Maii Residential Hillside Development

ENVIRONMENT IMPACT ASSESSMENT REPORT

16 March 2025

Prepared for:
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Report prepared by:
TURANGI Geotechnical Services

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APPENDICES

DEFINITIONS AND LIST OF ABBREVIATIONS

Terms, abbreviations and acronyms	Meaning
CEMP	Construction Environment Management Plan
EIA	Environment Impact Assessment
EMP	Environment Management Plan
ESCP	Erosion & Sediment Control Plan
HSP	Health and Safety Plan
MSL	Mean Sea Level
MEC	Muri Environment Care
NES	National Environment Services
NGO	Non-Government Organisations
TMP	Traffic Management Plan
TOR	Terms of Reference
ICI	Infrastructure Cook Islands

EXECUTIVE SUMMARY

This EIA Report has been prepared for Pavo & Tara Mustonen, to provide recommendations with developing the existing hillside property, for a residential dwelling.

The Maii property is located along the inland hillside, generally referred to as Maii Heights, it is easily access from the Ara Metua along the Maii Heights Drive.

No building plans were made available during the preparation of this report, at this stage the landowner wants to develop the hillside property with safe access across the sloping hillside and an eventual levelled building platform to support a residential dwelling.

The proposed development comprise the following:

- Formation of a new private driveway, extending from the existing gravel road, to run diagonally across the sloping terrain, ascending towards the upper south-western side of the property.
- Formation of a building platform, tentative dimensions of 28m by 8m wide, sitting near the top of the hill, at an elevation of 90m (above mean sea level). Earthworks will anticipate a cut-batter of 8m vertical height will be required to form the building platform.
- Formation of a CUT level bench platform, along mid-way of the slope at an elevation of 66m. This new bench will serve several purposes; a place to position water storage tanks, tool/garden shed, small units and a place for additional parking.
- Improved drainage, all surface drains will be diverted and flow along new shallow drains, towards designated sediment ponds, prior to discharge into the existing Maii roadside drains.
- All excavated (cut) materials, will be moved, carted and placed (filled) along the lower level platforms, within the property. The fill materials will be compacted by suitable compaction roller machinery.
- Erosion and sediment control measures, in addition to the formed spoon drains and sediment ponds, will also include, silt fence and slope stabilizing matting. Riparian embankment stabilization is also considered using vetiver grass.

The objective of this project is to provide for a suitable building platform, safe sloping driveway, improve drainage, and minimize impacts to the environment and to the community.

This EIA confirms that the effects of this proposal will not be significant. It is considered that with the implementation of the EMP, along with other management plans, that any potential effects of the proposal will be minimised.

1. INTRODUCTION

This Environmental Impact Assessment (EIA) report has been prepared to identify potential impacts, provide justification and also include measures to mitigate any negative impacts on the environment. Alternatives considered will also be explained.

This report outlines the proposed hillside development, focusing on extensive earthworks to create a stable access road and building platform. The project involves significant excavation, including vertical cuts ranging from 1.2m to 8m in height, to establish a 95m-long driveway and a level building platform at the top of the hillside. Stability measures such as 80° cut slopes, retaining walls, and protective matting will be implemented to minimize erosion and landslide risks.

Excavated material will be repurposed to extend the lower platform, with compacted fill ensuring structural integrity. Drainage systems, including spoon drains and sediment control measures, will manage surface water and prevent soil erosion. Additionally, ongoing monitoring and maintenance will ensure long-term stability and environmental compliance.

This EIA has been produced in accordance with the Environmental Act 2003.

1.1. Proposal Proponent

Pavo & Tara Mustonen are both Cook Islanders, local resident and land owner whom reside in Muri, Ngatangiia.

1.1.1. Contact details for the proponent/project manager

All general enquiries are to be directed to the 'Project Manager', Pavo Mustonen.

Contact Details:

- Name: Pavo Mustonen
- Mobile: +682 71638
- Email: tara@cooksbayvillas.com

1.2. Project Description

Maii Hillside Property

The subject property is legally described as **Maii Pt Sec 12C, Maii Tapere, Ngatangiia District**; it is approximately irregular in shape and covers a total area of 7701m2. The property is located along the inland Maii hillside; the property is easily accessed by a partial chip sealed and remaining gravel road "Maii Heights Drive" extending from the Ara Metua (Back Road).

Figure 1: Aerial drone view of the property following the August 2024 clearing works.

Recent vegetation clearing was undertaken in August 2024, which involved cutting down trees and large shrubs, using a chainsaw and bush knife along the hillside slope, a digger was also acquired to form three levelled platforms along the bottom of the slope. It is understood that vegetation clearing is an ongoing maintenance activity carried out by the family, with the last clearing done in 2014.

Figure 2: Native shrubs has re-established growth along the cleared hillside, photo taken November 2024.

Figure 3: Today the entire hillside is re-vegetated, photo taken March 2025.

The hillside has moderate to steep slopes, occupy approximately 74% of the property, mainly the western and south-western side, while the remaining side has a level platform at the base of the hill, retains 26% of the property.

The moderate to steep slopes descends towards the northeast direction, with ground slopes ranging between 25° to 44° inclinations, with a steeper 48 cut batter along the bottom of the hill, and a gentle to flat 4° for the level platform.

Proposed Hillside Development

The project involves extensive earthworks to reshape the hillside, creating a stable private driveway and building platform.

1. Excavation of the Hillside

The hillside will be excavated to create a diagonal access road, with soil and rock removed to form a stable driving surface. Alongside this road, an 80-degree roadside embankment will be established, reinforced with retaining walls where required to maintain stability. The driveway itself will feature vertical cuts ranging from 1.2 to 4 meters in height over its 95-meter length and 4-meter width. At the hilltop, the construction of a level building platform will involve an 8-meter vertical cut and two 80-degree side slopes, resulting in a 28-meter by 8-meter flat area suitable for development. Midway down the hillside, a 100-meter-long bench will be formed by making a 2-meter vertical cut, supported by an 80-degree batter slope to create a 3-meter-wide level surface. To minimize erosion risks, protective matting will be installed over all exposed slopes. In areas identified as particularly vulnerable, additional reinforcements such as retaining walls and geotextiles will be incorporated. Surface water will be managed through a system of spoon drains, ensuring effective drainage and reducing the potential for slope instability.

2. Driveway Road Platform Formation

The formation of the driveway road platform involves cutting a continuous diagonal ramp into the hillside, extending approximately 95 meters in length with slopes ranging between 15 to 20 degrees. Once shaped, the road surface will be compacted to ensure long-term stability. Initially, the driveway will feature a compacted gravel finish, with provisions made for potential future upgrades such as chip seal surfacing or the incorporation of geogrid reinforcement to further enhance durability and performance.

3. Building Platform Construction

At the hilltop, further excavation will be carried out to create a level building platform by removing volcanic soil and rock. Once excavated, the platform will be carefully compacted and graded to provide a stable, solid surface capable of supporting the structural loads of the proposed development.

4. Downslope Material Movement and Fill

The material excavated from the hillside will be transported downslope to the existing platform, where it will be compacted in successive layers to enhance stability and extend the lower platform area. The fill will be engineered to maintain a consistent 40° slope, with temporary protective coverings applied to prevent erosion during and after construction activities.

5. Drainage, Erosion, and Sediment Control

Surface water runoff from the cut and fill slopes will be managed using spoon drains that direct the flow towards designated sediment ponds. To prevent erosion, temporary covers will be used to shield exposed soil, while mulched tree trunks will help retain soil moisture and further minimize erosion risks. Additionally, silt fences will be strategically installed where necessary to capture sediment and prevent runoff from impacting surrounding areas.

6. Monitoring and Maintenance

Regular inspections will be carried out to ensure erosion and sediment controls remain effective, with particular attention following periods of rainfall. Maintenance activities will include clearing sediment ponds once they reach capacity, repairing any damaged silt fences, and replenishing mulching or vegetation cover as required to maintain stability. The

earthworks will utilize plant equipment including 20-ton and 14-ton hydraulic excavators, supported by a front-end loader, compactor, and tip truck. The movement and operation of this heavy machinery will be managed and documented under the project's Traffic Management Plan.

Project Funding and Duration

This proposal is to be funded by the applicant, Pavo & Tara Mustonen.

The total project cost is estimated at $10k to $20k. The estimated total duration of the earthworks including new drainage system is five weeks, pending favorable weather and locally available earthworks plant machinery.

Construction Management

Where required, the Contractor with guidance from the Project Manager, and appointed Civil Engineer will prepare a Construction Environment Management Plan (CEMP), and a Health and Safety Plan for the earthworks period. The CEMP will include, but not be limited to a Traffic Management Plan (TMP).

These plans will be provided to the National Environment Authority for approval prior to earthworks commencing. Conditions stipulating the above are suggested as conditions of approval. Earthworks will be monitored by a suitably qualified engineer appointed by the proponent.

Traffic and Access

The proposed hillside development is located away from the main road and along the back road (Ara Metua) and therefore poses little disturbance to general traffic flow in the Maii area.

The proposed Traffic Management Plan will address the general mobilization of heavy plant machinery to the property.

The contractor will minimise disruptions to the daily traffic peak times, typically in the mornings 7am to 9am and in the afternoon 2pm to 4pm.

The Contractor will apply appropriate measures to cordon off the general earthworks area with barriers and signage. Access to the earthworks area will be restricted and closed off to the general public.

Work hours

Works will generally be undertaken between the hours of 8am and 4pm, Monday to Friday. Saturday work which does not create significant noise nuisance will be undertaken with the agreement of the local community.

Disaster Risk Management

Works will cease and all heavy plant machinery will be evacuated in the event of extreme weather events, following the emergency alerts issued by the Cook Island Meteorological Services and Emergency Cook Islands.

1.3. Project Objectives and Scope

The objective of this project is to provide for a suitable building platform, safe sloping driveway, improve drainage, and minimize impacts to the environment and to the community.

The hillside development is to provide for:

- Formation of a new private driveway to run diagonally along the sloping terrain.
- Formation of a building platform sitting along the top of the hill.
- Formation of a contour-cut level bench platform, mid-way down the slope.
- Improved stormwater drainage system.
- Erosion & Sediment control measures, utilize riparian embankment stabilization methods.
- Reduce impacts to the Environment and the Community.

The hillside development project is designed to balance the need for infrastructure with environmental preservation and social responsibility. One of the primary goals is to minimize environmental impact by incorporating erosion control methods, including protective matting, retaining walls, and stabilizing cut slopes, to prevent soil degradation and reduce landslide risk. Sustainable water management is another key objective, achieved by directing stormwater through formed drains into temporary sediment ponds and/or rain gardens, before controlled discharge into the Ara Metua roadside drainage system. This approach reduces the potential for runoff-related issues.

Efforts are also focused on protecting vegetation and natural habitats by limiting land disturbance to only essential areas, replanting where feasible, and applying mulch to retain soil stability. Social considerations are addressed by ensuring construction activities have minimal impact on nearby residents, particularly in terms of noise, dust, and visual disruption, even though the nearest neighbor is approximately 200 meters away. Additionally, the project prioritizes long-term stability and safety by designing earthworks that support durable infrastructure while preserving natural landscape features to maintain the integrity of the hillside.

