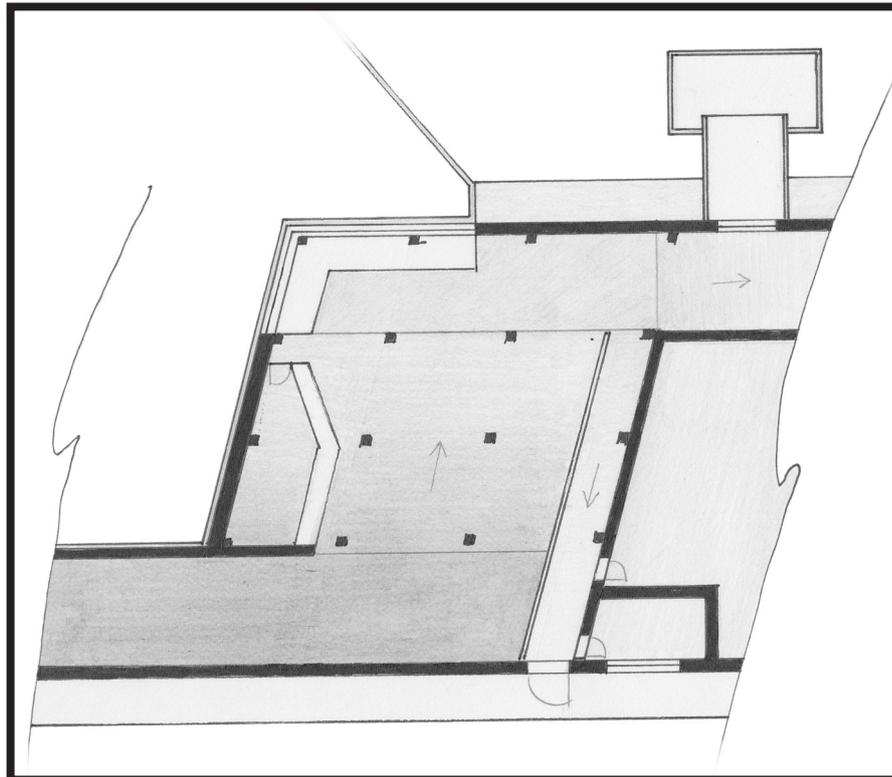


Figure 76.

Further development of the area containing the reef and stream displays. The compression and release effect achieved through the height change has been amplified through the horizontal expansion of the reef and shore area. The tanks for the reef display are now able to be maintained from within the building. Public bathrooms and emergency exits are added, running down each side of the plant room (right). Scale 1:500.

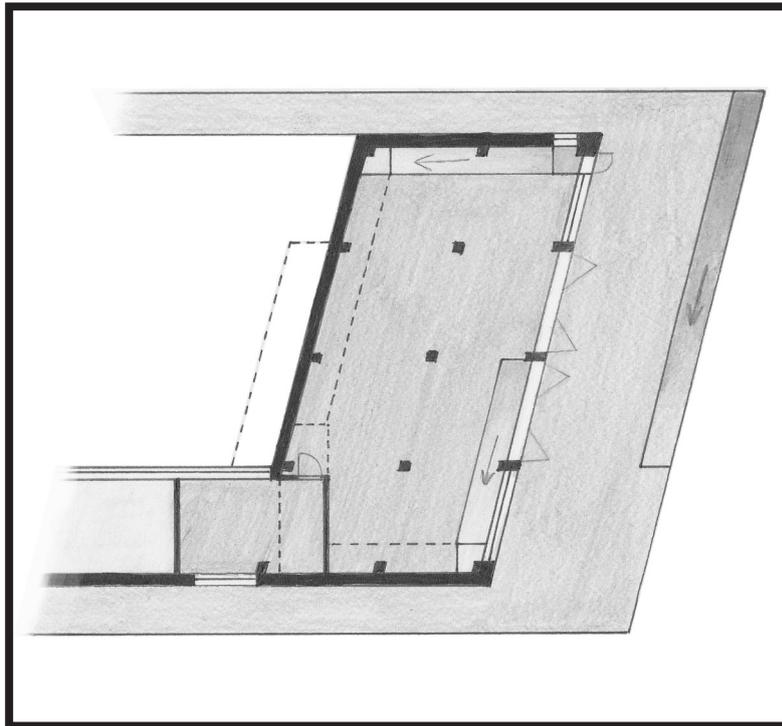


Figure 77.

Initial layout of the ground floor of the cafe area. The ramp system from the canopy of the aviary area leads down around the edge of the cafe area, exiting at the northern edge of the building. The ramp leading down to the cafe itself runs along the opposite walls of the space.

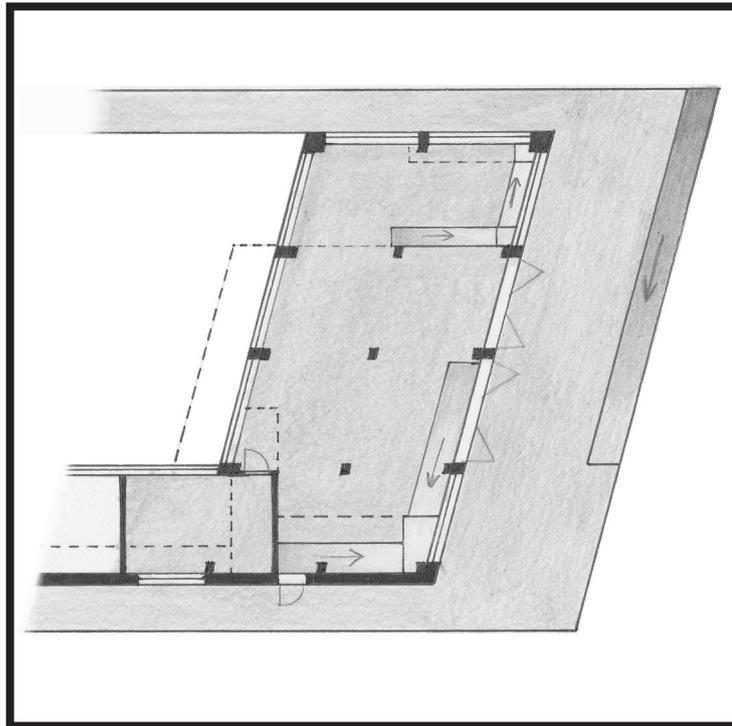


Figure 78.

Revised layout of the cafe area. The ramp system now leads down the southern end of the cafe, and the exit and cafe entrance routes now branch off the same ramp. This allows viewing into the aviary from within the cafe. It also provides space for a second level at the northern end of the cafe to make the most of the views out to sea.

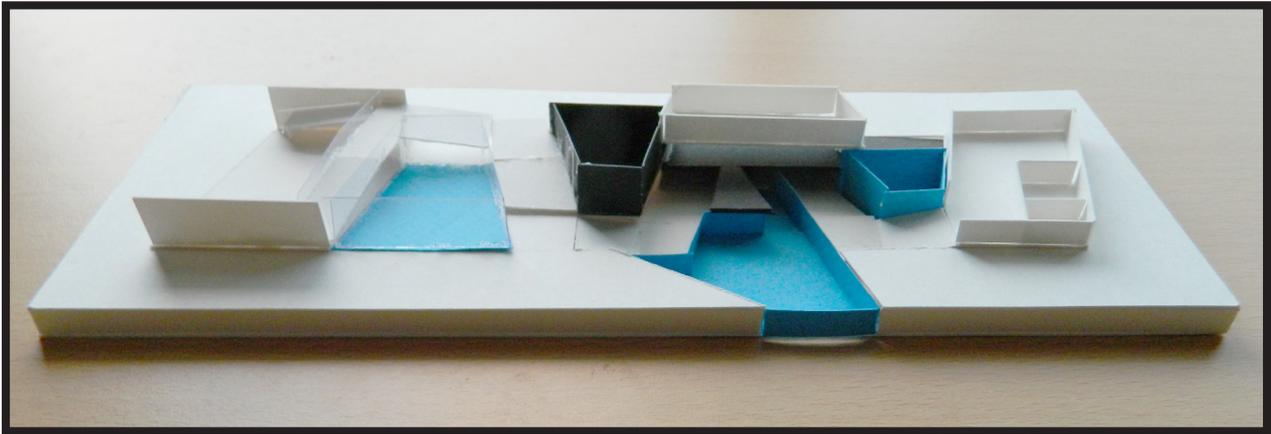


Figure 79.

Early open-sided model illustrating the level changes within the building and how these relate to the ecosystem display areas. The ecosystem areas are shown in blue, the plant room in black. The area to the right of and above the plant room is the proposed seminar room.

also emphasised the amount of plant required for an aquarium, and the centralising of the aquarium-style displays became important in order to reduce the amount of piping and ducting spread throughout the building.

All of the above factors influenced the form of the building. The desire to utilise the sea connection, take advantage of natural sunlight through the trees while excluding direct light from other areas, and create a separation between each of the display environments, lead to the snake-like form of the building. The width of the snake has been varied in areas to accommodate additional display areas and, in conjunction with variation of heights, create a compression and release system in some places to emphasise changes between displays and encourage exploration.

An important aspect of the design will be the active inclusion of all age groups and levels of physical ability. The sloping ramp system evolved out of a direct desire to make the centre wheel-chair friendly, and accessible to as many as possible. The elderly and those with young children may also find the ramps easier to traverse than stairs. Incorporating child-scale features into the centre is also important, along with targeted displays and activities to encourage exploration and learning. Areas where visitors can rest and relax during their journey also need to be included, so that fatigue does not discourage visitors from lingering longer and learning more.

URBAN DESIGN RESPONSE

The three primary goals for the urban design of the park area are to draw more people into the park, encourage people to spend time there, and to educate where possible.

The positioning of the centre on the western side of the site was adjusted so that it more correctly aligned with the axis which runs through the clock tower and down Vaea Street. It was proposed that a walkway into the park, which connects with the promenade along the sea wall with the main axis to Vaea Street, could be installed with the entrance to the centre feeding off this walkway, and the centre itself acting as a visual draw-card into the park.

An additional shaded walkway coming off the main axis, just prior to the centre, is proposed in order to entice more people into the centre of the park, with the principles of compression and release, prospect and journey being used to draw people through. Providing additional shade and structured walking surfaces are a priority



Figure 80.

The design of the area between the education centre and the government building will be key to creating amenity and drawing people further into the park itself. This image shows the area as it was during the site visit. The park bench shown is the only seating in the western half of the park area.

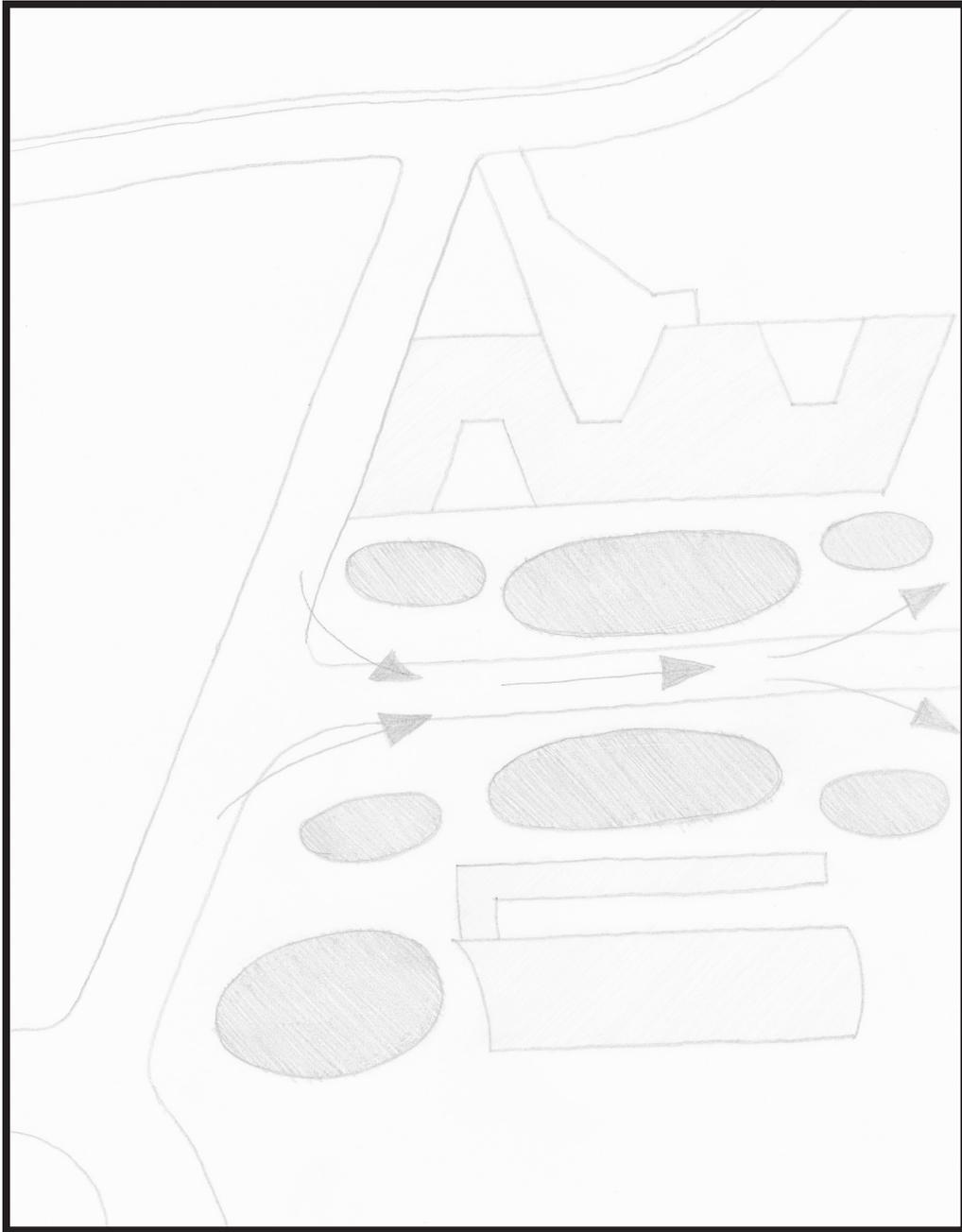


Figure 81.

The conceptual design for the urban planning uses the principles of compression and release to draw people in and through the space. The dark hatched areas are landscaped plantings.



Figure 82.

Developed urban design scheme. Landscaping is used to both screen the car parking area of the Central Bank of Samoa and to guide people through the space between the buildings. The four rectangular areas are a proposed demonstration garden, illustrating the principles and benefits of crop rotation.

for the urban design of the park, as well as providing a variety of seating. It is proposed that the pond to the north of the park, with its celebratory arch, be retained, but that the promenade along the sea-wall could be enhanced by the introduction of walking surfaces which will amplify the heat less than the existing asphalt. The addition of shaded seating areas will provide areas for people to congregate or relax.

The area immediately surrounding the building will be landscaped to provide shaded seating, and will also include a water fountain incorporated into the raised building platform which would be accessible for children (or adults) to play in. The fountain would be fed by a reservoir beneath the building where rainwater collected from the roof could be stored. A gauge on the side of the fountain would show the amount of water stored in the reservoir, and the volume of water fed to the fountain would decrease as the storage levels dropped – the idea being to educate people on their water usage in relation to recent rainfall. The fountain and shaded seating is proposed as a means of drawing people in to the park and providing them with amenities for education, play and relaxation.