An alternative to development was considered—the ‘do nothing’ approach—where the land would remain in its current, natural state. While this would prevent immediate environmental disturbance, it carries several limitations. The property would remain largely inaccessible and unsuitable for residential or commercial use, limiting its potential value. Natural erosion processes, combined with rainfall and runoff, could progressively destabilize the slope, increasing the risk of landslips over time. Furthermore, without proper drainage management, stormwater could transport sediment to the Ara Metua roadside drains, heightening the risk of blockages and localized flooding. The absence of a constructed driveway would hinder future access, making any later development more challenging and costly. Ultimately, this option would result in missed economic and social opportunities, leaving the land underutilized. Conversely, a carefully planned hillside development, integrating effective earthworks, slope stabilization, and drainage measures, offers a balanced approach that ensures the land is safely and sustainably utilized while managing environmental and community risks.

1.4. Environment Impact Assessment (EIA) Process

1.4.1. Methodology of the EIA

The EIA process is an important planning and implementation process for any project that has the potential to significantly affect the environment.

The stages as they relate to this project are described below.

1) Application stage

August 2023 NES advised that the proposal was assessed under Section 36 of the Environment Act 2003, the outcome of the assessment determined that the project is likely to cause significant environmental impact, which puts the project in 'Tier Three Activities', and therefore an Environmental Impact Assessment (EIA) would be required.

The EIA Terms of Reference (ToR) provided by NES for the hillside development forms the basis of this EIA Report.

2) Public notification stage

Section 36(5) of the Environment Act 2003 requires the EIA report be publicly notified so that interested or affected persons have the opportunity to provide feedback on the proposal. This formal public consultation period is for a 30 day period from the date the NES notifies the EIA report.

As public submissions are received, the NES will provide the applicant with the relevant matters raised, which are to be addressed and comments provided back to the NES.

3) Decision stage

Once the matters raised during the consultation period have been addressed by the applicant, the NES provides a recommendation on the proposal to the Rarotonga Environment Authority (REA) for their consideration and eventual decision. There are three possible outcomes:

1) The application is approved. The NES provides the applicant with an EIA Approval with conditions;

2) The application is deferred until the applicant has satisfactorily addressed issues raised by the REA; or

3) The application is declined.

1.4.2. Objectives of the EIA

The objectives of this EIA are to ensure that possible adverse environmental, social and economic impacts are identified and avoided, minimized or mitigated; and inform the public about the proposal and receive feedback.

1.4.3. Submissions

All submission is to be sent to NES, within the formal public notification period of 30 days. As public submissions are received, the NES will provide the proponent with the relevant matters raised, which are to be addressed and commented provided back to the NES.

1.5. Public Consultation

Public consultation for the hillside development was conducted through direct engagement with key community stakeholders. As most residents in the immediate vicinity are from the same family, the landowner held face-to-face meetings with family representatives from August to November 2024, securing unanimous support, with each representative signing the land agreement documents. Additionally, a meeting with Muri Environment Care (MEC) resulted in their commitment to supporting riparian embankment stabilization and providing

technical assistance. This direct approach fostered stronger community support and was more effective in addressing concerns. Further consultation will take place during the 30-day public notification period.

1.5.1. Relevant Legislation and Policy Requirement

The National Environmental Services (Tu'Anga Taporoporo) are an organization, which is committed to ensuring the safety of people and the environment. Given the legal authority under the Environment Act 2003, Island Environment Authority will consent to carry out any hillside development provided that:

- Erosion or soil instability or any other environmental impacts have been accounted for and mitigated to both environmental and engineering standards.

The Environment Act 2003 stipulates and enforces Section 57 Part 8 – *Excavations on sloping land*.

1.5.2. Planning Process and Standards

The EIA is working to meet the requirements of the Environment Act 2003 and related National Environment Service process.

2. PROPOSAL NEED AND STANDARDS

2.1. Proposal justification

As the availability of flat, developable land along Rarotonga's coastal plains has become increasingly scarce in recent years, many families are now shifting towards the island's inland hilly areas to establish their homes. This trend reflects not only a growing need for housing but also highlights the importance of ensuring that such developments are approached sustainably and responsibly.

The proposed hillside development presents valuable economic opportunities for the local community. It will create immediate employment prospects for local earthworks companies and builders engaged in constructing the new dwelling. Additionally, potential future expansion of the site, such as adding accommodation units, will further contribute to the Cook Islands' broader economic growth by supporting construction and tourism sectors.

Site visits and historical reviews of the property confirm that the chosen earthworks approach is well-suited to the terrain. By excavating into the slope and using fill material at the base to form a level platform, the risk of slope instability is minimized. This method ensures that the new dwelling will be securely constructed on solid, natural ground, providing both structural integrity and long-term resilience.

Following earthworks, vegetation restoration on the steep slopes will offer multiple environmental benefits. Replanting efforts, particularly the use of deep-rooted species such as Vetiver grass (Mauku A'i), will play a key role in stabilizing the soil. The plant's strong root systems reduce erosion by anchoring the soil, preventing sediment runoff during heavy rains, and mitigating landslide risks. Planted in rows along the contours of the hillside, Vetiver grass enhances slope stability while improving water absorption, thus reducing surface runoff and maintaining a balanced water table.

Beyond structural benefits, re-establishing vegetation will also promote biodiversity by creating habitats for wildlife and insects. This effort will contribute positively to the island's ecosystems while enhancing the aesthetic appeal of the area, blending the built environment with the surrounding natural landscape. Furthermore, vegetative cover will

help control dust and sediment movement, improving local air and water quality and supporting a healthier environment for the community.

2.2. Alternatives to the Proposal

Alternative: 'Do nothing' approach

Choosing a 'do nothing' approach for the hillside property would leave the land in its natural, undeveloped state, preserving the existing vegetation and terrain conditions without immediate disturbance. However, while this avoids short-term environmental impacts, it also comes with several limitations and risks. The land would remain largely inaccessible and unsuitable for productive residential or commercial use, significantly restricting its potential. Over time, natural erosion processes driven by rainfall, runoff, and weathering could continue unchecked, potentially resulting in localized landslips and degradation of the slope's stability.

Additionally, without any form of drainage management, stormwater would flow freely down the slope, increasing sediment transport to the Ara Metua roadside drains. This uncontrolled runoff poses a risk of blockages or flooding during heavy rain events. The absence of an access driveway would further limit any future use of the property, making it both difficult and costly to develop at a later stage.

Moreover, leaving the land idle would mean missed opportunities for housing, economic investment, and community benefits. In contrast, a thoughtfully designed hillside development, incorporating proper earthworks, slope stabilization techniques, and sustainable drainage solutions, would ensure the property is safely utilized while managing and mitigating environmental risks over the long term.

3. DESCRIPTION OF PROJECT DEVELOPMENT

3.1. Location of the site

The property is located along the inland Maii hillside; the property is easily accessed by a chip sealed road "Maii Heights Drive" extending from the Ara Metua (Back Road).

3.2. Staging

Hillside Development Staging Plan

The hillside development will be completed in stages over five working weeks:

1. **Driveway Formation** – Constructed in 10m sections (2 weeks).
2. **Building Platform Formation** – Excavation and leveling (2 weeks).
3. **Contour Cut Bench Platform** – Creation of a stable bench (2 weeks).
4. **Drainage System Installation** – Integrated with all earthworks (1 week).
5. **Erosion & Sediment Control** – Implemented in the first and final week (2 weeks).
6. **Riparian Vegetation Planting** – Planted alongside drainage works and maintained post-earthworks (1 week).

3.3. Emergency management

In the event a natural disaster warning has been issued, being an approaching cyclone or flooding, where possible, the contractor will removed off-site all machinery, equipment and loose construction material. If removal off-site is not achievable, then the contractor is to

make secure all loose materials and equipment. Work will recommence once the respective authorities; Police and Emergency Management Cook Islands (EMCI) has issued the all clear notification.

Accidents and emergencies will be managed through the development and implementation of a Construction Management Plan with the necessary equipment and personnel training provided.

3.4. Infrastructure requirement

The hillside property is located well away from major public infrastructure utilities, such as TAU power line, Vodafone communication line and TTV water pipeline. The existing Maii Heights Drive access road is partial chip-sealed and gravel surface.

3.4.1. Transport

The Maii hillside property sits at the end of a 400m private road, *Maii Heights Drive*, which connects to the Ara Metua (inner back road). There are fewer than three homes along this road, with most of the land vacant and regularly maintained. During the proposed hillside development, heavy machinery will be brought in during the first week and will remain on-site until earthworks are complete. Similar activity occurred in the past, during the construction of the existing hillside building and landscaping works.

3.4.2. Stormwater Drainage

The existing stormwater drainage for the Maii hillside property consists of an approximate 1m-wide, 0.5m-deep open channel drain running along Maii Heights Drive. This drain is seasonal, flowing only after prolonged heavy rain and usually remaining dry. It connects to the Ara Metua roadside drain, which discharges into the Otake-Tuapu wetlands, then through the Tuapu drain into the lagoon, about 1km away.

The new stormwater system will include spoon drains at the base of all excavation cuts and subsoil drains to absorb surface water. Mulch from felled trees will be used to cover exposed soil and encourage vegetation growth. All new drains will direct water into three sediment ponds designed to capture sediments and debris. These ponds can later be enhanced into permanent rain gardens for improved drainage and filtration.

3.4.3. Mining of Materials

No materials will be mined on the hillside property. The earthworks will follow a cut-and-fill methodology, with all excavated material stored on the lower part of the property. No material will be removed from the site.

3.5. Waste Management

3.5.1. Character and Quantities of Waste Materials

The hillside development will repurpose all waste generated. Cleared vegetation will be stockpiled separately on-site—usable material will be composted, while invasive plants will be dried and burned under controlled conditions. Excavated soil will be spread and compacted on the lower levelled platform. The main waste generated will be empty lubricant containers from servicing heavy machinery; these will be removed from the site by the contractor at the end of each day.

3.5.2. Solid Waste Disposal

No temporary or permanent landfill will be constructed on the property. The hillside development will not generate significant solid waste, and therefore all waste will be removed from the property.

4. ENVIRONMENT VALUES AND MANAGEMENT OF IMPACTS

Description of the Baseline Environment

4.1. Land

4.1.1. Description of Environmental Values

To ensure hillside development proceeds in a way that balances environmental protection and community well-being, specific quantitative standards and indicators will be applied throughout the project. The establishment of a stable building platform will involve carefully controlled excavation and cut-and-fill techniques designed to minimize disturbance to the natural slope. The key indicators for this process include maintaining a post-earthworks slope angle of no more than 30 degrees, alongside soil compaction and bearing capacity tests to verify foundation stability. Geotechnical assessments will be conducted both before and after earthworks, with regular on-site inspections ensuring the slope remains stable and over-excavation is avoided.

For the construction of a safe sloping driveway, proper grading, reinforced surfaces, and effective drainage systems will be implemented to guarantee both accessibility and safety. Standards will require that the driveway gradient does not exceed 15%, with reinforced materials such as concrete or stabilized gravel used to prevent deterioration. The design will accommodate adequate turning radii and widths to support emergency and service vehicles. Surveying equipment will be used to monitor grading accuracy, and periodic maintenance will be carried out to address erosion or surface wear.

Drainage improvements will focus on incorporating spoon drains, subsoil drains, sediment ponds, and retained vegetation to manage water flow effectively. The objective will be to achieve a reduction of at least 30% in peak runoff volumes, improve soil permeability, and ensure sediment retention systems operate efficiently. Post-development, rainfall and runoff data will be monitored, and regular clearing of drainage features will be carried out. Vegetation will also be assessed to confirm it is stabilizing the soil effectively.

To mitigate environmental and community impacts, sustainable land-use practices will be embedded throughout the development. Targets will include retaining a minimum of 50% of existing vegetation, ensuring noise and dust levels comply with legal standards, and diverting at least 80% of organic waste for composting or reuse. Environmental audits will be conducted before, during, and after construction to verify compliance, supported by monitoring of noise, dust, and water quality. A system for community feedback will be maintained, allowing local concerns to be addressed promptly.