Additional landscaping in the area would demonstrate on a small scale alternative land-use practices, particularly with respect to horticulture. Included in this would be a small garden area with a crop rotation plan, and sediment control systems such as shallow rock-lined drainage beds, which will slow the velocity of storm-water runoff and allow particulates to settle before they reach the streams. It is important not to over-formalise the design of this area, and to use simple materials in the construction, so that it is seen as applicable to both domestic and small-holding horticultural situations. This demonstration area is critical, as infiltration of chemicals and silt into the streams affects the rest of the water-based ecosystems in the area.

ENVIRONMENTAL DESIGN RESPONSE

Respite from heat is a key influence on the design. Minimisation of solar gain to the interior of the building is a priority. Free-standing panels of louvres positioned along the northern face of the building would help to keep the structure of the building cooler through shading and minimise solar gain through north-facing apertures. If these freestanding panels were mounted on rails, were robustly built, and could be adjusted so that they were able to fold down like scales, they could also be used to protect more vulnerable elements



Figure 83.

Initial 3D modelling experiments worked with largely solid screens with louvred apertures.



Figure 84.

Full louvre screens of various configurations were modelled. Variations in spacing and depth were tried in an attempt to break up the large expanse of screening.

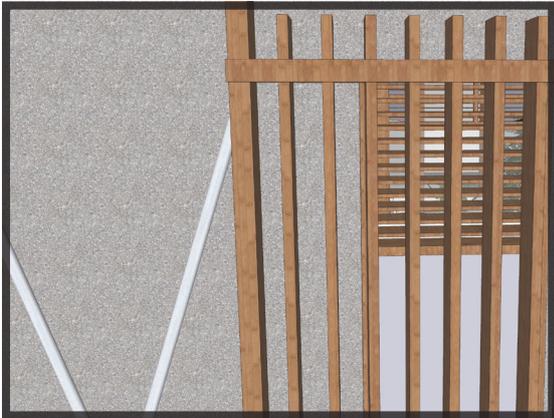


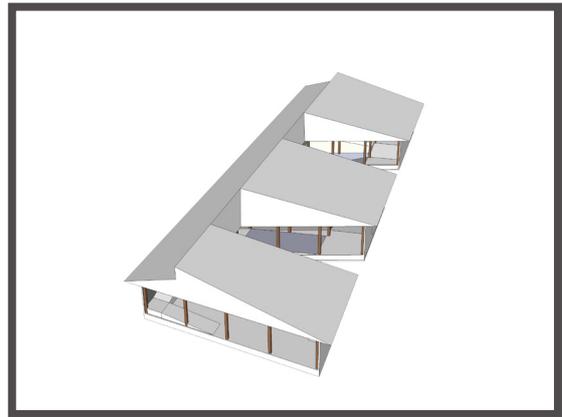
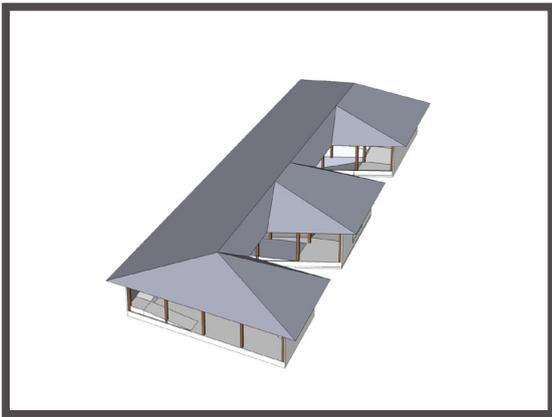
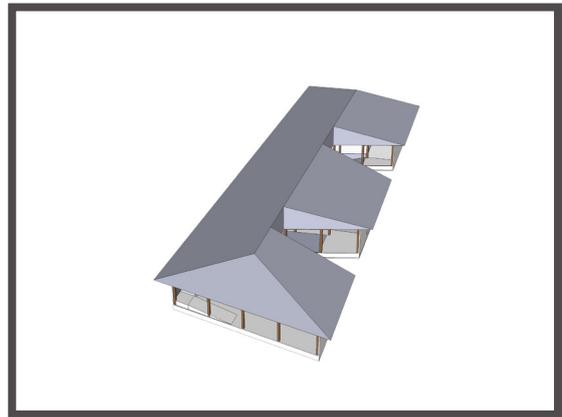
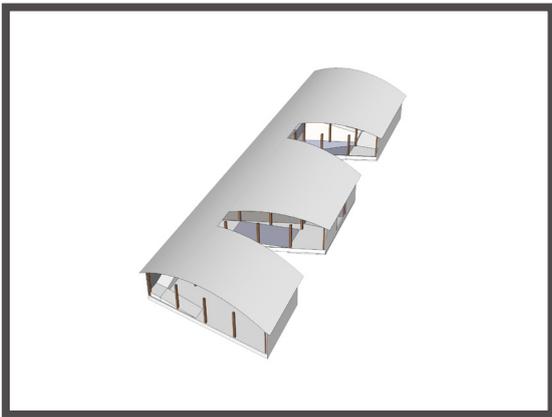
Figure 85.

Vertical screening on the western and eastern faces of the building are required to shield the interior from low sun in the morning and evening. Different screen designs were trialled and mixed with bracing elements to variation.



Figure 86.

Screens for the northern face of the building were developed which changed in profile to highlight the arpetures beneath, so that the physical form of the building could be better expressed.



Figures 87-90.

Some examples of the many roof forms which were modelled and evaluated using the mind map described earlier.

of the building (such as the aviary and mangrove exhibits) during storms.

Vertical or horizontal orientation of louvres would be determined by directional orientation of the building face. North facing elements would benefit from horizontal louver systems, while east and west faces would receive more benefit from vertical louvres or a mesh-screen system as suggested by the New Zealand Ministry for the Environment.²⁴

Traditionally, steeply pitched roofs had been used in Samoa for their ability to shed water effectively and to deflect wind loads. A pitched roof will be used for these reasons and without a suspended ceiling. This will assist with natural cross ventilation and allow warmer air to rise away from the level of human occupancy. Suitable insulation, or perhaps a ventilated roof cavity, would be needed to minimise heat gain to the interior of the building.

Various iterations of a pitched roof were modelled and a roof which integrated a clerestory was selected, enhancing natural lighting within the interior and assisting with ventilation by allowing the warmer interior air to be released. Deep eaves were also chosen for their ability to deflect wind-driven rain from the roof-wall junction and also for shading the exterior walls to reduce heat gain within the building.

Once solar gain to the interior has been minimised, cooling of the interior must be addressed. The use of concrete as an interior surface may have the benefit of acting as a heat sink, drawing excess warmth from the interior spaces, provided these walls are not permitted to receive solar gain from the exterior. The use of natural cross-ventilation should be utilised as much as possible, not only from a sustainability viewpoint, but also because the electricity supply in Apia is prone to interruption. A mechanical ventilation system would also need to be included, but this should be treated as supplementary to the natural ventilation rather than the primary form of climate conditioning. The potential for using the reservoir beneath the building to aid in cooling the conditioned air could also be investigated, to reduce the energy load of the building.

With the issues of sustainability and electricity supply in mind, natural day-lighting also becomes a priority. A south-facing

92 New Zealand Ministry for the Environment, "Guidance on Passive Solar Design," accessed January 26, 2014, <http://www.mfe.govt.nz/publications/sus-dev/passive-solar-design-guidelines/html/page4.html>

clerestory would allow diffuse daylight to infiltrate to the interior.²⁵ If managed correctly, this would provide light to the roof space, and increase light levels generally to the interior, without compromising the play of light and shadow through trees and water in the display areas. Targeted artificial light in some display and circulation areas would be necessary, but minimised wherever possible. South facing apertures would be favoured in the areas which are not subject to the particular light qualities required by some displays.

Prior to European settlement, Samoan buildings were lightweight and had a limited lifespan. Durability from storms was low, and it was accepted that these buildings would need to be reconstructed on a regular basis. This was compensated for by the supply of local building materials and the relative ease of construction. Subsequent European-style buildings were constructed with more permanence in mind, but also suffer damage as a result of tropical storms. There is an increase in cost and complexity in the repairs and reconstruction of the western-style buildings.

Based on this alone, it may seem that the traditional style of building, which allows for the destruction and relative ease of rebuilding, should be the preferred method of construction in Samoa. However, lifestyles have changed substantially since the eighteenth century, and an increase in material possessions, and new technologies now part of everyday life (such as refrigerators), means that the total destruction of buildings has a different consequence. The financial implications of losing the possessions of an average twenty-first century household, coupled with increased population density placing a strain on local building resources, suggests that the traditional style of “building with destruction in mind” may no longer be appropriate.

In the case of the education centre, preservation of the materials contained inside is incredibly important, and the time and cost needed to source replacements or the wait for areas such as the mangrove exhibit to regenerate would be highly detrimental to the economic viability of the centre. Because of this, it was decided that the building would be approached from the viewpoint of durability, and that an ability to survive tropical storms would be a key design influence. A pitched roof to deflect winds, a reinforced concrete structure, and the sliding louver systems may contribute to the

93 New Zealand Ministry for the Environment, “Guidance on Passive Solar Design,” accessed January 26, 2014, <http://www.mfe.govt.nz/publications/sus-dev/passive-solar-design-guidelines/html/page4.html>

building's storm durability. The raised concrete plinth may also help provide defence against flood waters resulting from heavy rainfall or storm surge.

INTERIOR DESIGN: INFLUENCING FACTORS

There are three main influencing factors in the interior design of the building. The first is the ability to make the displays informative, interesting and engaging. Part of this is providing the ability to update the displays as new research is presented and to change the configuration and location of wall- and table-mounted displays to keep the experience fresh. Elements such as the aviary and the tidal displays would need to be fixed, but flexibility of spaces for the displays surrounding these elements would be beneficial.

Another influence is the acoustic quality of the interior. The dominant materials in most areas will be concrete, glass and timber. The first two of these are highly reflective, so there is a risk that noise created by visitors will be bounced around inside the large interior volume. Care must be taken so that two reflective surfaces are not positioned directly opposite each other.²⁶ This can be achieved by incorporating texture into the concrete surfaces, or by the addition of more timber surfaces, with modulation of those surfaces improving things further. Aerated concrete is not as reflective as regular concrete, so its use within parts of the building may be investigated, though it will need a protective coating applied where it is exposed to the elements on the exterior.²⁷

The third major influence on the interior design was how the experiential quality of each environment display might be enhanced by surface treatments. The primary method of this would be to alter the surface texture of the floor and wall surface around each display. For example, the concrete walls and floor of the subterranean ocean area could be polished to best reflect the play of light through the

Although Samoa faces many challenges in the future, with climate change and increased urban development, they are not challenges which are insurmountable. While the urban design interventions suggested here lack the broad strokes of some redevelopment

94 Wenger Corporation, *Acoustic Problems and Solutions for Rehearsal and Practice Spaces* (Owatonna, MN, 2000), 17.

95 "Autoclaved Aerated Concrete" Portland Cement Association accessed February 12, 2014, <http://www.cement.org/think-harder-concrete-/homes/building-systems/autoclaved-aerated-concrete>



Figure 91.

Shells are incorporated into the footpath leading from the beach at Leigh to the Goat Island Marine Discovery Centre. The shells serve as a reminder of the connection between the building and the natural environment it promotes.

water, and to give the feeling of smooth coolness. The area around the shore displays could have lightly textured concrete, as if walking on wet sand and the viewing area for the aviary canopy would have predominantly timber surfaces. Surfaces in areas where the light is filtered through trees should ensure that play of light and shadow on those surfaces is clear.

CONCLUSION

Although Samoa faces many challenges in the future, with climate change and increased urban development, they are not challenges which are insurmountable. While the urban design interventions suggested here lack the broad strokes of some redevelopment projects, a more gentle approach may be considered more appropriate in a country currently operating at a fiscal deficit. Still, new building sites and community-focused buildings are proposed, allowing the cautious, tending-of-the-garden approach to provide opportunities for flourishing new life.

Many of Apia's existing attractions are located on the fringes of the city – the location of the proposed Education Centre has the potential to draw the tourist dollar into the heart of Apia, while proximity to the bus station and inter-island ferries means the facility is accessible to residents throughout Samoa. Preservation of water quality throughout Samoa's ecosystems is essential to Samoa's long-term success, and especially to the ability of its people to maintain a living from the land and sea. Education is the important first step.

A major goal of the building was to facilitate education through

its design, by sparking interest in its audience and by providing a sense of connection to the ecosystems displayed. Using changes in levels, lighting conditions and surface treatments to give a sense of the experiential qualities of the ecosystems may go some way to achieving that, but it will never replicate the experience itself. Examples of each of the ecosystems can be found in close proximity to the site. By giving visitors a small taste it is hoped that it would whet their appetites for more, rather than replace the need to visit these locations.

Other means of aiding education included targeting displays for children, enabling the regular changing of displays to maintain variety, and allowing exhibits to be viewed from multiple perspectives. While the environmental issues facing Samoa were researched extensively, the potential for the architecture to further influence the educational experience is something which could be investigated further. This could be achieved through examination of psychological research and existing non-environmental education facilities. Additional ways in which the architecture could assist the learning process would be valuable to this project.

Exclusion of direct solar gain, with natural cross-ventilation, day-lighting where possible, and rain-water collection help to ensure the building subscribes to the sustainable ethic it preaches. While it is unlikely the building could operate entirely on day-lighting and natural ventilation alone, it is a step in the right direction towards reduced dependence on mechanical climate control in a tropical environment. The approach taken of resilience towards climatic events, instead of building in expectation of destruction, not only offers protection to the materials housed within the building, but also recognises the financial strain placed on Small Island Developing States following these climatic events.