Auditing and long-term management plans will ensure compliance and sustainability beyond the construction phase. Monthly inspections will take place during construction, followed by post-construction reviews and environmental impact studies conducted every six months for a full year. Should erosion, instability, or drainage issues arise, immediate corrective actions will be implemented, supported by adaptive management strategies to address any unforeseen impacts. Continued community involvement will be encouraged to support long-term maintenance and conservation initiatives.

4.1.2. Soils

Geology

A walkover inspection of the property indicates that the site is underlain by volcanic derived deposits. These soils typically comprise firm to very stiff clays, silts and sands of variable plasticity, including basalt boulders and gravels.

Figure 4: Observe dense soils and weathered volcanic rock, remnant of past excavation works, in this regard the 4m high cut face is adjacent to the existing water storage tanks. The earthworks was undertaken in 2010 and has remain in place without a retaining wall for over 14 years.

Reference has been made to the published report titled ‘Geology of the Cook Islands, Bulletin N0. 82 prepared by the New Zealand Geological Survey, 1970’. The report along with the Geological Map of Rarotonga, indicates that the site is underlain by a distinct soil types, 'Te Manga Group formation' volcanic rock, comprising two physiography types, the upper western hillside is described as **'Fringing Hilly'**, with the soil name of **Pokoinu Hill Soils**. The lower eastern gulley is described as ‘**Fans**’, with the soil name of **Tikioki Soils**.

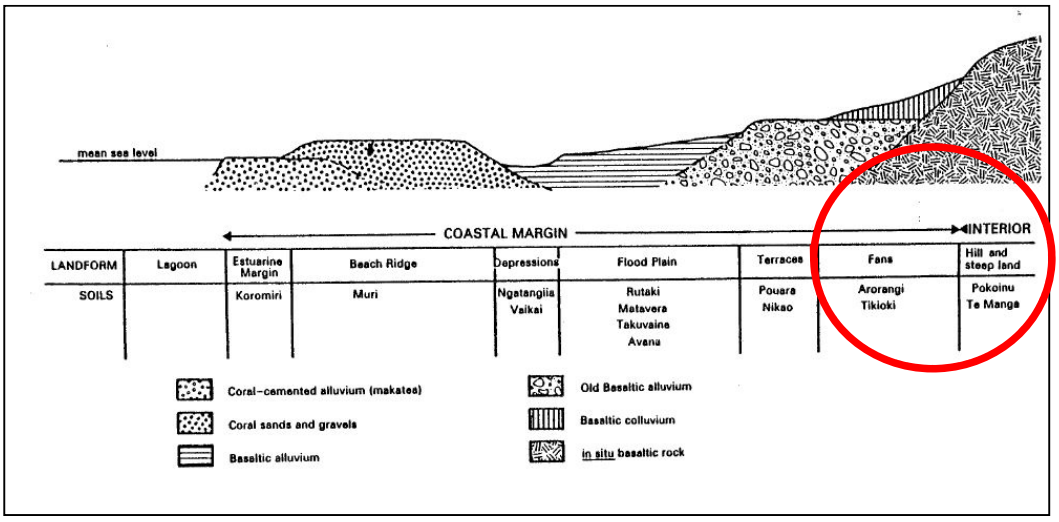

Figure 5: Diagrammatic cross-section of Rarotonga, showing relationship of soils to landscape and geology (source D.M. Leslie, 1980).

Our recent site visit confirms the presence of natural Volcanic rock and soils, basalt rock outcrops were observed, overlain by weathered residual volcanic soils, typically comprising clays and silts, with a veneer layer of topsoil, underlies the inland property. The depth to the volcanic rock was observe to be shallow in places.

4.1.3. Landuse/Characteristics

Land Tenure

The property is owned by Pavo & Tara Mustonen. The nature of ownership of the land is 'Occupation Right'.

Landuse Characteristics

The hillside property has seen minimal land use in the past, aside from periodic bush clearing to control invasive shrubs. Of the total 7,701m² land area, the hillside development will utilize approximately 16% (1,210m²) land area, distributed as follows:

- **Building Platform:** 4% (319m²)
- **95m long Sloping Driveway:** 7% (525m²)
- **Mid-way Cut Contour Bench:** 5% (367m²)

The remaining land outside the development area will remain untouched.

4.1.4. Landscape Character

The hillside property typical features:

- High vegetation density with native trees, shrubs and understory plants.
- Steep terrain influencing water flows, soil stability, and habitat connectivity.
- Mature trees, which stabilize the soils and provide erosion control.
- Secondary growth and shrubland, area with regenerating vegetation, often after periodic clearing, like last year vegetation clearing.
- Cleared or Disturbed areas, past land use, such as the upper water tank platform.
- Continuous dense vegetation cover, supporting soil stability and water retention.

4.1.5. Potential Impacts and Mitigation Measures

To balance the proposed development with the preservation of ecological integrity, a range of sustainable strategies has been adopted, guided by the patch-corridor-matrix framework. The site planning process prioritizes minimizing land disturbance by making use of existing landforms. Specifically, the building platform is located in the same position as the current header water tank, where dense soils and weathered rock offer ideal conditions for stable foundations. Development elements, including the platform, driveway, and contour-cut bench, are clustered within areas that have already been disturbed or recently cleared, thereby reducing the need for additional vegetation removal. A benched platform, incorporating terraced cut batters, is used to adapt to the natural slope, minimizing the volume of earthworks required.

Maintaining ecological connectivity is also a key consideration. Vegetated buffer strips are retained around cleared zones, ensuring continuous tree cover and preserving wildlife corridors throughout the landscape. In terms of water management and erosion control, a terraced drainage system will be constructed, incorporating spoon drains, swales, and contour berms to slow down runoff and enhance soil infiltration. Stormwater quality is further improved by implementing sediment retention ponds and rain gardens to capture and filter runoff before it reaches natural waterways. Permeable surfaces, such as gravel and porous concrete, will be used for driveways and pathways to reduce impermeable

coverage. Additionally, mulch produced from felled invasive trees will be applied to exposed soil areas, aiding moisture retention and preventing erosion, while supporting reforestation efforts.

Sustainable building practices are embedded within the development approach. Lightweight, low-impact structures such as timber-framed or modular buildings are preferred, reducing pressure on the land. Foundations will utilize piers or posts rather than full concrete slabs to minimize soil disturbance. Passive design principles—such as building orientation for natural ventilation and shading—will be incorporated to limit energy consumption. Rainwater harvesting systems will capture roof runoff for use in irrigation and household supply, reducing demand on external water resources.

Vegetation restoration and protection form another key element of the strategy. Native species will be replanted to stabilize slopes and enhance biodiversity, with fast-growing native trees and shrubs prioritized. Invasive plant species will be systematically removed and replaced with native ground covers, promoting long-term ecological balance. Agroforestry and permaculture techniques may also be integrated into the landscape design, incorporating edible plants and native fruit trees to provide additional environmental and community benefits.

To ensure the long-term success of these initiatives, ongoing monitoring and community involvement are central components. Regular ecological audits will track soil stability, water quality, and vegetation regrowth post-development. Local community stakeholders will be engaged in land management activities, including tree planting and erosion control programs, fostering shared responsibility. Adaptive management practices will allow strategies to be refined over time, based on environmental feedback and monitoring outcomes, ensuring the development remains sustainable and resilient.

4.1.6. Landuse Suitability

The proposed hillside development will result in significant changes to the property's current land use, with broader implications for surrounding undeveloped, vegetated areas. Presently, the land remains undeveloped aside from periodic bush clearing to control invasive species. Prior to development, the property had potential uses such as conservation, reforestation to enhance slope stability, or agroforestry to support sustainable land management. Post-development, the site will shift to residential or commercial use, featuring permanent structures, driveways, engineered drainage systems, and earthworks. This transformation will reduce the natural vegetation cover, impacting slope hydrology and runoff patterns.

On adjacent properties, which are currently densely vegetated and undeveloped, serving as vital buffers for biodiversity, soil retention, and water absorption, the development introduces potential risks. Pre-development, these neighboring lands could remain conservation areas or potentially support sustainable development, depending on landowner decisions. However, following earthworks, increased runoff and sedimentation from the developed site may alter natural drainage patterns, and affect vegetation health. There is also the risk of invasive species spreading into these untouched areas, along with increased human activity potentially disturbing local habitats.

The development may also create hydrological changes, as clearing and compacting land can accelerate surface runoff, leading to soil erosion and sedimentation on nearby properties. Disruption of existing drainage channels could cause localized flooding or drought conditions, altering the natural water balance. Furthermore, removing vegetation for construction may expose fragile soils, increasing erosion and landslide risks, especially on steep slopes, and destabilizing neighboring lands without proper retention measures.

Disturbances caused by construction may also create opportunities for invasive species to establish themselves in surrounding forests. Additionally, the hillside's scenic and aesthetic value may diminish, potentially affecting eco-tourism opportunities or conservation incentives for adjacent landowners. Earthworks activities will introduce noise, dust, and long-term light pollution, disrupting the tranquility of nearby areas and altering nocturnal wildlife behavior.

To mitigate these impacts, several strategies will be implemented. Erosion and sediment control measures—such as sediment fences, retaining walls, and slope stabilization using mulching and replanting—will be crucial. Sustainable stormwater management, designed to mimic natural flow patterns through the use of permeable surfaces and infiltration features, can help reduce runoff. Buffer zones should be preserved, retaining at least half of the existing vegetation, with habitat corridors maintained to ensure ecological connectivity. Best construction practices, including scheduling works during dry seasons and utilizing low-emission, quieter machinery, can minimize environmental disruption. Finally, baseline environmental assessments and ongoing monitoring of soil stability, drainage, and vegetation recovery will ensure that the development aligns with long-term sustainability goals.

In summary, while the hillside development offers economic and residential benefits, it brings with it risks of erosion, habitat disturbance, and altered hydrology for neighboring properties. Careful planning, sustainable site management, and robust mitigation efforts are essential to balancing development objectives with environmental protection and community well-being.

4.1.7. Land Contamination

All waste generated and associated with the earthworks activities will be removed from the site on a daily basis.

4.2. Water Resource & Quality

4.2.1. Description of Environmental Values

The water resources and quality of the existing hillside property, which features a seasonal drainage system flowing approximately one kilometre to the Tuapu wetlands and the lagoon, hold several key environmental values. The vegetated drainage channel plays a crucial role in water quality protection by filtering sediments, nutrients, and potential contaminants such as fertilizers, herbicides, and animal waste before they can reach downstream ecosystems. Seasonal flows naturally dilute these pollutants, reducing the risk of long-term accumulation, as heavy rainfall events flush the system periodically.

Ecologically, the drainage system contributes to biodiversity and habitat value. Vegetation within the channel not only stabilizes the soil but also provides shelter for insects, amphibians, and small animals. The periodic freshwater supply supports the Tuapu wetlands' health by maintaining salinity balance and supporting a variety of species including shrubs, fish, eels, and migratory birds. This connectivity ensures the wetlands remain ecologically balanced without significantly disrupting the natural interaction between freshwater and saltwater environments.

In terms of flood and erosion control, the drainage system slows the release of stormwater, lowering peak flood levels downstream and minimizing soil erosion. Stabilizing vegetation reduces sediment transport to the wetlands and lagoon, which is vital for preserving water clarity and protecting coral reef systems. Additionally, the system supports groundwater recharge by allowing a portion of runoff to infiltrate the soil, sustaining moisture levels across the property and surrounding landscape.

Beyond its environmental functions, the drainage system and connected wetlands carry cultural and community significance. In Pacific island settings, such water systems are closely linked to traditional land and water management practices, supporting activities like fishing and agriculture. Maintaining the quality and function of these waterways is essential not only for ecological reasons but also to ensure the long-term sustainability of local livelihoods, tourism appeal, and coastal resilience.

4.2.2. Potential Impacts and Mitigation Measures

Protecting and enhancing the environmental values of the hillside property's seasonal drainage system, the Tuapu wetlands, and the downstream lagoon requires a balanced approach that combines natural preservation, effective stormwater management, and active community participation. Maintaining and improving vegetation along the drainage channel is essential for filtering sediments, slowing water flow, and stabilizing the soil. Planting deep-rooted native grasses, shrubs, and hedges, helps prevent erosion while removing invasive species supports the natural ecosystem’s ability to filter runoff. Minimizing bare soil areas by using contour planting, terraces, mulching, or erosion control materials further reduces sediment loss.

Managing stormwater quality is equally important. Installing small-scale retention features such as vegetated swales, bioswales, and check dams helps slow and filter runoff before it reaches the drainage channel. Reducing pollutants involves avoiding chemical fertilizers and pesticides near the drainage area, practicing organic or low-impact farming methods, and restricting livestock access to sensitive areas to prevent bacterial contamination and soil disturbance.

Sustainable land management practices should guide any property development activities. Limiting excessive land clearing, using low-impact development techniques like permeable pathways or rainwater harvesting, and reforesting degraded areas can all contribute to slope stability and better water infiltration. Managing road and construction runoff through silt traps and barriers ensures sediments are captured before entering the drainage network, while keeping debris away from waterways reduces the risk of pollution.

Community-based conservation plays a critical role in maintaining the resilience of the drainage system and wetland health. Collaboration with local landowners, environmental groups such as Muri Environment Care (MEC), and government agencies can promote watershed-friendly practices and support restoration projects like the MEC Parengaru Stream Riparian program. Encouraging community participation in water quality testing, erosion monitoring, and raising awareness of the importance of protecting waterways strengthens long-term conservation efforts. Through a combination of these strategies, the ecological integrity of the Tuapu wetlands and downstream lagoon can be preserved for future generations.

4.3. Waste

4.3.1. Description of Environmental Values

The hillside development is not expected to generate significant waste or emissions, nor will it allow any disposal or landfill on the property. All waste produced will be collected and removed daily by the contractor, ensuring minimal environmental impact.

4.3.2. Potential Impacts and Mitigation Measures

All waste generated will be removed, at the end of each working day and no waste to remain at the completion of the works, the contractor is responsible for maintaining a waste free and tidy site.

No solid waste, either generated or imported to be disposed on the hillside property. All solid waste is to be carted offsite at the end of each day.

No landfill or disposal areas permitted in the area.

4.4. Social

4.4.1. Description of Environmental Values

The hillside property is privately owned and maintained by the family, with no public or communal use.

4.4.2. Potential Impacts and Mitigation Measures

Since the development is situated on private property with no public access, the potential for land use conflicts is minimal. However, construction activities may still temporarily affect nearby residents through increased noise, dust, and traffic. To mitigate these impacts, it is important that the surrounding landowners are informed of hillside development schedules in advance, allowing them to plan accordingly and reduce inconvenience. Additionally, maintaining clear and safe access roads throughout the construction period will help ensure the safety and accessibility of local traffic.

4.5. Health and Safety

4.5.1. Description of Environmental Values

Although the hillside property is privately owned and not designated for public use, its development has the potential to affect key community values tied to public health and safety. Local residents place a high priority on maintaining a peaceful, clean, and safe environment, free from excessive construction noise, dust, and traffic hazards. Any increase in these disturbances could diminish the quality of life for those living nearby.

Additionally, the community relies on secure access routes and robust emergency preparedness, particularly given the area's vulnerability to cyclones and extreme weather events. Development activities that obstruct roads or interfere with natural drainage patterns may compromise the resilience and safety of the wider community.

Worker safety also forms a crucial aspect of community concern, especially in a construction setting involving steep terrain and the use of heavy machinery. Ensuring the health and safety of contractors and plant operators is vital, both from a social responsibility perspective and to prevent incidents that could have wider implications for public safety and emergency response capacity.

4.5.2. Potential Impacts and Mitigation Measures

The hillside development presents several potential challenges related to earthworks noise, dust, traffic, and overall safety. Earthworksn activities may generate noise that disturbs nearby households, while dust emissions from excavation could impact air quality, particularly affecting individuals with respiratory conditions. Additionally, the operation of heavy machinery and increased truck movements may pose safety risks to local pedestrians and road users.

To mitigate these impacts, construction work should be confined to reasonable daytime hours (8am to 4pm) to reduce noise disturbances. Dust suppression techniques, such as water spraying and covering exposed soil, will be applied consistently to minimize airborne particles. A comprehensive traffic management plan, incorporating warning signs and

speed limits for construction vehicles, will help ensure the safety of both workers and the public.

Emergency access and disaster resilience are also critical considerations. Blocking natural drainage paths during construction could elevate flood risks during periods of heavy rainfall, while improperly stored equipment or materials may obstruct roads and delay emergency response. The development design must maintain unobstructed water flow and incorporate appropriate flood protection measures. Access roads should remain clear at all times to allow emergency vehicle passage and support site safety protocols.

Health and safety risks for contractors and heavy plant operators are heightened due to the steep, uneven terrain and the use of heavy machinery. Operators face potential injuries from machinery and equipment accidents, while uneven ground increases the likelihood of falls or slips. Prolonged exposure to dust and noise may result in respiratory or hearing issues, and working in hot, humid conditions raises concerns about heat stress and fatigue.

To address these hazards, all workers must be equipped with personal protective equipment (PPE), such as hard hats, high-visibility clothing, gloves, and steel-toe boots. Heavy machinery operators should be trained and certified, with daily safety briefings and hazard identification procedures in place. Dust masks and hearing protection are necessary to limit exposure to harmful elements, and rest areas with hydration stations should be available to prevent heat exhaustion. Emergency response measures, including first aid stations and clear evacuation plans, must also be established.

By prioritizing public health, environmental safeguards, worker safety, and disaster resilience, the hillside development can minimize adverse effects and ensure a safe, responsible construction process.

4.6. Economy

4.6.1. Description of Environmental Values

The hillside development is situated in Muri Village, widely recognized as the tourism hub of the Cook Islands and is surrounded by sparsely distributed accommodation units, cafes, and restaurants. Its prime location places the project in direct interaction with key economic drivers such as tourism, property values, local business activity, and environmental sustainability.

Muri is renowned for its lagoon, pristine beaches, and scenic surroundings, which are major attractions for visitors. The tourism industry in this area relies heavily on maintaining a peaceful, natural environment, as accommodation providers, tour operators, and local businesses depend on these qualities to draw tourists. The presence of clean, inviting surroundings directly supports the success of cafes, restaurants, and lagoon-based tourism services, with visitors specifically seeking out Muri for its natural beauty and premium holiday experience.

Additionally, Muri’s strong tourism sector underpins significant real estate value, particularly in the form of high-end holiday accommodations and commercial properties. Property values in the area are closely tied to the preservation of the village’s tranquil atmosphere, scenic views, and unspoiled landscape.

Central to the village’s economic stability is the health of Muri Lagoon. The lagoon not only supports key tourist activities such as snorkeling, kayaking, and lagoon tours, but also sustains the broader tourism economy. Any degradation of the lagoon’s condition would have far-reaching impacts, potentially reducing tourism revenue and affecting the viability of local businesses and accommodations dependent on its continued appeal. Therefore, the

development must carefully consider its potential influence on Muri's environmental and economic well-being.

4.6.2. Potential Impacts and Mitigation Measures

The hillside development in Muri presents several potential impacts on tourism, local businesses, property values, and environmental sustainability, all of which require careful management to balance growth with community and visitor interests.

Construction activities may cause temporary disruptions to the tourism and visitor experience, particularly through noise, dust, and the visual presence of heavy machinery, which could affect tourists staying in nearby accommodations. Increased construction vehicle movement also poses the risk of traffic congestion, especially along key access routes to tourism hubs. Furthermore, there is a risk that visitors may perceive the development as overdevelopment, diminishing the natural charm and appeal of the area. To mitigate these effects, construction will be carefully timed to avoid peak tourism hours, dust suppression measures will be applied, and the design will be tailored to blend seamlessly with the surrounding landscape. Construction traffic will also be managed to avoid key access routes during busy periods.

Local businesses, such as cafes, restaurants, and tourism services, may experience short-term impacts from dust pollution and concerns over water quality in Muri Lagoon—an essential feature that underpins their economic viability. Construction activity could deter customers if it is perceived as noisy, dusty, or intrusive. To address this, collaboration with local businesses will be prioritized to minimize disruptions, and noisy works will be scheduled outside of peak business hours. Water quality monitoring in partnership with relevant agencies will ensure the lagoon's health is maintained, and strict dust control and cleanliness measures will be enforced to preserve the outdoor, dust-free experience valued by visitors.

The development may also influence property values and the area's investment appeal. There is a risk that changes to the natural landscape and construction disturbances could negatively affect the desirability of nearby properties, potentially reducing short-term accommodation bookings. However, if the development is thoughtfully designed, eco-friendly, and aligns with the character of Muri, it has the potential to improve infrastructure and attract further investment. Construction disturbances will be carefully managed, and ongoing engagement with local accommodation owners will ensure concerns are addressed, along with clear communication of project timelines.

Environmental sustainability is another critical consideration, particularly the risk of sediment runoff and water pollution affecting Muri Lagoon. Decreased water clarity or contamination could reduce the area's attractiveness to tourists and harm local businesses dependent on the lagoon's health. To mitigate these risks, sediment traps, erosion control measures, and vegetative buffers will be implemented, preserving natural drainage patterns. Collaboration with local environmental groups such as Muri Environment Care (MEC) will be essential to monitor lagoon water quality throughout construction.

Ultimately, the success of the hillside development hinges on balancing economic growth with the preservation of Muri's natural beauty, tourism appeal, and environmental integrity. Through strong environmental safeguards and proactive engagement with the community and local businesses, the project can minimize potential disruptions while contributing to long-term economic and social benefits.

4.7. Hazards and Risks

4.7.1. Description of Environmental Values

The hillside development is situated on steep terrain, with slopes varying between 25 and 48 degrees and an average gradient of 30 degrees. The site is underlain by dense volcanic soils, though weathered rock is present along the crest of the hill, further influencing stability. These geological and topographical conditions present a range of natural and construction-induced hazards that necessitate thorough risk assessments, detailed emergency planning, and the implementation of robust counter-disaster strategies.

Slope stability and the potential for landslides are of particular concern, with the risk sensitivity rated as high due to the combination of steep slopes and weathered volcanic material. Similarly, the risk of erosion and sediment runoff affecting the nearby Muri Lagoon is also considered high, as uncontrolled soil displacement could lead to significant environmental degradation.

Worker safety is another critical issue, with the steep terrain posing a very high risk of falls, machinery accidents, and complications in carrying out rescue operations. The risk associated with heavy rainfall and flash flooding ranges from moderate to high, as extreme weather events have the potential to compromise both site safety and environmental conditions by triggering slope failures and obstructing construction activities. Additionally, dry conditions increase the likelihood of fire hazards, with the risk sensitivity assessed as moderate due to the presence of flammable vegetation and the potential for accidental ignition from construction activities.