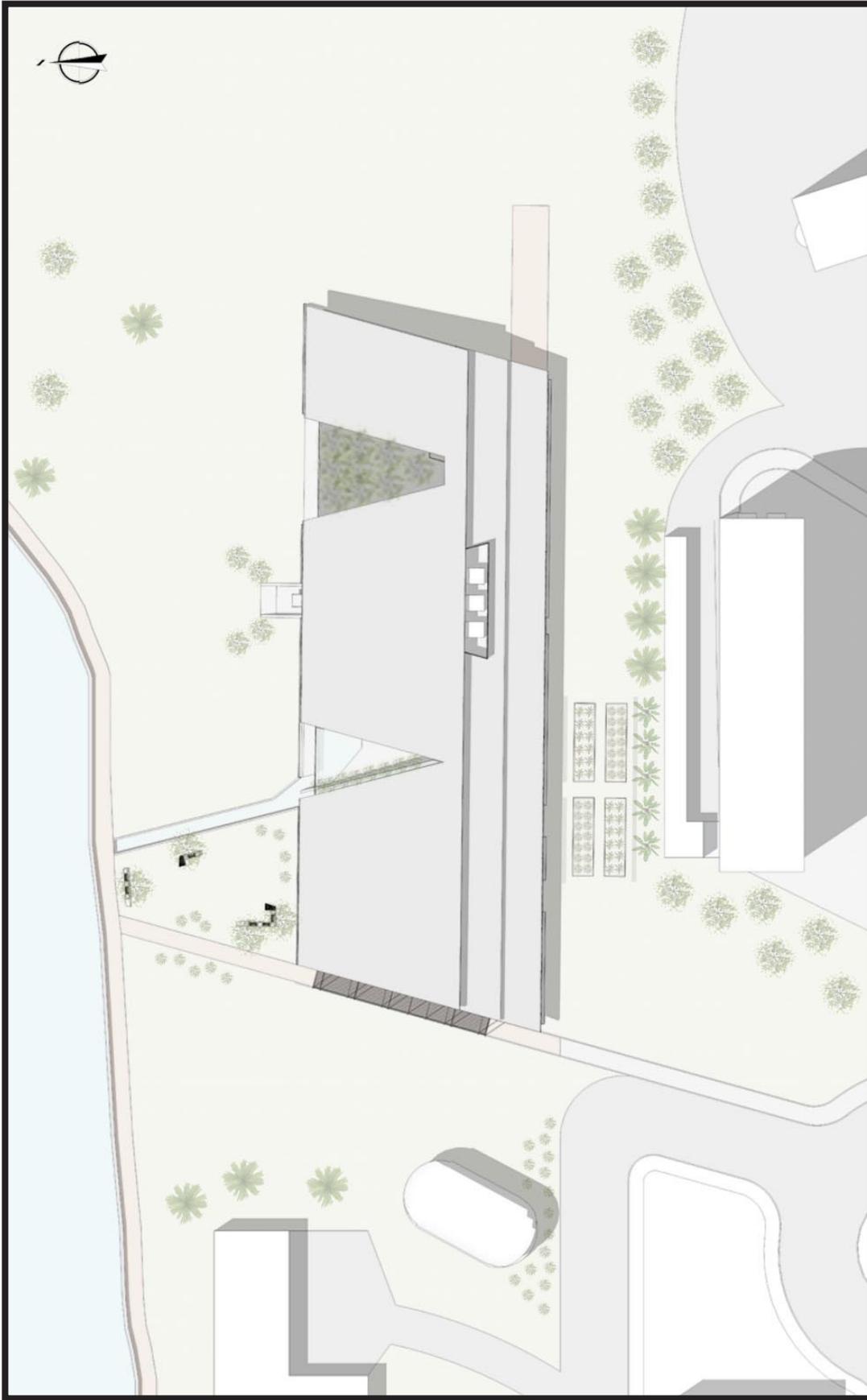
By using the Mumford approach to regional design, the direct references to the fale which have been adopted by some nearby buildings are absent. The end result may be that the building is recognisable as a tropical climate building, but perhaps not one that is specific to Samoa. In attempting to avoid the more cliché aspects of a Samoan building, what is achieved may be a building of the Pacific region, rather than a building of Samoa.

One area in which the project may not entirely achieve its goal is in the ability to attract people into the park area beyond the large commercial buildings. Even with the centre located in the park, the reinforcement of the axis down Vaea Street, and the increased

amenities within the park itself, the existing buildings still act as much as a barrier as they do a buffer. Regular activities used to be held in the park, during a time when it was more frequently used. Perhaps the best method of returning people to the park itself would be to reinstate those activities or create new ones.

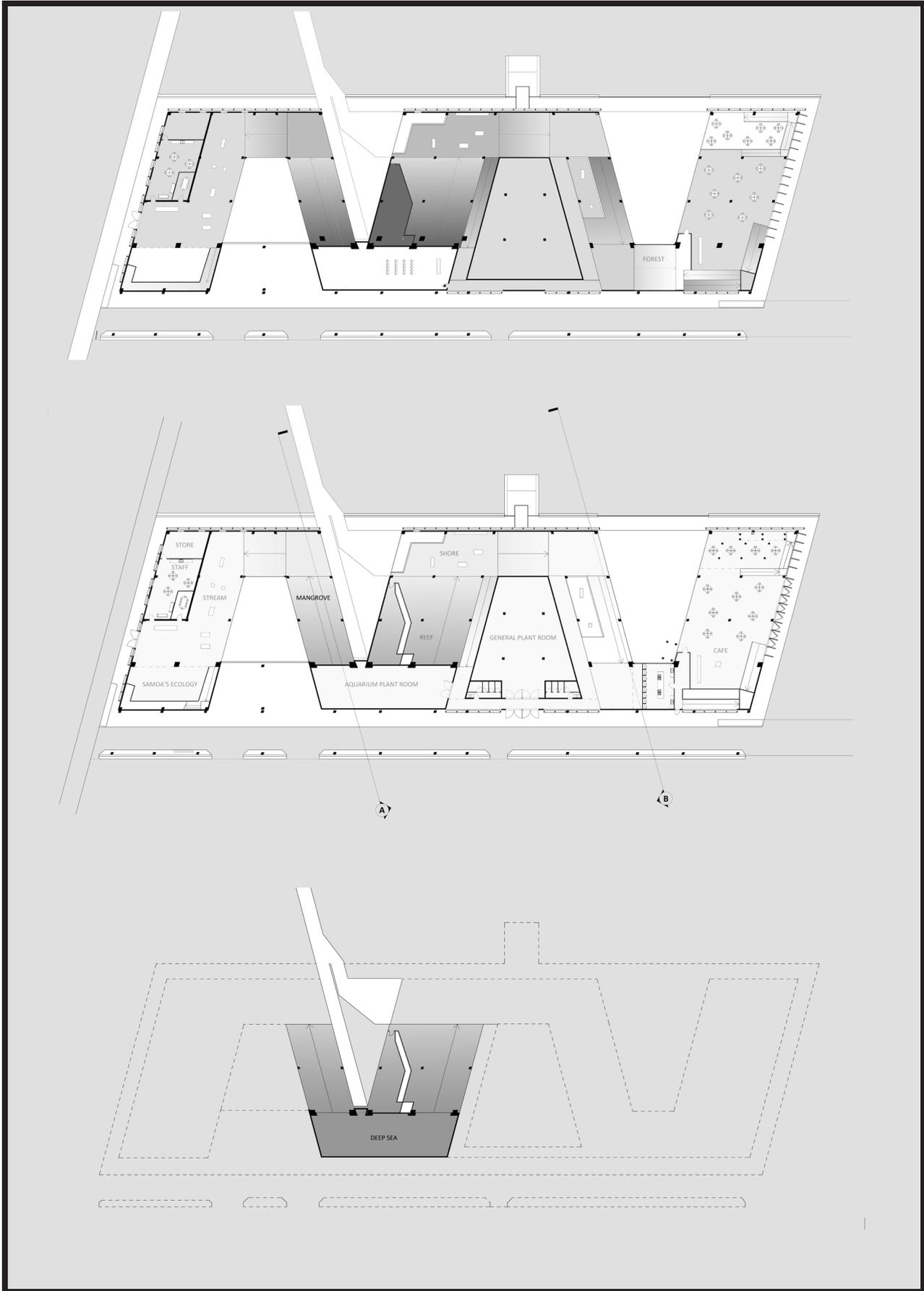
Finally, while an Environmental Education Centre may prove beneficial to Apia in the future, it is recognised that there are many other projects which need to be carried out on the islands which are of greater urgency, as they directly influence the well-being of the people of Samoa. Many of these projects are underway; others are still in the planning stages. A great number of these are reliant on overseas aid in order to be realised. These projects must take precedence, as it is the wellbeing of the people of Samoa which lies at the heart of those projects – and of this one also.

FINAL BUILDING DESIGN



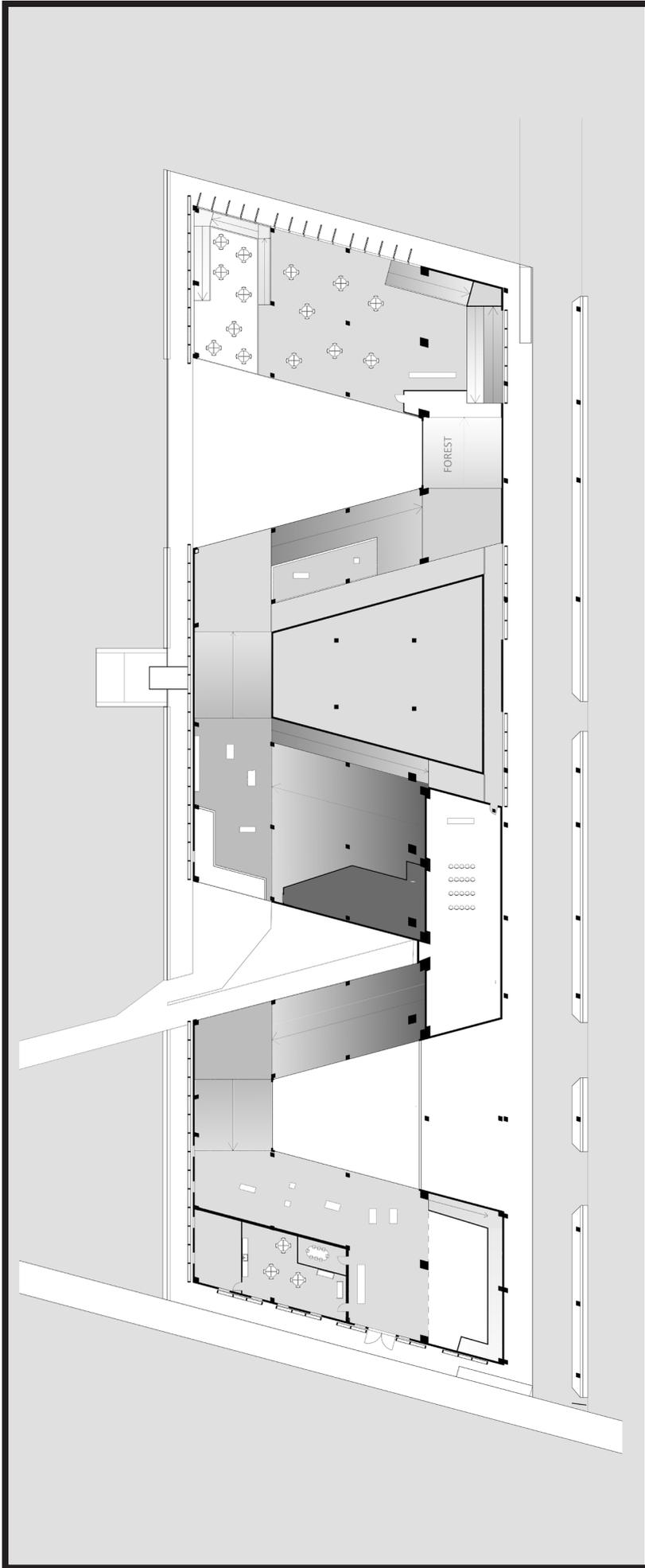
SITE PLAN

Areas immediately adjacent to the building have been landscaped, while those further from the building have been left open so that there is still space for sports activities and play. To the north of the building seating has been provided with trees for shade, but the main area to the front of the building has been left clear so that glimpsed views from within the building are open to the sea vista. To the south of the building the demonstration area for sustainable farming and gardening practices has beds for crop rotation, banana and coconut palms, and swales for the control of sediment run off.