4.7.2. Potential Impacts and Mitigation Measures

The steep volcanic terrain presents a range of challenges related to slope stability, worker safety, environmental protection, and emergency response. Key hazards include potential slope failures caused by excavation, vegetation removal, and additional loading, as well as heavy rainfall which can saturate the volcanic soils, reducing shear strength and increasing the likelihood of landslides. Construction activities such as drilling and machinery movement may also trigger localized soil displacement or rockfall.

To address these risks, pre-construction geotechnical analysis will be carried out to assess soil strength and slope stability. Stabilization measures include the use of retaining structures such as timber pole retaining walls, and anchored mesh systems, alongside terracing and stepped excavation techniques to manage load distribution. Continuous slope monitoring using inclinometers will be implemented to detect early signs of movement, supported by emergency evacuation procedures in case of sudden instability.

Erosion and sediment runoff pose further risks, particularly to the Tuapu wetland and Muri Lagoon. Soil displacement during earthworks and storm-induced surface runoff can transport sediment and nutrients into drainage channels, affecting water quality. To mitigate these impacts, sediment control measures such as silt fences, check dams, and sediment traps will be installed. Stabilization will be reinforced through vegetative buffer zones, mulching, and contour drainage systems, with an emergency response plan in place for accidental hazard spills.

Worker safety is a priority given the steep, uneven terrain, which increases the risk of slips, falls, and machinery instability. Access constraints also present challenges for emergency response and rescue operations. Mitigation strategies include fall protection systems, restricting heavy equipment to stable platforms, establishing safe emergency access routes, and ensuring hydration stations and rest breaks to prevent fatigue.

Heavy rainfall and flash flooding add further risks, with rapid soil saturation potentially leading to slope failures, and machinery immobilization. Daily weather monitoring will guide the suspension of high-risk activities during extreme events.

In dry conditions, fire hazards are heightened by the use of spark-generating equipment and the presence of dry vegetation. Fire risk assessments will be conducted regularly, with buffer zones cleared around work areas, portable fire extinguishers available onsite, and coordination established with local Teimurimotia Volunteer Fire Brigade (Takitumu Fire Station) to ensure emergency access.

Overall, the project requires a comprehensive approach combining engineering controls, stringent safety measures, environmental protections, real-time monitoring, and well-developed emergency procedures to manage the complex risks associated with developing in steep volcanic terrain.

4.8. Erosion Control

4.8.1. Description of Environmental Values

The hillside development is situated on steep volcanic terrain with slopes ranging from 25° to 48°, with an average of 30°. The volcanic soils present are dense but highly susceptible to erosion, particularly during heavy rainfall events. Additionally, the seasonal drainage system channels runoff 1km away toward the Tuapu wetlands and ultimately into the Muri Lagoon, a sensitive marine environment.

To reduce potential erosion of soils and waterways during and after earthworks for the hillside development, a combination of engineering and environmental control measures must be implemented. The key challenges include managing runoff, preventing sediment transport, and stabilizing cut and fill slopes.

4.8.2. Potential Impacts and Mitigation Measures

The erosion and sediment control measures for the project are outlined in the appended Erosion and Sediment Control Plan (ESCP), which details both temporary and permanent approaches. Prior to construction, careful planning has been undertaken to ensure effective control, including a staged approach to earthworks over five working weeks as described in Section 3.2. To minimise risks associated with slope failure, the proposed 8-metre-high cut batters will be reduced to 4 metres and stabilised, with riparian vegetation and retaining wall structures providing additional slope protection.

Surface water management will involve installing contour drains or diversion bunds upslope of the cut area to redirect runoff, while sediment retention measures such as silt fences and sediment ponds will prevent eroded material from reaching waterways. Check dams lined with rock will also be placed in drainage channels to slow water flow and control sediment transport. Driveway and cut bench areas will be stabilised using compacted aggregate with geotextile underlay or reinforced concrete incorporating surface drainage channels. Additionally, vegetated swales will be installed along driveway edges to filter and slow runoff.

To further reinforce steep batter slopes, geotextile matting reinforced with steel mesh has been utilised in previous works on the property. Long-term stabilization will be supported by revegetation efforts, involving the planting of native shrubs, deep-rooted plants, and trees along exposed surfaces. Mulching and bioengineering techniques, such as applying coconut fibre mats, will help retain moisture and limit surface runoff as vegetation becomes established. Post-construction, routine inspections will be carried out to monitor for signs of erosion, sediment accumulation, or slope instability, while regular maintenance of drainage systems, sediment ponds, and culverts will ensure ongoing functionality.

Figure 6: Geotextile matting reinforced with steel mesh, applied some 17 years ago along the adjacent property.

5. ENVIRONMENTAL MANAGEMENT

5.1. Purpose of this Plan

The purpose of the EMP is to provide for the protection of the environment during the proposed works and to minimize potential adverse environmental, social and economic effects that cannot be avoided. This EMP will be used by the Contractor to prepare a detailed Construction EMP, which will be used throughout the proposed works.

5.2. Environmental objective

To undertake the proposed works in compliance with the conditions of approval, in keeping with the principles of the Environment Act and avoiding wherever possible any significant negative environmental impacts, whether covered by plans and approvals, or not.

5.3. Environmental policies

General environmental principles shall be:

- The hillside development and associated activities will not commence until the EIA and CEMP has been approved;
- Social disturbance as a result of the project will be minimized as far as practicable.
- Areas outside the property boundary, which were developed or altered in any way, shall be reinstated to its original condition as observed prior to the commencement of the hillside development.

5.4. Table 1 Summary of Potential Impacts, Mitigation Measures, Monitoring and Responsibilities

Environmental Issue	Mitigation Measures	Locations	Timeframe	Action by	Monitoring Parameter	Monitoring Frequency	Monitoring Responsibility & Supervision
Impacts on landscape and visual amenity values	Earthworks will be carried out to form a stable building and driveway platform. Once completed, the site will be landscaped and planted with appropriate deep-rooted native shrubs and trees to restore the natural visual character.	Entire Maii property, especially along the sloping terrain.	Landscaping and riparian undertaken following general earthworks, starting at week 5, for a duration of 1 week.	Contractor	Visual inspection reports	Weekly during works and at completion	Site Supervisor (Contractor) Project Manager
Dust nuisance	Regular moistening of exposed soil areas to minimize dust generation, especially during dry conditions.	Throughout the sloping terrain of the property.	During earthworks period from week 1 to week 4, total est duration of 4 weeks.	Contractor	Visual inspection, dust observations, community feedback or complaints received.	Daily during site works.	Site Supervisor (Contractor) Project Manager
Excessive noise during earthworks.	All earthworks activities limited to 8am to 4pm Monday to Friday. Maintain continuous communication with nearby residents regarding schedules and potential disruptions..	Entire Maii Property.	Full 5 weeks duration.	Contractor	Noise level observations, community feedback & complaints received.	Daily monitoring during site works.	Site Supervisor (Contractor) Project Manager

Environmental Issue	Mitigation Measures	Locations	Timeframe	Action by	Monitoring Parameter	Monitoring Frequency	Monitoring Responsibility & Supervision
Health and Safety	All personal must wear appropriate Personal Protection Equipment (PPE).at all times. Health & a safety protocols clearly displayed, first aid kit available on site at all times.	Entire earthworks area, including the sloping terrain.	Full 5 weeks duration.	Contractor	Health & Safety compliance checks, Incident/accident records, local community feedback.	Daily monitoring	Site Supervisor (Contractor) Project Manager
Site Hazards	Appropriate signage and barriers are installed (where required) to restrict general public entry into the earthworks area. The contractor will ensure there is a dedicated spotter whom is responsible for overseeing both the movement of heavy plant machinery and the general public.	Entire property boundary and adjoining access road.	Full 5 weeks duration.	Contractor	Site inspections, barrier inspections, safety incident records.	Prior to earthworks commencing, after heavy rain events and weekly during the site works.	Site Supervisor (Contractor) Project Manager
Erosion Control	Installation and ongoing maintenance of erosion control measures (e.g., silt fences, protective matting, stabilizing vegetation) to prevent soil erosion.	Property sloping terrain and earthworks cut/fill areas.	Full 5 weeks duration.	Contractor	Regular site inspections of erosion control device.	Daily during earthworks, intensify after rainfall.	Site Supervisor (Contractor) Project Manager

Environmental Issue	Mitigation Measures	Locations	Timeframe	Action by	Monitoring Parameter	Monitoring Frequency	Monitoring Responsibility & Supervision
Emergency management	Once a hazard warning has been issued or made known, all work will cease, all machinery, equipment and material removed off-site. Work to recommence once all clear notification is issued.	Maii Property	Pending the duration of the hazard.	Contractor	Notification reports.	Hazard observations	Site Supervisor (Contractor) Project Manager
Stormwater Drainage	Drainage improvements will focus on surface spoon drains, subsoil drains and contour drains, diverting water away from the general earthworks areas towards designated sediment ponds/rain garden prior to discharge into the existing roadside drain.	Entire earthworks area, especially along the sloping terrain.	Week 4 and week 5.	Contractor	Regular site inspections of the drainage system.	Daily during earthworks, more frequent during and following heavy rainfall events.	Site Supervisor (Contractor) Project Manager
Mining of Materials.	No materials to be mined from the site.	Not applicable	Not applicable	Project Manager	Regular site inspections.	Daily monitoring	Project Manager

Environmental Issue	Mitigation Measures	Locations	Timeframe	Action by	Monitoring Parameter	Monitoring Frequency	Monitoring Responsibility & Supervision
Waste generated during the installation period.	All waste materials to be removed off site at the end of each working day. No landfill or disposal areas permitted in the area.	Maii Property	Full 5 weeks duration.	Contractor	Regular site inspections.	Daily monitoring	Site Supervisor (Contractor) Project Manager
Water resource and quality.	No heavy plant machinery to operate within the existing waterways. No shrub clearing permitted along all existing road side drains.	Maii Property	Full 5 weeks duration.	Contractor	Regular site inspections.	Daily monitoring	Site Supervisor (Contractor) Project Manager
Maii traffic.	A traffic management plan will be develop, and implemented. No road closure at any time. No delivery of materials during peak traffic times.	Maii Property	Full 5 weeks duration.	Contractor	Local traffic checks, Incident/accident records, local community feedback.	Daily monitoring	Site Supervisor (Contractor) Project Manager

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusion

This Environmental Impact Assessment has been prepared to support Pavo & Tara Mustonen's application to NES for the proposed hillside development on the Maii property. The development aims to establish a safe, stable building platform and driveway, improve site drainage, and minimize environmental and community impacts. As demand for housing in Rarotonga continues to shift towards inland hilly areas due to limited flat land availability, it is essential that such developments are carried out responsibly and sustainably.

The proposed project offers economic benefits by creating employment opportunities for local contractors and builders, with potential for further contributions to the Cook Islands' economy through future site expansion. While the development will alter the existing undeveloped landscape, appropriate mitigation measures, including an updated Environmental Management Plan, will ensure that environmental, social, and economic impacts are effectively managed. Based on the proposed methodology—successfully applied in similar projects across Rarotonga—the potential adverse effects are expected to be minimal, ensuring the project is undertaken in a sustainable manner within the Maii property.

6.2. Recommended Conditions of Approval

In addition to NES standard conditions of approval, the following are some suggested conditions of approval, based on mitigation measures proposed throughout this EIA:

- The construction of the hillside development to be carried out by an experienced, competent and reputable contractor, with supervision by a NES registered Civil Engineer.
- The updated technical drawings is to be made available to NES prior to work being carried out.
- A practical completion report is to be made available to NES within 10 days following the completion of the tertiary system installation.
- All machinery shall be operated away from the adjacent waterways, so that any contaminant such leaking fuel or oil does not enter the waterways.
- On-going consultation with the Maii community will be facilitated as required. Progress reports will be released to the public via social media.

7. STUDY TEAM

The following professionals contributed to the development of the EIA Report.

Name	Qualifications	Key Experience
Paul Teariki Maoate	Masters in Business Administration NZ Certificate in Civil Engineering Graduate Certificate in Ridge to Reef Sustainable Development	Experience in Geotechnical, Coastal and Three Waters Engineering. Member of the Institute of Professional Engineers Cook Islands

8. REFERENCES

Wood, L.B. & Hay R.F. 1970. Geology of the Cook Islands. NZDSIR Geological Bulletin Report.

Appendix A

National Environment Services
EIA Terms of Reference

TERMS OF REFERENCE (TOR) FOR AN ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

PAVO & TARA MUSTONEN, MAII RESIDENTIAL HILLSIDE DEVELOPMENT

Maii Pt Sec 12C,

Maii Tapere,

Ngatangiia District.

Table of Contents:

Part A. Information and Advice on the preparation of the EIA.

1. Introduction

This document forms the Terms of Reference (TOR) for an Environmental Impact Assessment Report (EIA) for the Cook Islands Project. The objective of the TOR is to identify those matters that should be addressed in the EIA report. The TOR is based on

the outline of the proposed proposal given as part of the application and also the National Environment Service's (NES) own assessment of the project site.

In order to clarify the nature and level of investigations that are envisaged in the TOR, the proponent may consult further with relevant stakeholders, ie. Government representatives and authorities, community interest organisations and groups to participate in the process especially during the preparation of the EIA to ensure that all matters as conveyed in the TOR are addressed.

An executive summary should be provided in the EIA and be able to be provided separately for public information.

2. EIA Objectives

The objective of the EIA is to identify potential environmental, social and economic impacts of the proposal and to ensure that adverse impacts are avoided where possible. Consistent with this objective, the EIA should be a self-contained and comprehensive document containing sufficient information to make an informed decision on the potential impacts. This document should provide:

- *for interested bodies and persons*: a basis for understanding the proposal, alternatives and preferred solutions, the existing environment that would be affected, both on and off the site, the impacts that may occur, and the measures to be taken to mitigate all adverse impacts.

- *for groups or persons with rights or interests in land*: an outline of the effects of the proposed proposal on that land, including access arrangements.

- *for government decision makers*: a framework against which decision-makers are able to consider the environmental aspects of the proposed proposal in view of legislative and policy provisions and provide sufficient information to decide whether the proposal can proceed; OR as appropriate, set conditions for approval to ensure environmentally sound development and, where required by legislation, recommend an environmental management and monitoring program.

- *for the proponent*: a definitive statement of measures or actions to be undertaken to minimise any adverse impacts during and following the implementation of the proposed proposal. A draft Environmental Management Plan (EMP) that describes acceptable impacts and environmental management strategies to agreed performances criteria is the recommended means of achieving this objective.

The proponent is required to address the TOR to the satisfaction of the National Environment Service and the completion of the EIA does not mean that the proposal will necessarily be approved.

The EIA should be a standalone document and it should contain sufficient information and other appended studies/surveys to avoid the need to retrieve previous reports.

3. Stakeholder Consultation

To facilitate the assessment process, the proponent is strongly encouraged to regularly consult with relevant/appropriate stakeholders throughout the EIA process.
It is the responsibility of the proponent, in consultation with appropriate stakeholders, to identify legislation, policies and methodologies relevant to the EIA process, and to determine the appropriate parts of the community to be consulted. Copies of the EIA shall be provided to the community and, on request, to relevant individuals with an interest in the proposal.

4. General EIA Format

The EIA should be written in a format matching the TOR. The EIA must include appendices containing at least the following:

- a copy of this TOR
- a list of persons and agencies consulted during the EIA with their contacts
- the names of, and work undertaken by, all personnel involved in the preparation of the EIA.

Maps, diagrams and other illustrative material should be included in the EIA.
The EIA should be produced on A4 size paper capable of being photocopied, with maps and diagrams on A4 or A3 size. An electronic copy of the EIA should also be submitted to the National Environment Service for display on the NES website during the consultation period of the project

Part B. Content of the EIA.

(It is strongly recommended that the Environmental Impact Assessment (EIA) Report follow the heading structure of the Terms of Reference (TOR))

EXECUTIVE SUMMARY

The Executive Summary should be written as a standalone, able to be reproduced on request and distributed to interested parties who may not wish to read or purchase the EIA as a whole. The structure of the Executive Summary should generally follow that of the EIA but focus on key issues to enable the reader to obtain a clear understanding of the proposal and its potential adverse and beneficial environmental, social and economic impacts and the management measures to be implemented by the proponent to mitigate all residual impacts.

The Executive Summary must include:

- the title of the proposal;
- name and contact details of the proponent, and a discussion of previous projects undertaken by the proponent and their commitment to effective environmental management;
- a concise statement of the aims and objectives of the proposal;
- the legal framework, decision-making authorities and advisory agencies;
- an outline of the background to and need for the proposal, including the consequences of not proceeding with the proposal;
- an outline of the alternative options considered and reasons for the selection of the proposed development option;
- a brief description of the proposal (pre-construction, construction and operational activities) and the existing environment, utilising visual aids where appropriate;
- an outline of the principal environmental impacts predicted and the proposed environmental management strategies (including waste minimisation and management) and commitments to minimise the significance of these impacts.

GLOSSARY OF TERMS

A glossary of technical terms, acronyms and abbreviations should be provided.

1. INTRODUCTION

The function of the introduction is to explain why the EIA has been prepared and what it sets out to achieve. In particular, the introduction should address the level of detail of information required to meet the level of approval being sought (for example, whether the proponent is seeking only a preliminary approval or a full approval from NES).

1.1 Proposal Proponent

Provide details of the proposal proponents, including details of any joint venture, if any.

1.2 Proposal Description

A brief description of the key elements of the proposal should be provided and illustrated. Any major associated infrastructure requirements should also be summarised. A brief description should be provided of studies or surveys that have been undertaken for the purposes of developing the proposal and preparing the EIA. This should include reference to relevant baseline studies or investigations undertaken previously.

1.3 Proposal Objectives and Scope

A statement of the objectives which have led to the development of the proposal and a brief outline of the events leading up to the proposal's formulation, including alternatives, envisaged time scale for implementation, anticipated establishment costs and actions already undertaken within the proposal area. Describe the current status of the proposal and outline the relationship of the proposal to other developments or actions that may relate whether or not they

have been approved. The consequences of not proceeding with the proposal should also be discussed.

1.4 Environmental Impact Assessment (EIA) Process

The purpose of this section is to make clear the methodology and objectives of the environmental impact assessment under the relevant legislation.

1.4.1 Methodology of the EIA

This section should provide a description of the EIA process steps, timing and decisions to be made for relevant stages of the proposal. This section should also indicate how the consultation process (which will be described in detail in section 1.5) would integrate with the other components of the impact assessment, including the stages, timing and mechanisms for public input and participation.

The information in this section is required to ensure:

- that relevant legislation is addressed;
- readers are informed of the process to be followed;
- that stakeholders are aware of any opportunities for input and participation.

1.4.2 Objectives of the EIA

While the TOR provides guidance on the scope of the information requested for the proposal, the TOR should not be seen as exhaustive or limiting. It is important for proponents and their consultants to recognise that there cannot be perfect knowledge in advance of undertaking an EIA of what the EIA studies may find.

In addition, it is essential that the main text of the EIA should address all relevant matters concerning environmental values, impacts on those values and proposed mitigation measures. No relevant matter should be raised for the first time in an appendix or the draft environmental management plan (EMP).

The EIA is a public document. Its purpose is not only to provide information to regulatory agencies, but also to inform the public of the scope, impacts and mitigation measures of the proposal. As such the main text should be written in plain English avoiding jargon as much as possible. Additional technical detail may be provided in appendices. The main text should not assume that a reader would have a prior knowledge of the proposal site. It should not be necessary for the reader to have visited the site to understand the issues involved in the proposal.

In brief, the EIA objectives should be to provide public information on the need for and likely effects of the proposal, to set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental values, and demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental values. Discussion of options and alternatives and their likely relative environmental management outcomes is a key aspect of the EIA.

The role of the EIA in providing the proposal's draft EMP should also be discussed, with particular reference to the EMP's role in providing management measures that can be carried over into conditions that would be attached to NES approval.

1.4.3 Submissions

The reader should be informed as to how and when public submissions on the EIA will be addressed and taken into account in the decision-making process.

1.5 Public Consultation

It is recommended that an open community consultation process be carried out in addition to the legislated environmental impact assessment process. Copies of the draft EIA will be provided to all relevant stakeholders and individuals with an interest in the proposal.

Public consultation should commence as early as possible especially in **Nikao Community,** and should be comprehensive and promote discussion on all aspects of the proposal including strategic decision making and design. It may include interviews with individuals, public meetings, interest group meetings, production of regular summary information and updates, and other consultation mechanisms to encourage and facilitate active public consultation.

The public consultation process should identify broad issues of concern and provide information to local community and specific interest groups. Consultation should have a specific focus on impact identification and mitigation of adverse social, economic and environmental issues, and it should directly inform all other relevant components of the EIA (particularly social impact analysis).

Details of the public consultation process and the major issues emerging from that process should be clearly addressed in the EIA. The consultation process should be integrated with the social assessment component of the EIA. Matters which become apparent through the consultation process such as community conflict or concerns which derive from fears about impacts from the proposal on the natural environment should be included in the social impact assessment section of the EIA.

1.5.1 Relevant Legislation and Policy Requirement

This section should explain the legislation and policies controlling the approval process. Reference should be made to the Environment Act 2003 and other relevant Cook Islands laws relevant to the proposal.

This information is required to assess how the legislation applies to the proposal, which agencies have jurisdiction, and whether the proposed impact assessment process is appropriate

1.5.2 Planning Process and Standards

This section should discuss the proposal's consistency with existing land uses or long-term policy framework for the area, if any, and with legislation, standards, codes or guidelines available to monitor and control operations on site.

2. PROPOSAL NEED AND STANDARDS

2.1 Proposal Justification

The justification for the proposal should be described, with particular reference made to the economic and social benefits, including employment and spin-off business development, which the proposal may provide.

2.2 Alternatives to the Proposal

This section should describe feasible alternatives especially in terms of the sites and designs. For example if the **Nikao Community** are not in favour of the proposed site, will there be any alternative site for the project OR are there any alternative designs if the community asked for other alternative designs? Such alternatives, if any, should be discussed in sufficient details to enable full understanding of such options.

3. DESCRIPTION OF PROPOSAL/DEVELOPMENT

3.1 Location

This section should describe the local context of the proposal and associated infrastructure and illustrated on maps at suitable scales, including identification and potential impacts on surrounding land uses. Real property descriptions of the proposal site should be provided. This section shall also demonstrate how the proposal relates to the **Pokoinu** village and the **Nikao District** as a whole.

Maps should show the precise location of the proposal area, and in particular the location and boundaries of land tenures, in place or proposed, to which the proposal area is or will be subject

The following information should be provided for all components of the proposal:

- distances to boundaries of land resumptions;
- slopes and elevations;
- site drainage and erosion controls;
- proposals for rehabilitation, if any;
- access arrangements, daily traffic generated, and internal roads.