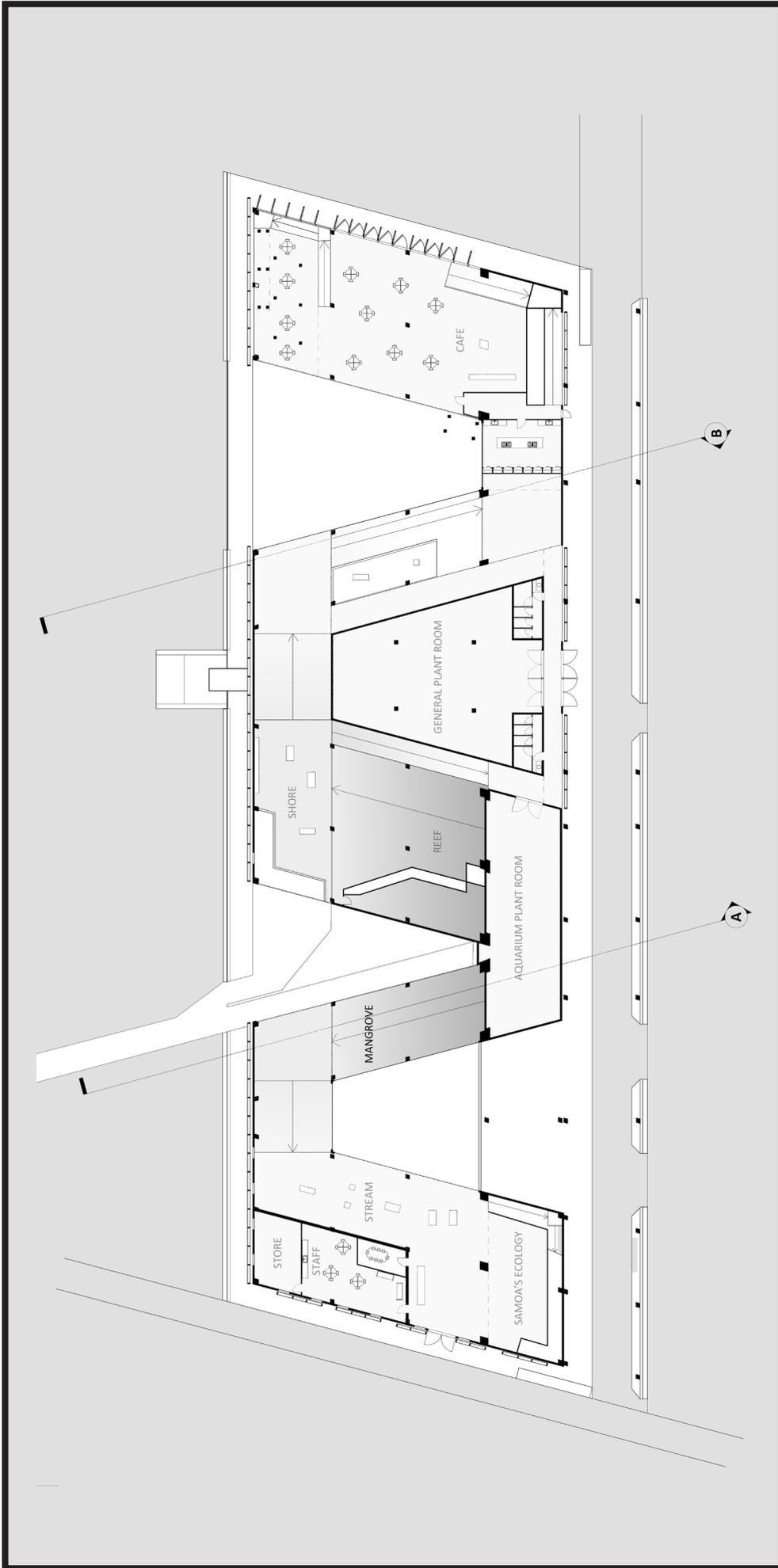


FLOOR PLANS

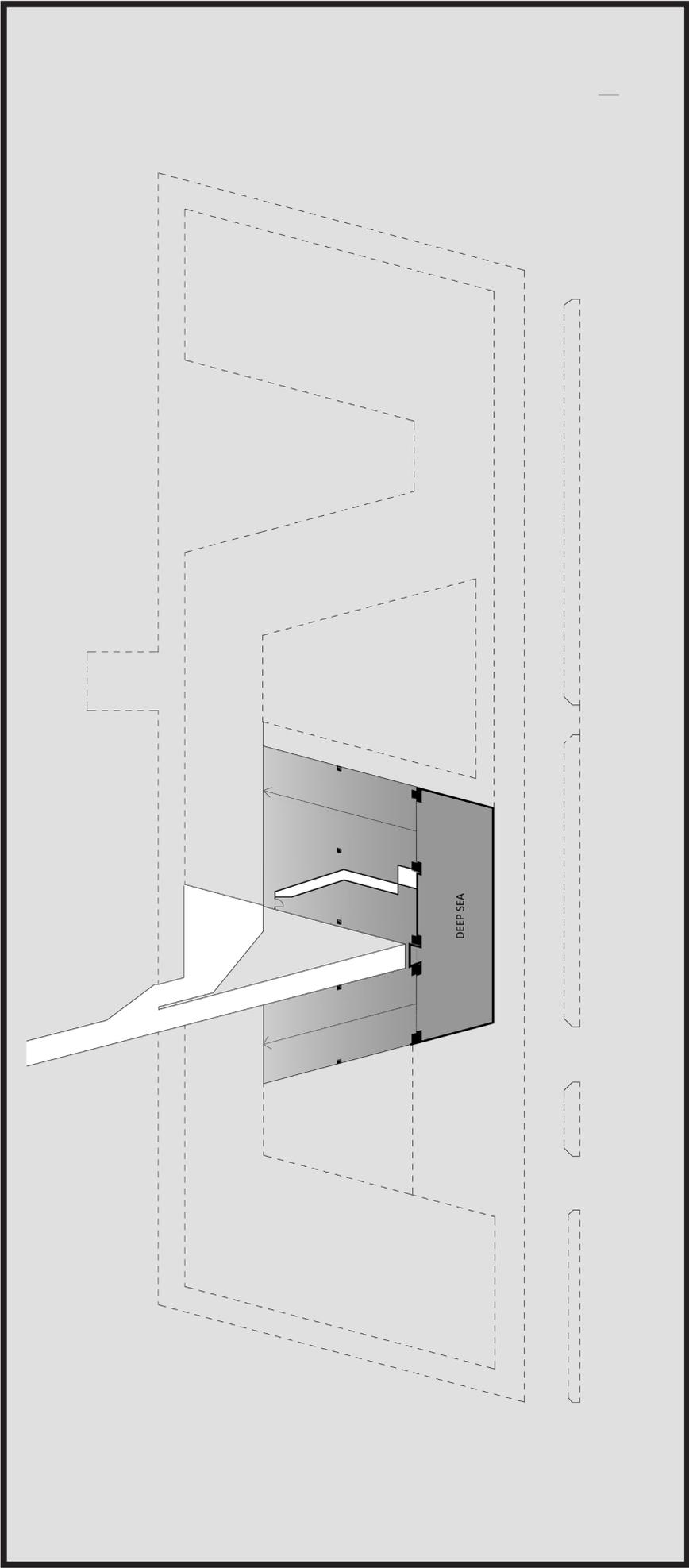
The journey starts at normal ground level and takes the visitor down past the stream area and mangroves, offering views of what lies underneath the water, down further to the subterranean deep sea area. From there the journey heads back up through the reef area, up to the shore and on to the forest area where the ground level then moves up into the canopy. From there visitors are brought back down to ground level by either exiting the building or visiting the cafe.



UPPER LEVEL PLAN



GROUND LEVEL PLAN



SUBTERRANEAN LEVEL PLAN

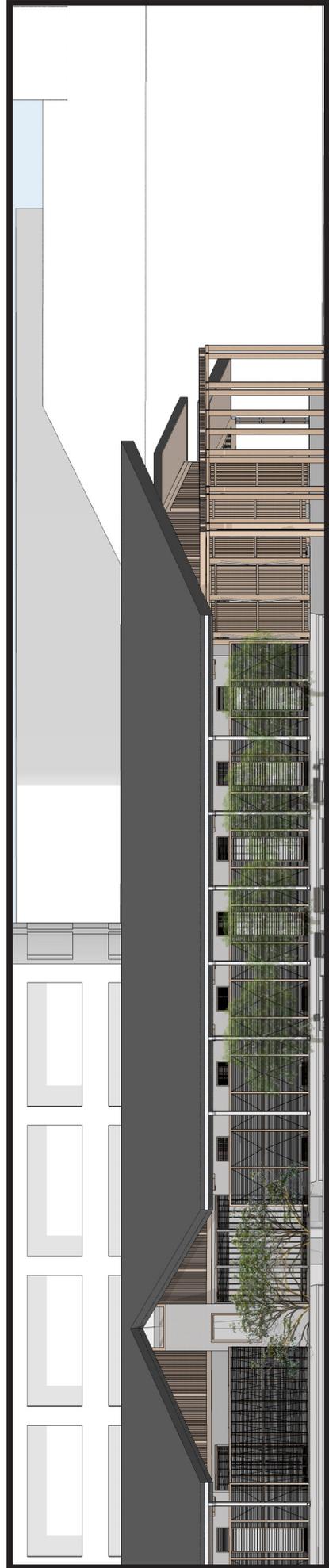


NORTH ELEVATION

Louvres protect the northern faces of the building, excluding direct sunlight from the interior and shading the structure of the building. The louvres are mounted on rails so that they can be slid across during stormy weather to protect the forest and mangrove areas (see fourth exterior perspective, page 163). Trees in the mangrove and forest areas create dappled light in those internal display areas.



LARGER IMAGE OF NORTH ELEVATION: LEFT HAND SIDE AND RIGHT HAND SIDE





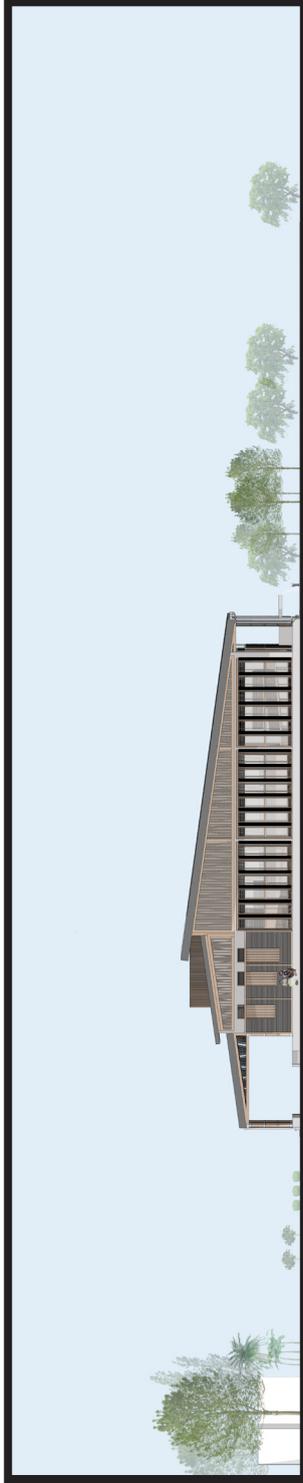
SOUTH ELEVATION

The clerestory at the top of the building allows for natural, indirect daylight to the interior of the building. Large glazed areas to the rear of the building are also covered with louvred screens to offer protection from flying debris during storm winds. It also offers some visual privacy to members of the public moving around the walkways and visiting the bathrooms within the building. The covered walkway across the southern side of the building is partially barricaded to buffer the demonstration garden from pedestrian traffic, but openings along the path allow people to visit the garden area.



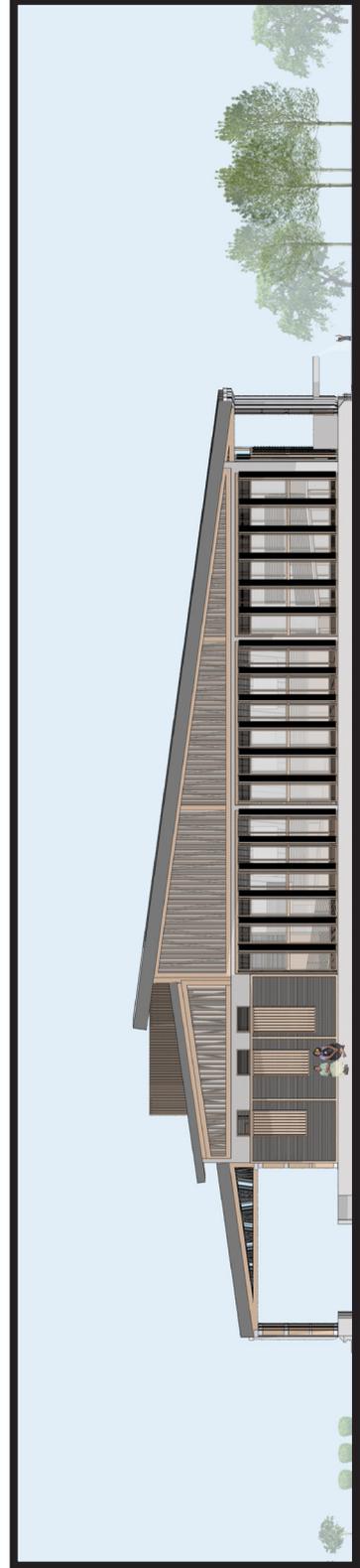
LARGER IMAGE OF SOUTH ELEVATION: LEFT HAND SIDE AND RIGHT HAND SIDE

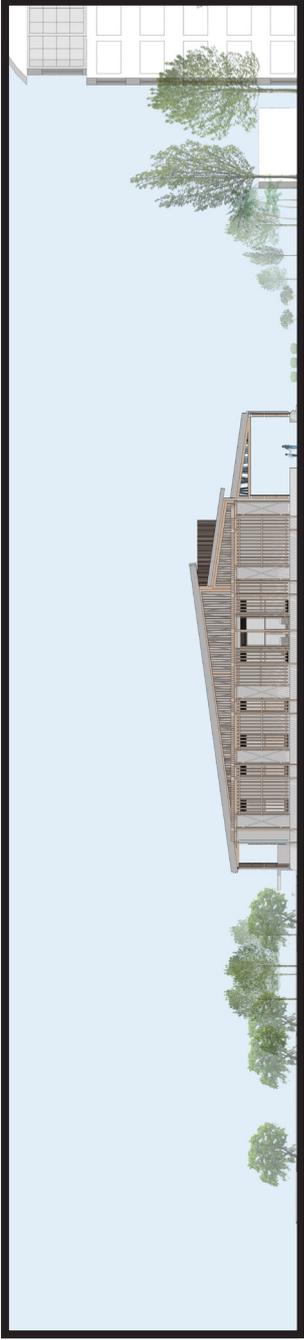




EAST ELEVATION

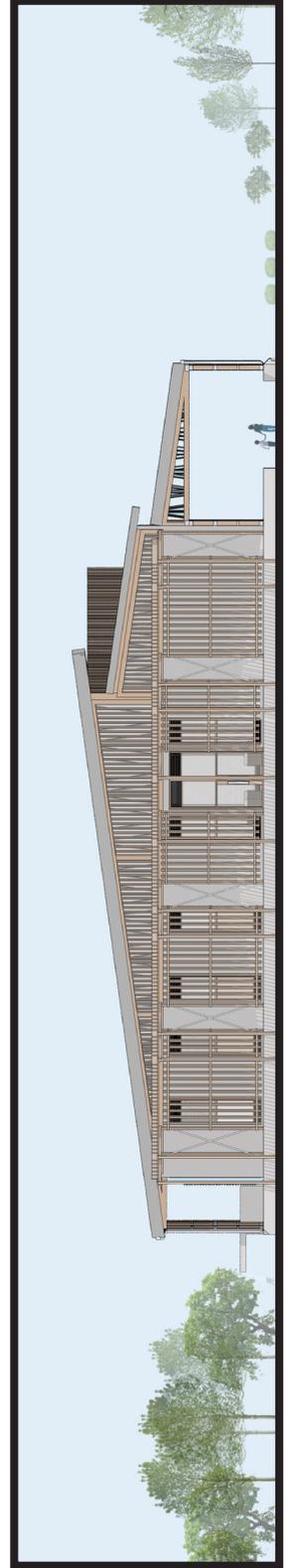
Vertical louvres have been used on the higher glazing on the east side, with individual moveable shade panels for each exterior door employed to allow the doors to the cafe area to be flung open in fine weather. Shading is again provided for the structure (to the left), with the louvres varied in from the of windows so that the form of the building is not disguised by the louvre panels. The air vents for the natural ventilation are visible above the panel.