3.2 Staging

Details of the likely staging of the proposal and timing of the staging are required, if any. A plan showing the likely sequencing of such development stages for the project should be incorporated and indicate the natural features to be retained

during the stages and management measures to maintain the natural features during these stages.

The staging of the project should be described and illustrated showing approximate site boundaries, development sequencing and timeframes. The estimated numbers of people to be employed during the life of the project should also be provided.

3.3 Emergency Management

In relation to emergency management, provide:

- details of emergency management plans to be put in place during construction, including procedures and notifications;
- emergency access provisions;
- an assessment of the potential disruption to community utility networks (i.e., water, electricity);
- details as to any permanent and/or temporary road closures or vehicle limitations to existing public road access.

3.4 Infrastructure Requirement

This section should provide descriptions, with concept and layout plans, of requirements, if any, for constructing, upgrading or relocating all infrastructures required supporting the proposed development

The matters to be considered include such infrastructure as roads (traffic), pedestrian pathways, and power lines and other cables, telecommunications, water etc.

3.4.1 Transport

Describe:

- existing road infrastructure Airport Infrastructure and all other infrastructure contained within the reserves within of the site boundaries, including private roads and public roads which are disrupted or expected to be used by construction employees especially for the transportation of materials to the site during construction and operational phases for each stage of development;

Information should also be provided on road transportation requirements on public roads for each of the proposed stages, including:

- Connectivity from the proposed development site to the existing main road. It is anticipated that the proposed scale of development will disrupt normal traffic movements at the **Nikao** area;

- The volume, composition (types and quantities), origin and destination of goods to be moved including construction materials, plant, wastes, hazardous materials , if any;
- The volume of traffic generated by workforce personnel, visitors and service vehicles;
- Details of vehicle traffic and transport of heavy and oversize indivisible loads (including types and composition);
- Any alternate proposal for relocation or realignment of access to the project site which will surely be disrupted by heavy transportation during the construction process;

3.4.2 Storm Water Drainage

A description should be provided especially to the existing storm water drainage system in the area. The EIA should indicate the sources of the drainage water, e.g. wetlands, road and the potential quality and location of discharge to the lagoon.

Surface water runoffs will also collect on site especially at times of construction therefore will there be any new drainage to be done for that?

− Storm water collection/drainage systems.

- A detailed environmental management plan that sets out the framework for management and mitigation of environmental impacts including contingencies for managing system failures and incidents.

- A description of any potential releases of contaminants, the environmental impacts and the actions that will be taken to prevent the likelihood of environmental harm.

3.4.2 Mining of Materials

A description should be provided especially to identify the existing materials present in the area. The EIA should indicate the sources of where the materials will be mined, the amount of materials that will be mined for the project.

- The general location of the area of which the material will be mined (e.g. Maps, Design etc.)
- A detailed environmental management plan that sets out the framework for management and mitigation of environmental impacts including contingencies for managing system failures and incidents.
- Any alternate source sites for mining if the proposed site is not enough to complete the work.
- Indicate what equipment’s or machinery will be used to carry out the mining phase.
- A description to be provided as to how the mined site will be restored to its natural state after the project is complete.

3.5 Waste Management

3.5.1 Character and Quantities of Waste Materials

Provide an inventory of wastes, likely to be generated by the proposal and methods of disposal having regard to the best practice waste management strategies. In particular, identify proposals for waste avoidance, reuse, recycling, treatment and disposal in the appropriate sub-section below.

3.5.2 Solid Waste Disposal

In general terms describe the proposed location, site suitability, dimensions and volume of any landfill/disposal site requirements for solid wastes generated by the proposal.

4. ENVIRONMENT VALUES AND MANAGEMENT OF IMPACTS

The functions of this section are to:

- Describe the existing environmental values of the area which may be affected by the proposal;
- Describe the potential adverse and beneficial impacts of the proposal on the identified environmental values. Any likely environmental harm on the environmental values should be described;
- Present environmental protection objectives and the standards and measurable indicators to be achieved;
- Examine viable alternative strategies for managing impacts. These alternatives should be presented and compared in view of the stated objectives and standards to be achieved. Available techniques, including best practice, to control and manage impacts to the nominated objectives should be discussed. This section should detail the environmental protection measures incorporated in the planning, construction, operations, decommissioning, rehabilitation and associated works for the proposal. Measures should minimise environmental harm and maximise socioeconomic and environmental benefits of the proposal. Preferred measures should be identified and described in more detail than other alternatives.

This section should address all elements of the environment, such as land, water, coast, air, waste, noise, nature conservation (incl biodiversity and any relevant protected areas), cultural heritage, social and community, health and safety, economy, hazards and risk, in a way that is comprehensive and clear. To achieve this, the following issues should be considered for each environmental value relevant to the proposal:

- **Environmental values affected** — describe the existing environmental values of the area to be affected.

- **Impact on environmental values** — describe quantitatively the likely impact of the proposal on the identified;

- **Monitoring programs** — describe the monitoring parameters, monitoring points, frequency, data interpretation and reporting proposals. Auditing programs: describe how progress towards achievement of the objectives will be measured, reported and whether external auditors will be employed. Include scope, methods and frequency of auditing proposed;

- **Management strategies** — describe the strategies to be used to ensure the environmental protection objectives are achieved and control strategies implemented eg. continuous improvement framework including details of corrective action options, reporting (including any public reporting), monitoring, staff training, management responsibility pathway, and any environmental management systems and how they are relevant to each element of the environment;

- **Information quality** — information given under each element should also state the sources of the information, how recent the information is, how any background studies were undertaken (e.g. intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) are in the information

4.1 Land

4.1.1 Description of Environment Values

This section describes the existing environment values of the land area that may be affected by the proposal. It should also define and describe the objectives and practical measures for protecting or enhancing land-based environmental values, describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

4.1.1.1 Soils

A soil profile for the surrounding **Nikao** area should be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential and storm water run-off quality.

Information should also be provided on soil stability and suitability especially the proposed site.

4.1.1.2 Landuse/Characteristics

The EIA should provide a description of past and current land tenures and land uses of the site and surrounding areas, and also maps at suitable scales showing

existing land uses and tenures, as well as the proposal footprint, should be provided for the entire proposal area and surrounding land that could be affected by the development. The maps should identify areas of conservation value and areas in any locality that may be impacted by the proposal.

4.1.1.3 Landscape Character

This section should describe in general terms the existing character of the landscape that will be affected by the proposal.
The landscape character of the property and its surrounds should be described in the context of landscape ecology and incorporate the concepts of patch-corridor matrix in describing the pattern of existing vegetation.

4.1.2 Potential Impacts and Mitigation Measures

This section defines and describes the objectives and practical measures for protecting or enhancing the land-based environmental values identified through the studies outlined in the previous section. It should describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

4.1.2.1 Land use Suitability

The potential for the proposal to change existing and potential land uses on the site and adjacent areas should be detailed.

The potential environmental harm caused by the proposal on the adjacent areas currently used for nature conservation, agriculture, urban development, transport corridors, recreation, tourism, other business.

4.1.2.2 Land Contamination

The EIA should describe the possible contamination of land from aspects of the proposals including waste, irrigation with treated effluent, reject product/materials and spills at chemical and fuel storage areas.
The EIA should also address management of any existing or potentially contaminated land in addition to preventing and managing land contamination resulting from project activities.

4.2 Water Resources & Quality

4.2.1 Description of Environmental Values

This section describes the existing environment for water resources & quality that may be affected by the proposal in the context of environmental values. i.e. - Surface waterways

- Groundwater - General (temp, salinity, pH, clarity, BOD etc…)
- Turbidity of suspends solids
- Eutrophications (DO, N, P)
- Harmful or Toxic substances

- Sanitation (Coli form, E Coli)

4.2.2 Potential Impacts and Mitigation Measures

This section is to assess potential impacts on water resource environmental values identified in the previous section. It will also define and describe the objectives and practical measures for protecting or enhancing water resource environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

Water management controls should be described, addressing surface and groundwater quality, quantity, drainage patterns and sediment movements. The beneficial (environmental, production and recreational) use of nearby surface and groundwater should be discussed, along with the proposal for the diversion of affected creeks and the stabilisation of those works. Monitoring programs should be described which will assess the effectiveness of management strategies for protecting water quality during the construction and operation of the proposal.

4.3 Waste

4.3.1 Description of Environmental Values

This section should complement other sections of the EIA by providing technical details of waste treatment and minimisation, with proposed emission, discharge and disposal criteria, while other sections describe how those emissions, discharges and disposals would impact on the relevant environmental values. The purpose of this format is to concentrate the technical information on waste management into one section in order to facilitate its transfer into the EMP. Ensure that waste is stored and disposed of appropriately, with minimum impacts on the environment

4.3.2 Potential Impacts and Mitigation Measures

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values from impacts by wastes, describes how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives will be monitored, audited and managed.

This section should assess the potential impact of all wastes to be generated and provide details of each waste in terms of:

- on-site treatment methods proposed for the wastes ;
- methods of disposal (including the need to transport wastes off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes;
- the potential level of impact on the surrounding community due to nuisance;
- proposed discharge/disposal criteria for liquid and solid wastes;

- Plan works to minimise the waste of materials; Reuse old materials suitable for other uses where possible;
- Recycle waste where possible;
- Store waste from ablution facilities appropriately (eg in tanks)
- Store waste in enclosed bins with no exposure to the elements
- Avoid large stockpiles of materials on site
- Avoid overloading bins
- Avoid storing waste on site for long periods of time
- Provide sufficient recycling and waste bins on site
- Use licensed contractors for the disposal of waste
- Dispose of waste on a regular basis or as needed
- Maintain records of disposal times and contractors

4.4 Social

4.4.1 Description of Environmental Values

This section describes the existing social values that may be affected by the proposal and should also include future social benefits resulting from the proposal including increased access and mobility.

The social amenity and use of the proposal area and adjacent areas for recreational, industrial, educational, community and government, centres, residential and other relevant purposes should be described. Consideration should be given to:

- Community infrastructure and services, access and mobility;
- Description of how the environmental impacts (noise, dust, water quality, waste treatment etc) of any onsite accommodation, during construction, will be managed;
- Recreational, cultural, leisure, community and sporting facilities and activities in relation to the affected area.

4.4.2 Potential Impacts and Mitigation Measures

This section defines and describes the objectives and practical measures for protecting or enhancing social values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

The social impact assessment of the proposal should consider the information gathered in the community consultation program and the analysis of the existing socio-economic environment, and describe the proposal’s impact, both beneficial and adverse, on the local community. The impacts of the proposal on local residents, community services and recreational activities are to be analysed and discussed.

4.5 Health and Safety

4.5.1 Description of Environmental Values

This section describes the existing community values for public health and safety that may be affected by the proposal. For proposals proposing air emissions, and/or those with the potential to emit odours, nearby and other potentially affected populations should be identified and described. Particular attention should be paid to those sections of the population, such as children and the elderly, who are especially sensitive to environmental health factors.

Consideration must also be given to health and safety aspects of erosion control structures and water storages or other structures that may impact on public health and safety especially for children in and near waterways and drainage infrastructure.

The protection of the health and safety of the public, is to ensure that the hazards and risk to public health and safety is minimised

4.5.2 Potential Impacts and Mitigation Measure

This section defines and describes the objectives and practical measures for protecting or enhancing health and safety community values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

The EIA should assess the effects on the proposal workforce of occupational health and safety risks and the impacts on the community in terms of health, safety, and quality of life from proposal operations and emissions. Any impacts on the health and safety of the community, workforce, suppliers and other stakeholders should be detailed in terms of health, safety, quality of life from factors such as air emissions, odour, dust and noise.