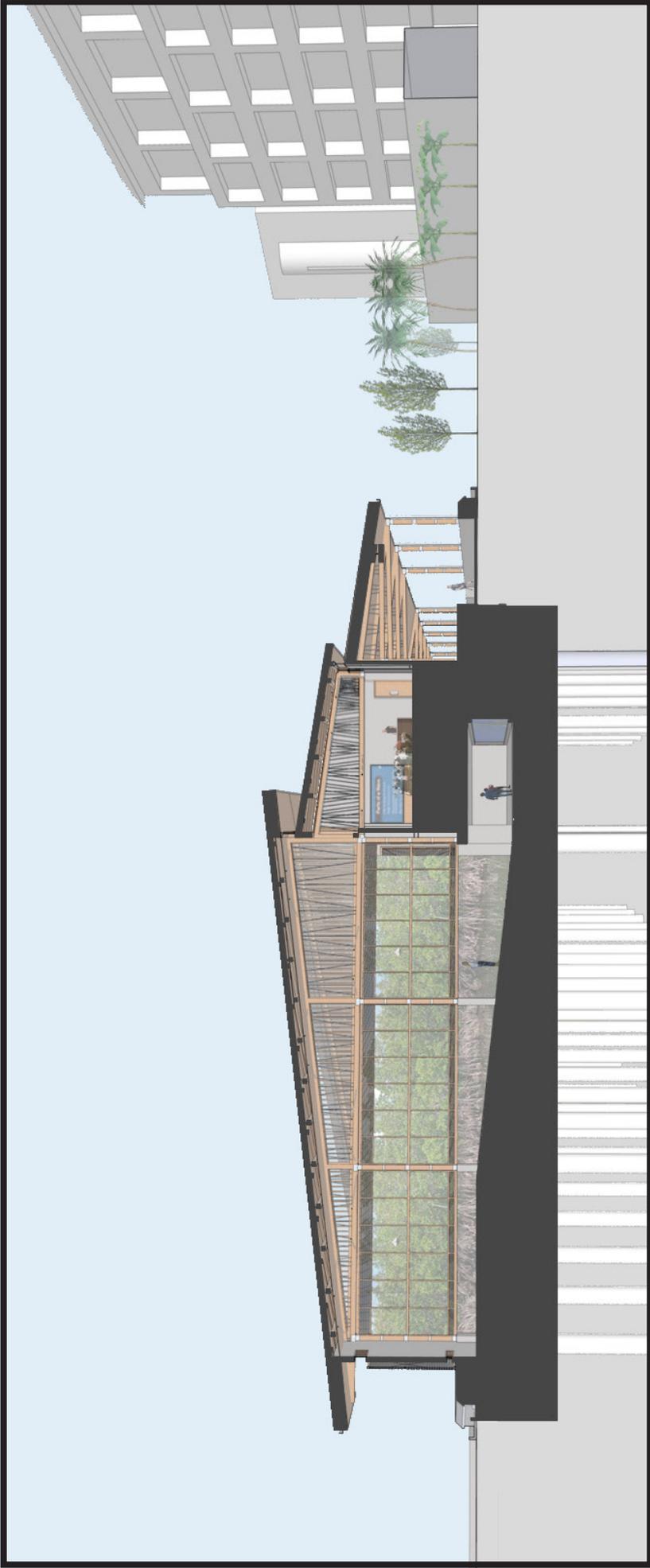




WEST ELEVATION

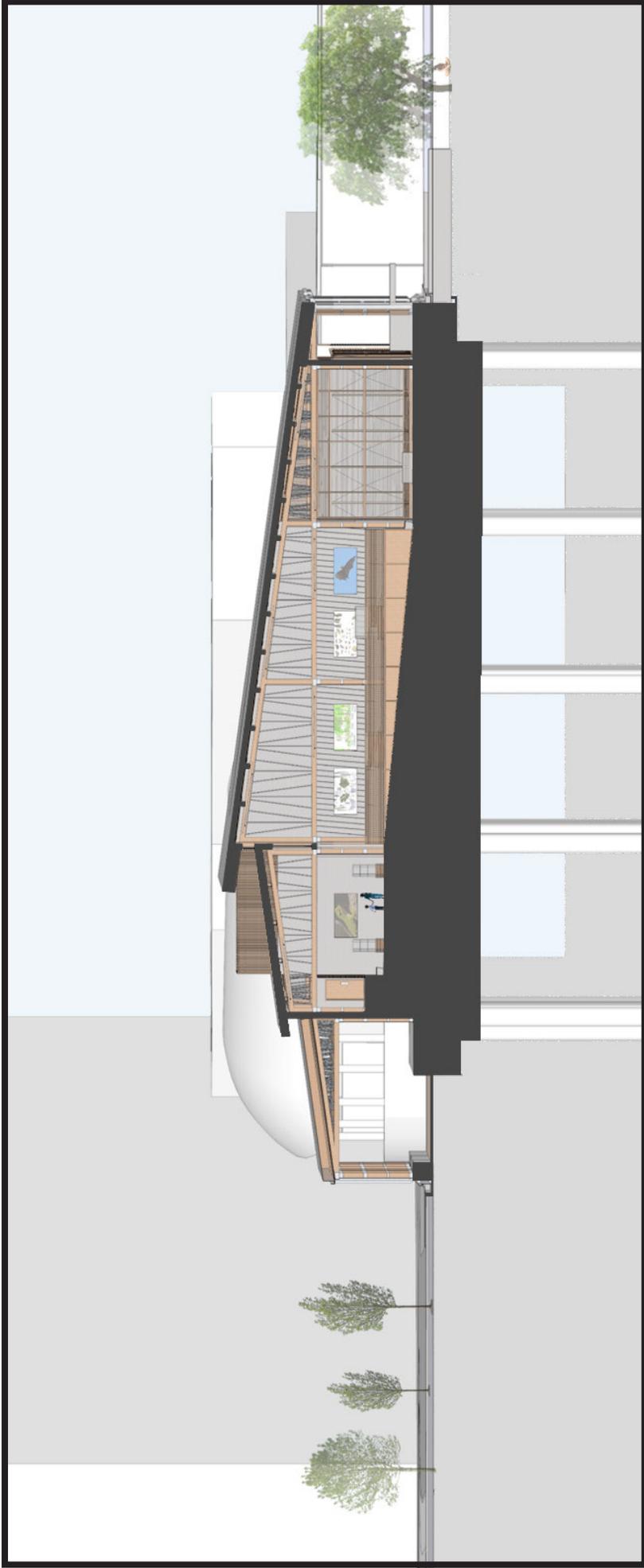
Vertical, angled louvres protect the windows from the low westerly sun angles, with cross bracing between the panels to break up the louvres. Shading of the structure itself during the hotter parts of the day is achieved by the pergola panels over the walkway. The main entrance is positioned parallel to the walkway - an invitation to enter which doesn't impede the pedestrian flow into the park. To the right, the alternative shaded walkway which leads to the centre of the park can be seen, providing shade and protection from downpours.





SECTION A:A

This section, looking east, illustrates the change of levels within the building as the visitor travels down past the mangroves and into the deep sea area. The upper level provides a seminar room where visitors can attend short presentations, or local Samoans can attend longer, more structured lectures on caring for their environment.



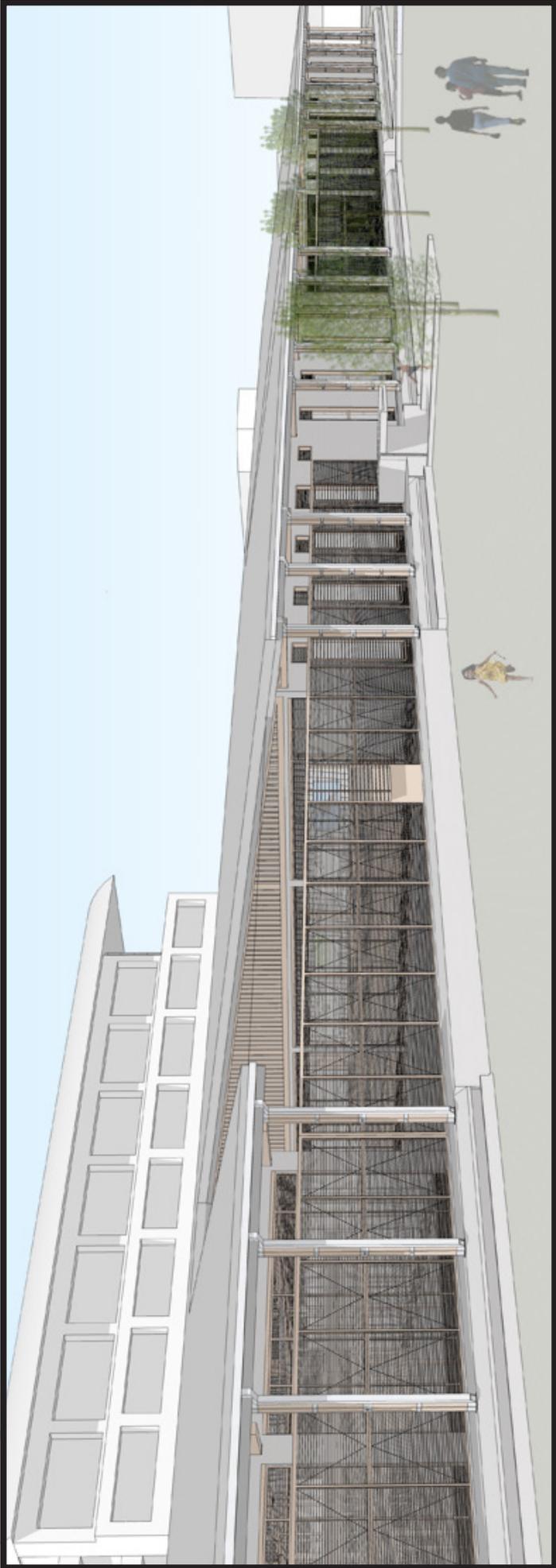
SECTION B:B

This section, looking west, shows the level change within the forest area, including the separate platform area for the flying foxes: creatures that are both endangered and critical to Samoa's ecosystem, being the only polinator of some native species. Inset areas such as this one, along with the mezzanine levels in the cafe and entrance areas and the compressed subterranean space, help create a variety of interior spaces by pushing and pulling with heights and widths within the main structure.

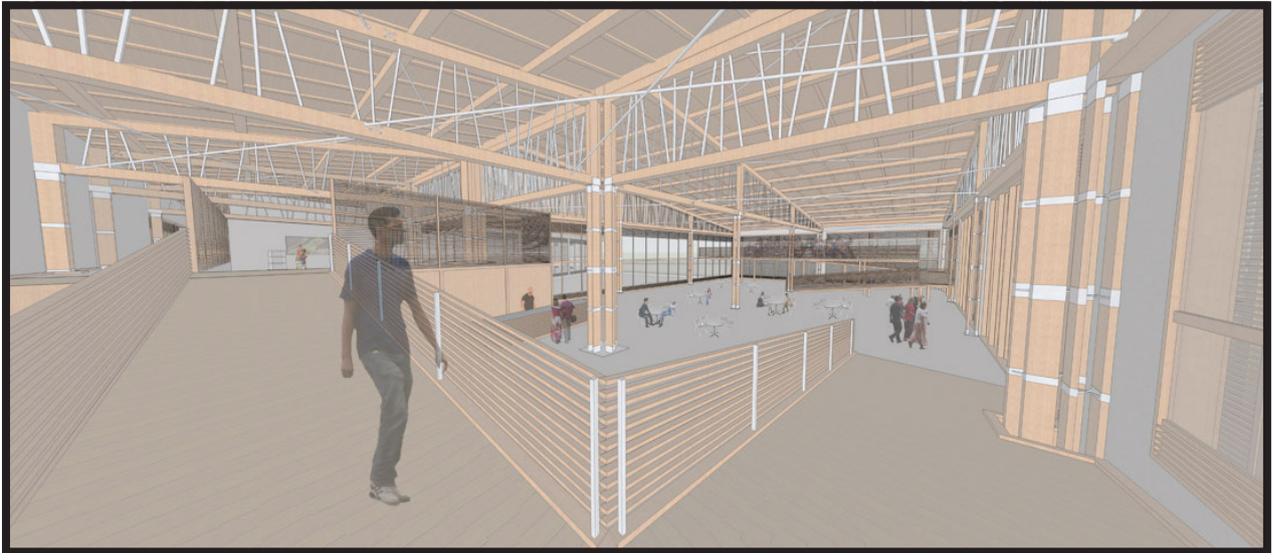
PERSPECTIVES

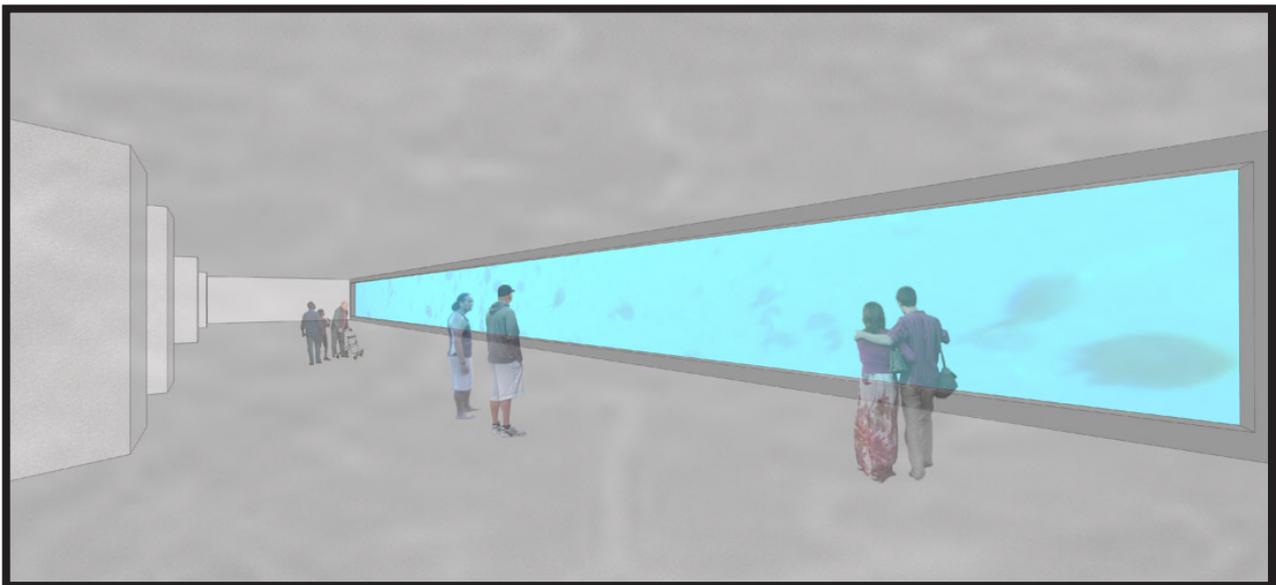




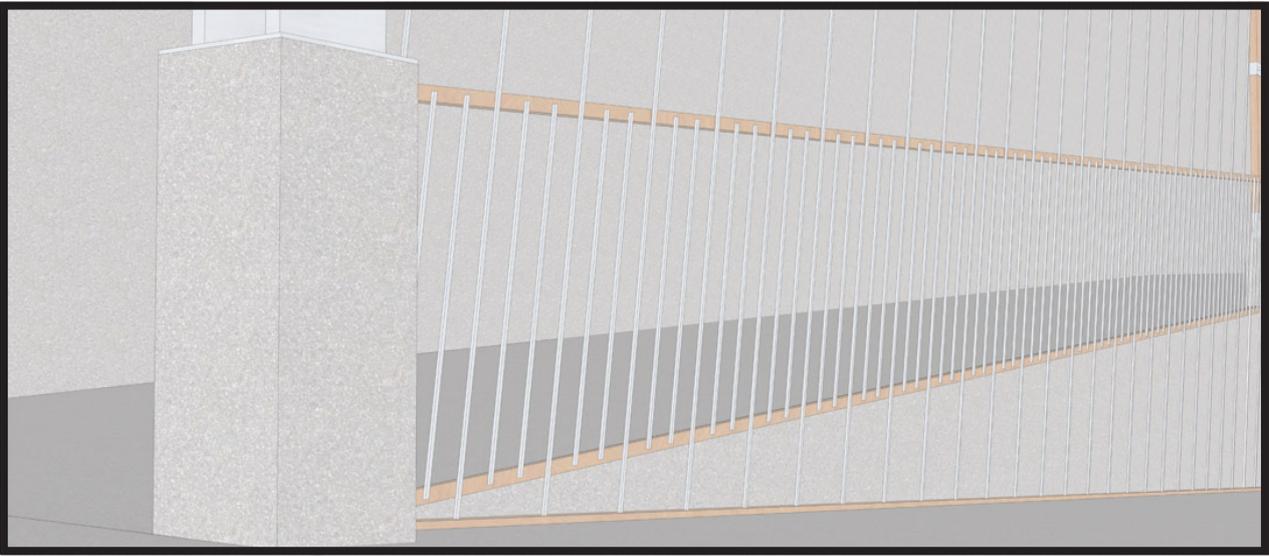
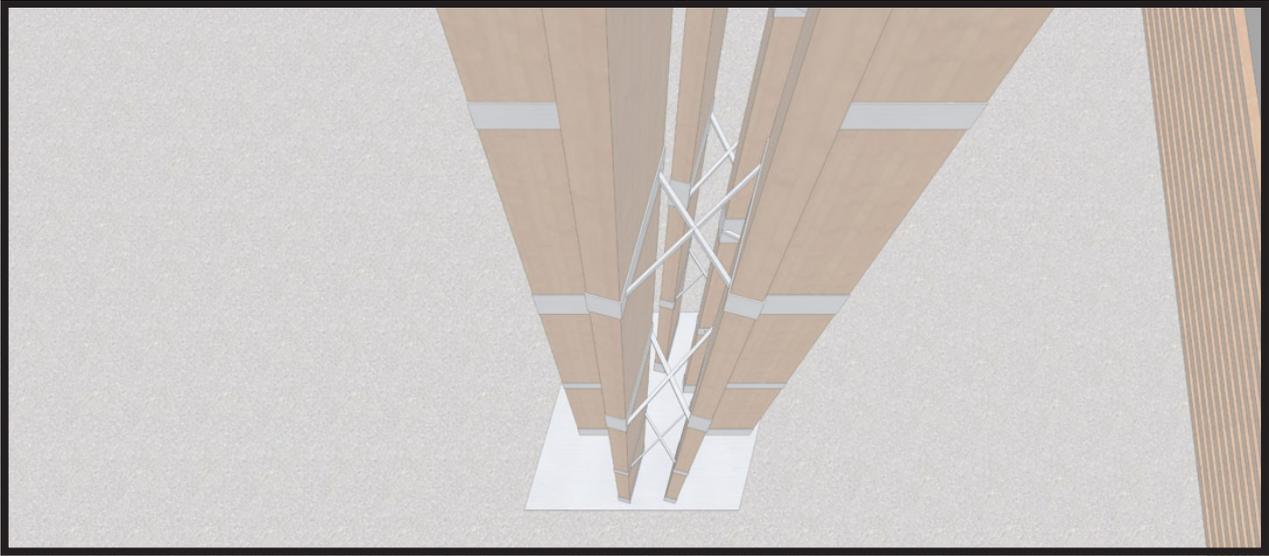


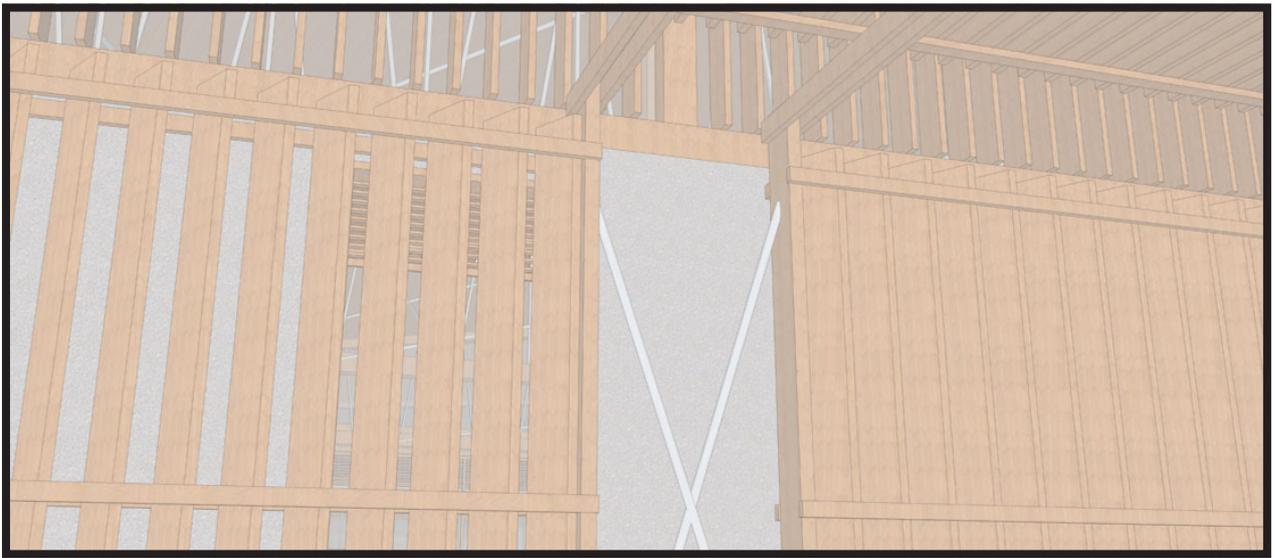
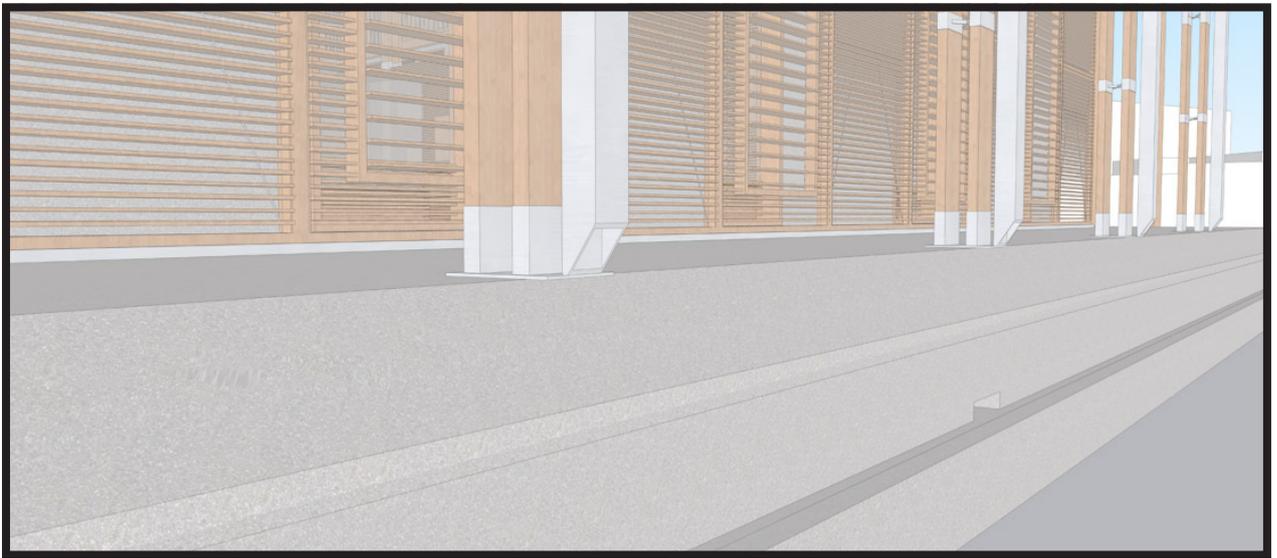


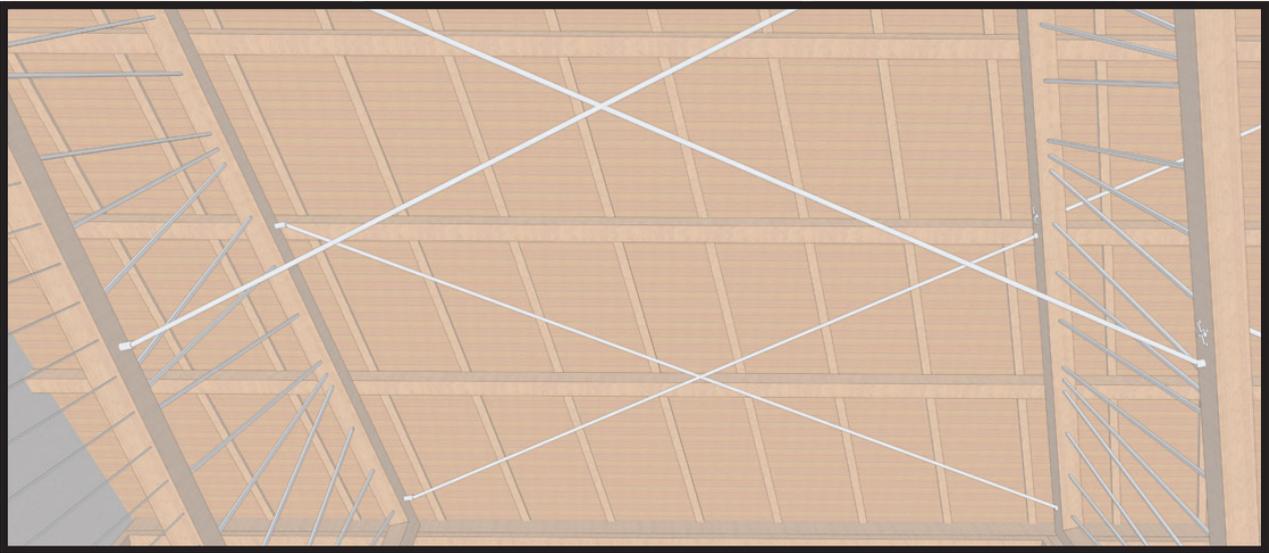




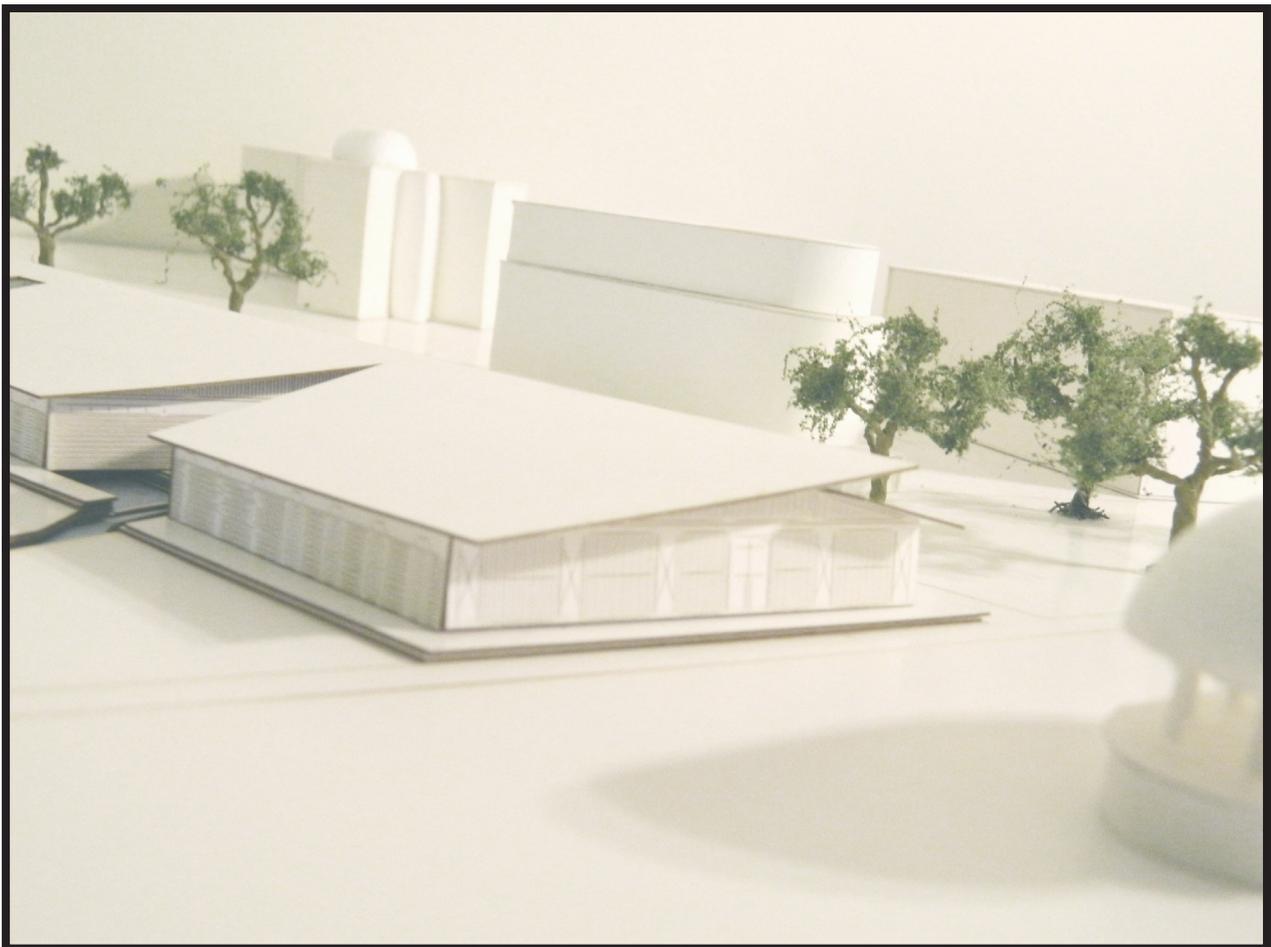
DETAILS







MODEL PHOTOS





APPENDIX I

BUILDING SURVEY

During the visit to Samoa in May 2013, a survey of the existing buildings within the waterfront area was taken. The target area was defined and running from the bus station to the east through to the port in the west with the landward boundary running roughly 300 metres parallel with the shore. In reality, this comprised the buildings along Beach Road and Convent Street and those on the streets running cross-ways between the two.

Where the occupancy of the building is known, this occupancy has been given. Where occupancy is uncertain, the apparent type of occupancy has been given, so far as can be ascertained. Residential buildings were not photographed out of respect for the occupants. Only public buildings are included in the photographic survey.

A series of maps outlining the locations of each building within the Apia urban area can be found at the rear of this appendix.



1 Public Toilets



2 Ministry of Women, Community and Social Development



3 Bus Shelters



4, 5 Flea Market (two buildings)



6 Retail on ground level, upper levels commercial.



7 RSA



8 Nelson Library



9 Fish Market



10,11 Industrial buildings associated with wharf for fishing vessels.



12 Ministry of Internal Affairs



13 Assembly House (used by local matai for meetings).



14 Central Bank of Samoa Corporate Headquarters.



15 Ancillary building to the Bank of Samoa.



16 Government building.



17 Ancillary buildings to Government building.



18 Replica traditional village.



19 Samoa Tourism Authority.



20 Tui Atua Tupua Tamasese Efi (TATTE) Buildings



21 Restaurant and retail at ground level, commercial units upper level.



22 Mix of retail and commercial buildings just outside the focus area.



23 Toyota dealership and workshop.



24 SNPF Plaza

25 Car park associated with SNPF Plaza (omitted from photographic survey in error).



26 Kalolo Bartley Building.



27 Eveni Carruthers building.



28 Under construction at time of visit.



29 Under construction at time of visit.



30 National Bank of Samoa.



31 Retail (pharmacy) ground level, Samoa
National Council of Women on upper
level.

32 Omitted from survey in error.



33 Westpac Bank.



34 Retail at ground level and commercial upper levels. Appears to be occupied by businesses associated with tourism.



35 Western Samoa Life Assurance Corporation (WSLAC) House.



36 Unknown occupancy, possibly associated with St Mary's Convent.



37 St Mary's Convent.



38 St Mary's Primary School.



39 Immigration Office and Samoan Observer newspaper.



40 Apollo Cinema.



41 Samoa National Lotto.



42 Retail ground level, commercial upper level.

43, 44, 45 Retail and commercial mix, omitted from photographic survey in error.

46 Commercial building with Air New Zealand as main occupant on ground floor level. Omitted from survey in error.



47 Amau Building now occupied by Chan Mow & Co. Ltd.



48 Camera House. Rear addition to the Amau Building.



49 ANZ.



50 Retail and commercial. Ground floor occupied by hairdresser and icecream parlour.



51 McDonald's.



52 Car park building.



53 Samoa Housing Corporation.

54 Retail on ground level, either commercial or residential upstairs. Omitted from survey in error.



55 Retail ground level, restaurant upper level.



56 Retail and Commercial.



57 Retail and/or commercial.



58 The Catholic Agency for Samoa Aid and Development, possibly with a church incorporated into the building.



59 Samoa Post Office.



60 Methodist Church



60a Possibly auxiliary buildings associated with the Methodist Church.



61 Wesleyan Christian Bookshop ground level, Methodist Church offices upper level.

62 Retail and possibly commercial - omitted from survey in error.



63 Roman Catholic Cathedral (under construction at time of visit).



63a Accessory building to Roman Catholic Cathedral.

64 Retail and commercial mix. Omitted from survey in error, but identical style to Samoa Post Office building.



65 Medical and commercial.



66 Commercial ground level, unknown occupancy upper level.

67 Residential buildings.



68 Methodist Printing Press.



69 Light industrial and/or commercial units.



70 Marist Brothers School.



71 Japan International Cooperation Agency (rear view of building).



72 Australian High Commission.



73 Italiano Pizza Bar, Internet Cafe and Coffee Bar.



74 Cocktails on the Rocks.



75 Apia Fire Station.



76 Apia Central Police Station.



77 Marist Brothers Old Pupils Association (MBOPA) House.

78 Residential.



79 Police Buildings.



80 Old Apia Police Station.

81 Residential.



82 Old Apia Courthouse.



83 Pasifika Mana Samoa Social Services.



84 Police building, possibly a vehicle workshop.



85 New Zealand High Commission.



86 Ministry for Natural Resources and Environment.



87 Congregational Church.

88 Residential.



89 Commercial with cafe on ground level.

90 Residential.

91 Printing press. Ommited from photographic survey in error.

92 Retail and commercial. Ommited from photographic survey in error.



93 Retail on ground level, commercial upper level.



94 Retail on ground level, commercial upper level.



95 Church (denomination unknown).



96 Building associated with Apia Protestant Church.



97 Apia Protestant Church.

98 Residential.



99 Aggie Grey's Gift Shop.



100 Aggie Grey's Hotel.



101 Car rental agency.



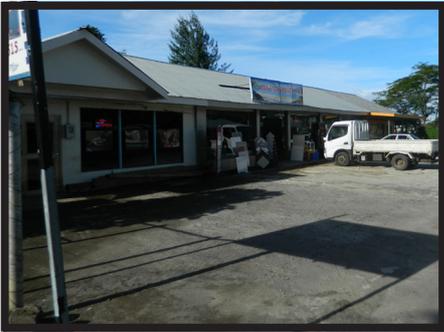
102 Apia Harbour Lodgings.



103 Pasefika Inn.



104 Retail and/or commercial.



105 Retail and/or commercial.



106 Commercial and/or residential.



107 Commercial.



108 Occupancy unknown.



109 Samoa Shipping Corporation.



110 Restaurant.



111 Government Printing MWSCD.



112 Car Rental Agency.



113 Ooh La La Icecream bar and Siva Afi Sewing Centre.



114 Gourmet Seafood Grill.



115 Club X Samoa.



116 Unknown occupancy.

117 Residential.



118 Apia Squash Centre.



119 Marina Hotel, Cafe & Bar.



120 Light Industrial.



121 Samoa Maritime Services Limited.



122 Commercial-residential mixture.

123 Residential.



124 Samoa Ports Authority.



125 Customs Services.

126 Port Industrial Building not directly visible from outside of port.



127 Security Gatehouse.



128 Samoan Quarantine.



129 Port Industrial Building.

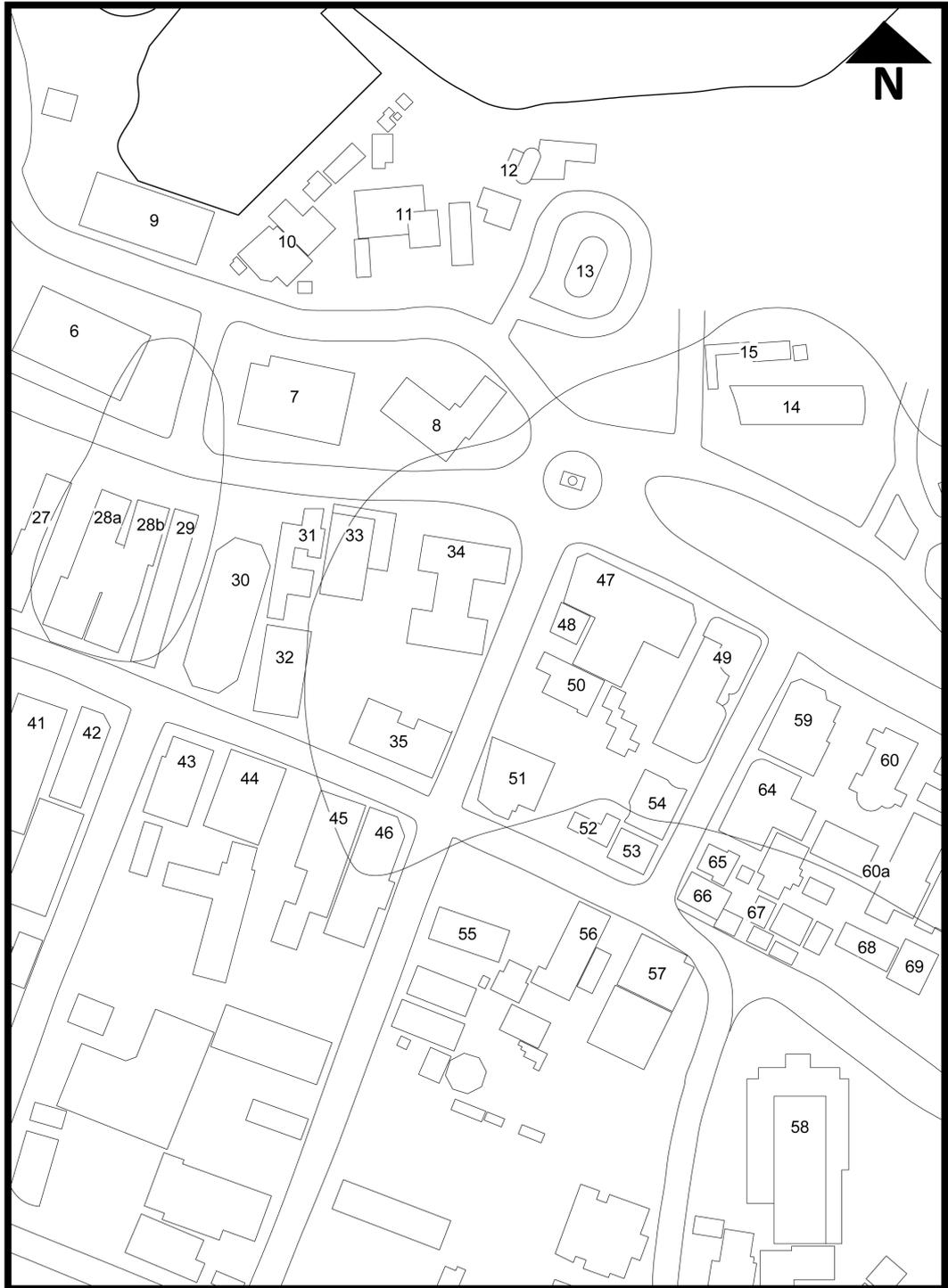


130 Cocktail bar & restaurant.

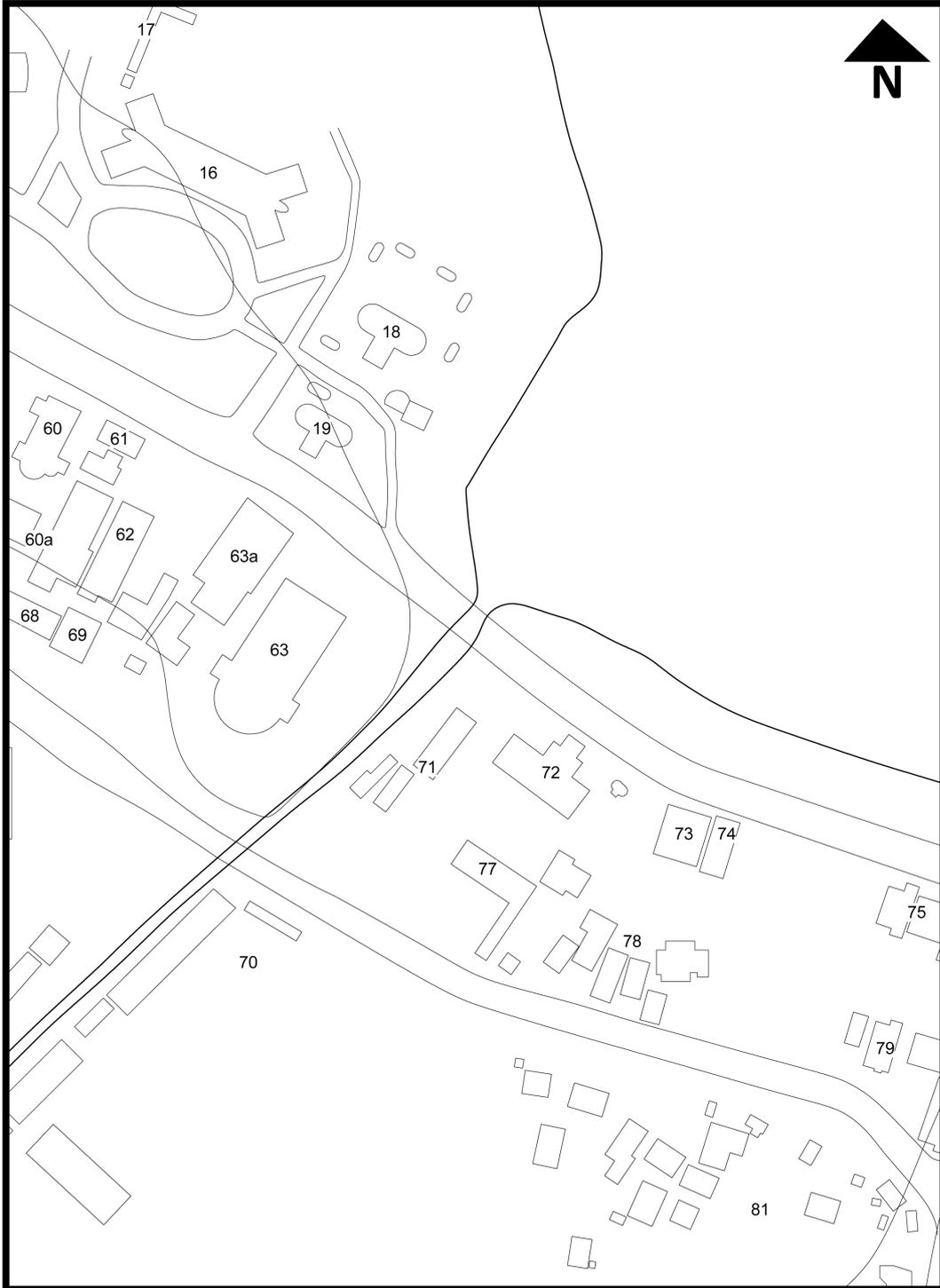
131 Village buildings.



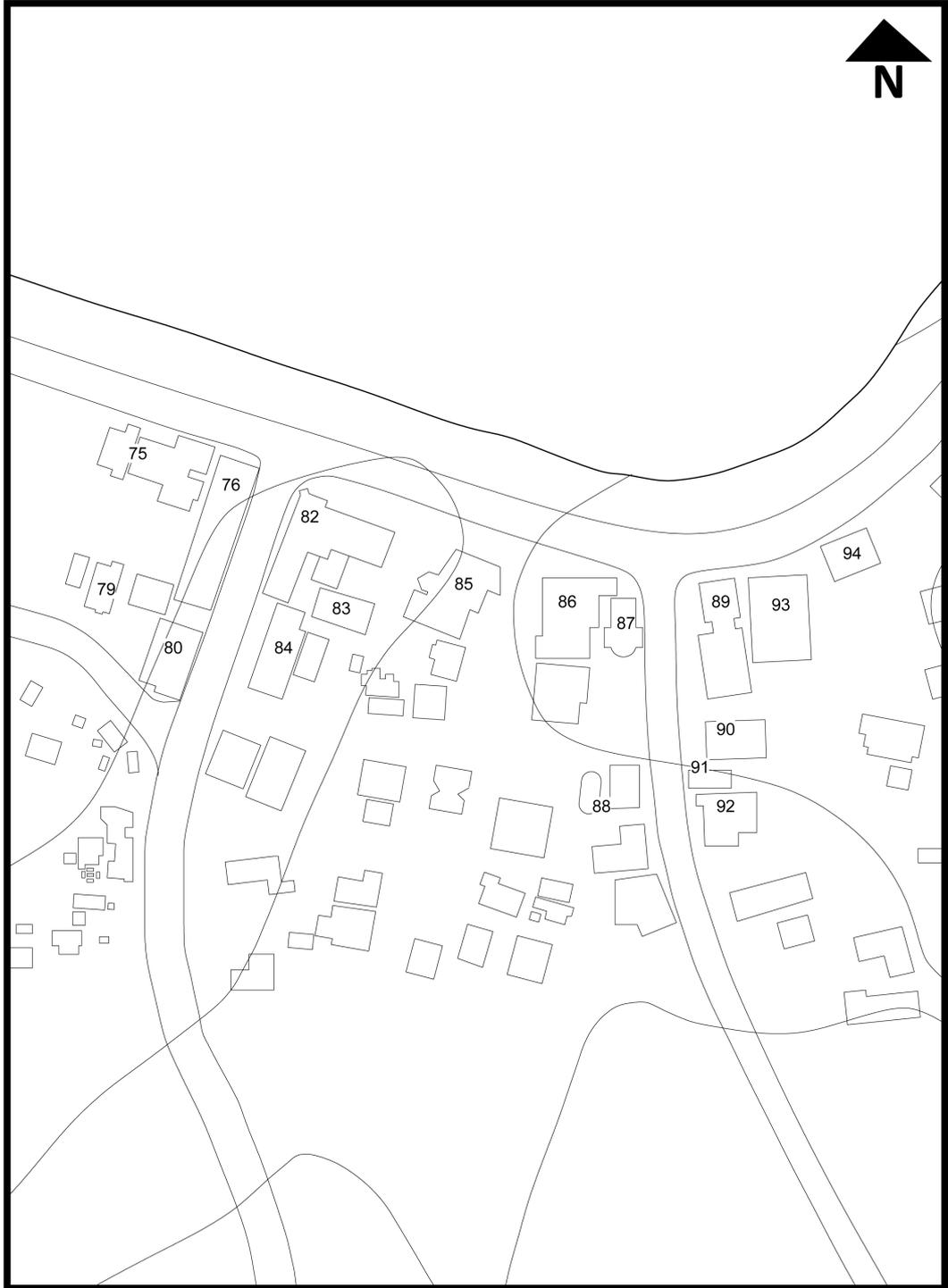
Building Key Map 1.



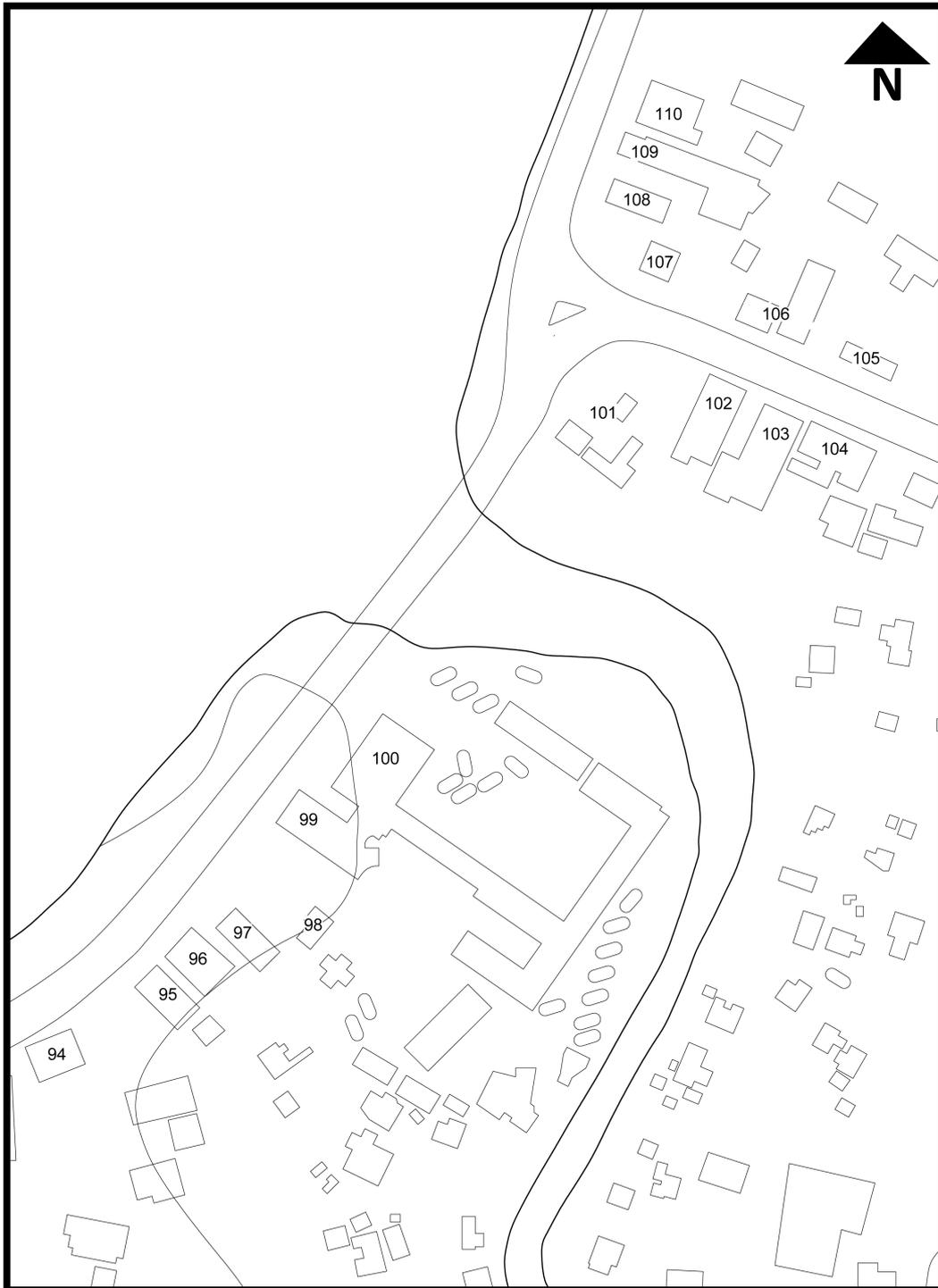
Building Key Map 2.



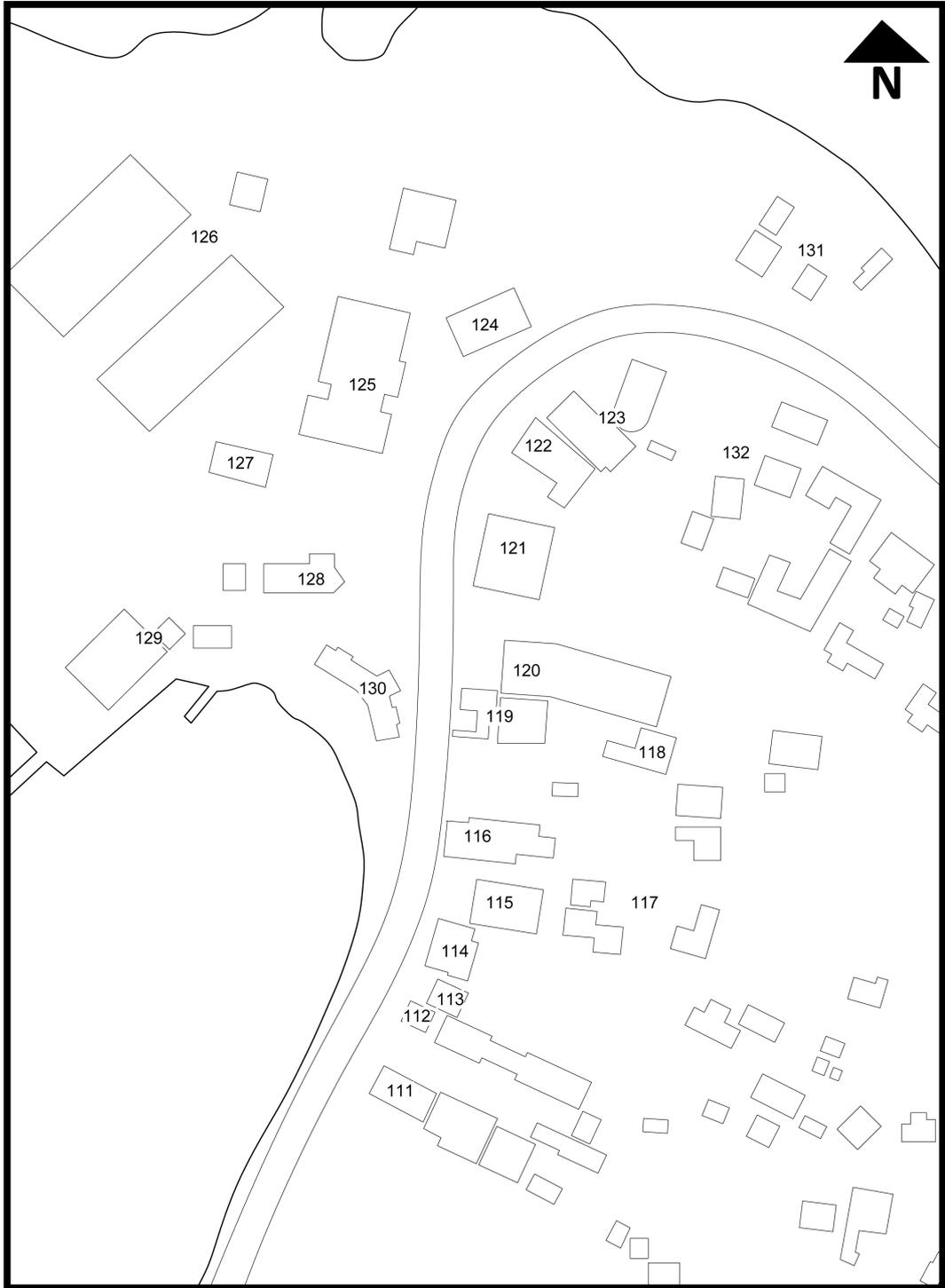
Building Key Map 3.



Building Key Map 4.



Building Key Map 5.



Building Key Map 6.

APPENDIX II

It was noted in the literature survey that much of the area designated as swampland also happens to be customary land, handed down through generations and distributed among family members by the reigning Matai. There are two main areas of customary land which fall within the focus area: both are used primarily for residential purposes, and both appear to be susceptible to flooding during major storm events. This focus area lies between Ifi'ifi Street and the Mulivai River, and is shown in Figure I.

The residential buildings in this area are predominantly sited on land which sits below the level of the road. It was observed during the visit that one of these dwellings was in the process of being dismantled, appearing to have suffered water damage to the floor. Discussions with Jule Kohlhase at PUMA revealed that the current strategy is to educate the residents regarding the risk of future flooding on their land and the consequence of rebuilding there. Relocating the residents onto other land has obvious social implications, but also large financial implications. Any relocation would involve purchasing land elsewhere and compensatory payments to the owners of that



Figure 1.

Map showing focus residential area highlighted, and the vacant site used for the intervention shown in yellow. Map not to scale. Map image courtesy of Google (2013).

land, which is likely to be customary land belonging to other villages. The costs involved are not able to be met by the Samoan government in the current financial climate.

This project does not make any suggestion as to who should provide funding for this proposal. Nor does it imply that the proposal should be enforced on the residents of the customary land in the focus area. It is merely one example of how the impacts of flooding within the focus area might be mitigated; one which the residents of the land might chose to consider or not.

While the following proposal would involve financial outlay of some sort, costs could be minimised by reusing existing materials and having the residents assist in the building process. The more houses which were able to survive the relocation process, the less the overall cost would be. Alternatively, the project could be seen as an opportunity to improve training in the construction industry, as lack of practical training in construction education was highlighted as an issue in the SBEC Services Sector Profile of 2010.¹ This has the potential to benefit the economy long-term.

Figure II shows a nearby lot of vacant land which has had the ground level raised in preparation for building (there are other pieces of land in Apia which are undergoing this process). Using this building up of the ground level as a guide to how the flood risk is being reduced locally, a plan could be developed for the housing in this area, with the currently vacant site used as a staging point for the intervention. Underground rainwater collection tanks and bio-digesters for sewerage treatment and electricity generation could be incorporated, assisting with the raising of the ground level.

By constructing a number of removable houses on this site, which has a higher ground level already, the residents of the customary land could be temporarily relocated while their own homes are raised (if they are structurally able to withstand this) or new homes are constructed in their place on the raised ground. This temporary relocation and building up of the ground level could be done incrementally, over several stages if necessary, as outlined in Figures III-X over the following pages.

There is no doubt that this process would, inevitably, be stressful for the residents in the short term. However by using this vacant

1 Small Business Enterprise Centre of Samoa, "Services Sector Profile" (SBEC, Apia, 2010), 7. <http://www.sbecsamoas.ws/publications/Sector%20Profile%20-%20Manufacturing.pdf>.



Figure II.
Nearby lot which has had the ground level raised.

site as the staging point for the intervention, the residents would be able to remain in their own neighbourhood and would also be able to observe the entire process, which may lessen the stress incurred during the process. If they were also directly involved in the construction process, then a greater sense of control may result. In the long term, the reduction of flood events on their land should be beneficial to them.

Once the process had been completed for all the sites in the neighbourhood, the removable dwellings could then potentially be shifted to another site where a similar process would be beneficial, or they could be relocated onto the neighbouring sites to accommodate growing numbers of families within the area. At the end of the process, the original bare site would again be available for urban development.

The design that follows is purely diagrammatic. The forms and layouts of the buildings are only indicative. Actual forms and layouts should only be arrived at after extensive consultation with the residents. The residents should be given options as to the size and form of the new homes, as well as being able to choose other features such as colours. Ideally, the location of the new dwellings should allow for additional buildings to be erected on the site to allow for possible increases in family size over time to future-proof their neighbourhoods.



Figure III.

Layout of the focus area as at May 2013. Existing property boundaries are shown as dashed lines.
Scale 1:2000.



Figure IV.

The initial step of constructing the transportable buildings onto the vacant site, shown in blue. The residential buildings in green show the first area to be addressed. Scale 1:2000.



Figure V.

The buildings of the second area addressed are shown in green. Again, the buildings in blue are the transportable buildings where the residents would relocate temporarily during the process. Scale 1:2000.



Figure VI.

The process continues with the small cluster of houses shown in green. Scale 1:2000.



Figure VII.

Again, the green houses are the area to be addressed. As stated previously, the new housing layouts are indicative only and any layout should be decided upon by the residents themselves. Scale 1:2000.



Figure VIII.

The final housing group in the focus area is addressed. Scale 1:2000.



Figure IX.

The transportable houses are shifted off the site, allowing for permanent development of the site. The final residential area shows space for additional housing if required in the future. The buildings in green are the Social Services and Police buildings to the rear of the old courthouse. The proposal is for these to be reconstructed on the newly cleared site.



Figure X.

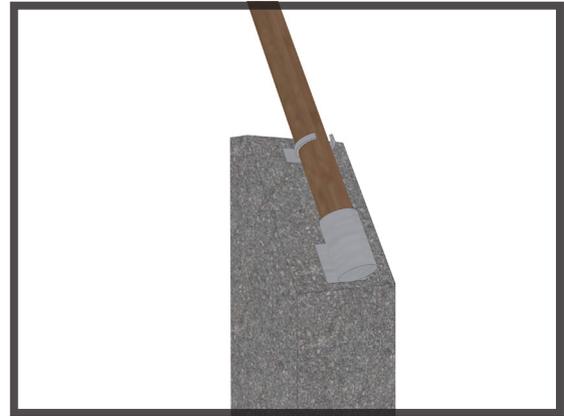
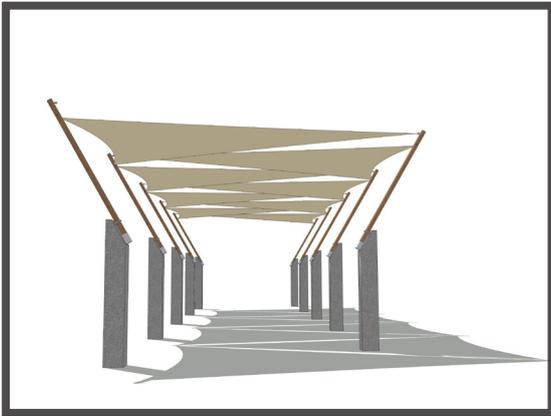
Final stage of the suggested development of the area, with the Social Services and Police buildings , shown in green, now nestled in with the other Police and Fire Department buildings. New commercial and light industrial buildings are shown in blue, with the proposed new community building on the MBOPA site also shown in blue.

APPENDIX III



Fixed Shading Structures.

Traditional forms of building in Samoa are very tectonic, in that they express how the building is constructed. This tectonic aesthetic was chosen for the shade structures as a way of paying homage to the simple beauty found in traditional Samoan structures.



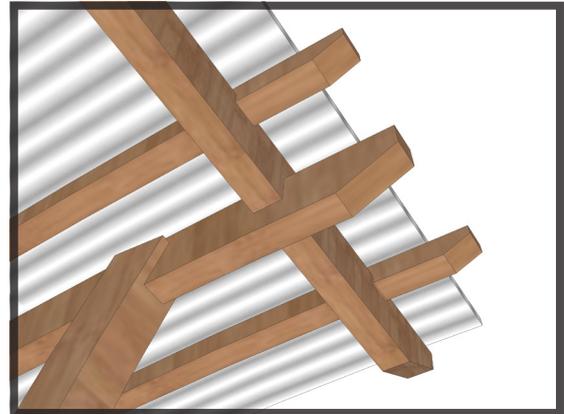
Free-Standing Shade Structures.

The desire to make the structures easy to remove should storms or strong winds be forecast was the driving factor in the design of the free-standing structures. Again, the tectonic aesthetic was applied to the design.



Park Benches.

The selection of timber and concrete for the construction comes from the desire to use locally sourced materials. Continuing the tectonic forms of the shade structures allows the benches to relate aesthetically but also means they can be easily dismantled for maintenance.



Bus Shelters.

The bus shelters are an elaborated form of the park benches with the addition of fixed shading. Again, the method of construction, with supporting posts slotting into stainless steel brackets, means that the shading devices can be removed should a storm be forecast.



Dual Litter Bins.

Maintaining Samoa's pristine environment relies on efficient means of waste disposal. In particular, recycling should be encouraged, and dual bins - one for waste that can be recycled and the other for waste which cannot - may remind tourists of the fragility of the environment they are visiting. Recycling is particularly important in Samoa where drinking the tap water is not currently recommended and bottled water is used extensively.



Stormwater Grates.

Due to the heavy downpours which occur in Apia, the stormwater grates are required to be much larger than those we see in New Zealand. Currently the grates are very utilitarian and industrial looking. Commissioning local artists to create more sculptural grates is a way of sharing more of Samoa's art with visitors.

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