-

4.6 Economy

4.6.1 Description of Environmental Values

This section describes the existing economic environment that may be affected by the proposal. The character and basis of the local economy should be described including:

- existing housing market, particularly rental accommodation which may be available for the proposal workforce, transportation etc.
- economic viability (including economic base and economic activity, future economic opportunities)

The economic impact statement should include estimates of the opportunity cost of the proposal.

4.6.2 Potential Impacts and Mitigation Measures

The function of this section is to define and describe the objectives and practical measures for protecting or enhancing economic values, to describe how nominated quantitative standards and indicators may be achieved for economic management, and how the achievement of the objectives will be monitored, audited and managed.

4.7 Hazards and Risk

4.7.1 Description of Environmental Values

This section describes the potential hazards and risk that may be associated with the proposal. An analysis is to be conducted into the potential impacts of both natural and induced emergency situations and counter disaster and rescue procedures as a result of the proposal on existing and proposed sensitive areas such as residential areas, water reserves, roads, places of residence and work, and recreational areas. The degree and sensitivity of risk should be detailed
.

4.7.2 Potential Impacts and Mitigation Measures

The EIA should define and describe the objectives and practical measures for protecting people and places from hazards and risk, describes how nominated quantitative standards and indicators may be achieved for hazard and risk management, and how the achievement of the objectives will be monitored, audited and managed. Storms and Sea surge may pose risks and procedures to minimise the impacts on the project.

4.8 Erosion Control

4.8.1 Description of Environmental Values

This section addresses the reduction of potential erosion of sand, soil and waterways by ensuring that works are managed to minimise risk of erosion

4.8.2 Potential Impacts and Mitigation Measures

- Manage storm water appropriately - Establish sediment and erosion controls around stockpiles where appropriate
- Minimise size of stockpiles
- Minimise the creation of hard, impervious surfaces
- Establish diversion drains around disturbed area
- Drain storm water into appropriate infrastructure
- Minimise the risk of erosion caused by machinery and disturbance to soils/land - Control access points to a limited number
- Fence off and restrict access to areas with a high potential for erosion (e.g. waterway outlets)
- Minimise the use of large machinery

Store machinery and construction materials away from sensitive areas

- Minimise the risk of erosion caused by vegetation clearance -Minimise extent of clearance required
- Progressively mulch and re-vegetate areas cleared as part of works
- Prepare re-vegetation plan for larger operations
- Use drift fencing to control sand movement created by vegetation clearance restrict access to areas of high erosion potential
- Beach erosion
- Sediment deposition

5. ENVIRONMENT MANAGEMENT PLAN (EMP)

The EMP should be developed from the mitigation measures detailed above. Its purpose is to set out the proponents' commitments to environmental management. That is, how environmental values will be protected and enhanced.

The EMP is an integral part of the EIA, but should be capable of being read as a stand-alone document without reference to other parts of the EIA. The EMP should not raise any issues or propose mitigation measures not already addressed in the body of the EIA.

The general contents of the EMP should comprise:

- The mechanisms for implementation of the EMP in association with the staging and timing of the development and ongoing management once the development is completed;
- The proponents' commitments to acceptable levels of environmental performance, including environmental objectives, i.e. levels of expected environmental harm, performance standards and associated measurable indicators, performance monitoring and reporting;
- Impact prevention or mitigation actions to implement the commitments to the project;
- Corrective actions to rectify any deviation from performance standards;

A complaints mechanism should be established as part of the EMP to address community issues. A complaints register could log details of all complaints received and action taken.

Through the EMP, the EIA's commitments to environmental performance can be used as regulatory controls through conditions to comply with those commitments. Therefore, the EMP is a relevant document for proposal approvals, environmental authorities and permits, and may be referenced by them.

6. REFERENCES

All references consulted should be presented in the EIA in a recognised format

7. RECOMMENDED APPENDICES

A1 Final TOR for this EIA

A copy of the TOR should be included in the EIS. Where it is intended to bind appendices in a separate volume from the main body of the EIA, the TOR at least should be bound with the main body of the EIA for ease of cross-referencing.

A2 Final Project Design/Drawings

All A3 OR A4 drawings and designs be included

A3 Study Team

The qualifications and experience of the study team and specialist sub consultants and expert reviewers should be provided.

A4 Consultation Report

Outcomes of consultation meetings in the **Nikao** community should be recorded and included. The Consultation Report should summarise the results of the community consultation program, providing a summary of the groups and individuals consulted, the issues raised, and the means by which the issues were addressed. The discussion should include the methodology used in the community consultation program including criteria for identifying stakeholders and the communication methods used. The consultation process should be integrated with the social impact assessment component of the EIA. Matters which become apparent through the consultation process such as community conflict or fears about impacts of the proposal on the natural environment should also be recorded in the social impact assessment of the EIA.

A5 Specialist Studies

Any reports generated on specialist studies undertaken as part of the EIA are to be included as appendices. These may include:

□ geology □ soil survey and land suitability □ groundwater □ flora and fauna □ coral survey □ noise and air quality □ Hydrographical Survey □ Environmental Action plan to supplement EMP □ Site investigations □ Excavation plans and equipment Biodiversity & ecosystems

A6 Contacts

Contacts of relevant experts/professionals interviewed or has contributions to the EIA.

Appendix B

Development Plans

Disclaimer: The aerial and overlay survey was conducted without survey control and should be regarded as approximate only. The aerial map was captured in August 2024.

Maii Pt Sec 12C
7701m2
Maii Tapere
Ngatangiia District

MAII TAPERE

ACCESS RD (6m wide)

FLAT TO GENTLE SLOPE

STEEP SLOPE

STEEP SLOPE

MAII HEIGHTS DRIVE

12B2

12C

12L

12I2

12G2

12D2D

12D2A

4030m2

70.0

60.0

50.0

80.0

90.0

100.0

Legend

- Pt12C Property Boundary
- Cadastral Boundary
- Contour (at 0.2m intervals)

REVISION:	BY:	APP'D:	DATE:	PROJECT TITLE:	DRAWING TITLE:	CLIENT:	JOB REF: E2414		DATE	SHEET No.	Total No. of SHEETS:
				Maii Hillside Development	Maii Hillside Property Plan	Paavo & Tara	DRAWN BY:	PZ	16/03/25	S01	S05
				Maii Heights, Ngatangiia	Aerial overlay Land & Topo Survey	CAD REF: E2414.dwg	CHECKED:				
						SCALE: N.T.S.	APPROVED:				

Disclaimer: The aerial and overlay survey was conducted without survey control and should be regarded as approximate only. The aerial map was captured in August 2024.

Proposed Private Driveway
Road Width: 4m
Road Length: 95m
Design Road Gradient: 15° to 20°
Road Surface Cover: Gravel (Chip-Seal later stage)

Level Platform #1
RL 58m

Level Platform #2
RL 55m

Level Platform #3
RL 51m

Existing
Gravel Road

A'

Proposed CUT (level) bench
FL 66m
Bench Width: 3m
Bench Length: 100m

Proposed Building Platform
FL 90m
Level Platform 28m by 8m wide

Proposed Cut Batter Slope
Total Vertical Height: 8m
Design Slope: 80°
Cut Bench: 1.5m wide at 4m height

A

Existing Header Water Tanks
RL 83m

Existing formed platform
RL 66m

MAII HEIGHTS DRIVE

Existing Chip-Sealed Road

Existing
Chip-Sealed Road

Legend

- A -A' Cross Section (Slope Profile)
- General Earthworks Area
- Contour (at 0.2m intervals)

REVISION:	BY:	APP'D:	DATE:	PROJECT TITLE:	DRAWING TITLE:	CLIENT:	JOB REF: E2414		DATE	SHEET No.	Total No. of SHEETS:
				Maii Hillside Development	Site Plan	Paavo & Tara	DRAWN BY:	PZ	16/03/25	S02	S05
				Maii Heights, Ngatangiia	Proposed Development (Earthworks)	CAD REF: E2414.dwg	CHECKED:				
						SCALE: N.T.S.	APPROVED:				

Disclaimer: The aerial and overlay survey was conducted without survey control and should be regarded as approximate only. The aerial map was captured in August 2024.

Proposed Sediment Pond
Retain sediments prior to discharge into the existing road-side drain

Existing Road-side Drain

Existing Gravel Road

Existing Culvert

Flow along existing drain towards the Ara Metua and eventual flows eventual the Tuapu wetlands

Proposed Private Driveway
Road Width: 4m
Road Length: 95m
Design Road Gradient: 15° to 20°
Road Surface Cover: Gravel (Chip-Seal later stage)

Level Platform #1
RL 58m

Level Platform #2
RL 55m

Level Platform #3
RL 51m

Spoon Drain
Formed along base of CUT, run along new driveway side-drain

Spoon Drain
Formed along base of CUT, run towards new driveway drain

Proposed Building Platform
FL 90m
Level Platform 28m by 8m wide

Spoon Drain
Formed along base of CUT, run towards new driveway side-drain

Existing Header Water Tanks
RL 83m

Existing formed platform
RL 66m

Existing Chip-Sealed Road

MAII HEIGHTS DRIVE

Existing Chip-Sealed Road

A

A'

70.0 60.0 50.0 80.0 90.0 100.0 104.0 44.0 42.0 46.0 48.0 52.0 54.0 66.0 64.0 62.0 60.0 58.0 56.0

Legend

- A -A' Cross Section (Slope Profile)
- General Earthworks Area
- Contour (at 0.2m intervals)
- Drainage Flow Path
- Sediment Ponds

REVISION:	BY:	APP'D:	DATE:	PROJECT TITLE:	DRAWING TITLE:	CLIENT:	JOB REF: E2414		DATE	SHEET No.	Total No. of SHEETS:
				Maii Hillside Development	Site Plan	Paavo & Tara	DRAWN BY:	PZ	16/03/25	S03	S05
				Maii Heights, Ngatangiia	ESCP Drainage Plan	CAD REF: E2414.dwg	CHECKED:				
						SCALE: N.T.S.	APPROVED:				

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Retain sediments prior to discharge into the existing road-side drain

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Existing Culvert

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Existing Chip-Sealed Road

MAII HEIGHTS DRIVE

Existing Chip-Sealed Road

Existing Header Water Tanks
RL 83m

Existing formed platform
RL 66m

Level Platform #1
RL 58m

Level Platform #2
RL 55m

Level Platform #3
RL 51m

Retain Existing Vegetation Buffer

Retain Existing Vegetation Buffer

Silt Fence

Silt Fence

Silt Fence

Silt Fence

A

A'

70.0
60.0
50.0
80.0
90.0
100.0
104.0
44.0
42.0
46.0
48.0
52.0
54.0
66.0
64.0
62.0
58.0
56.0

Legend

- A -A' Cross Section (Slope Profile)
- General Earthworks Area
- Contour (at 0.2m intervals)
- Drainage Flow Path
- Sediment Ponds
- Silt Fence

REVISION:	BY:	APP'D:	DATE:	PROJECT TITLE:	DRAWING TITLE:	CLIENT:	JOB REF: E2414		DATE	SHEET No.	Total No. of SHEETS:
				Maii Hillside Development	Site Plan	Paavo & Tara	DRAWN BY:	PZ	16/03/25	S04	S05
				Maii Heights, Ngatangiia	ESCP Silt Fence & Buffer	CAD REF: E2414.dwg	CHECKED:				
						SCALE: N.T.S.	APPROVED:				

Property: Maii Pt Sec 12C

110m
108m
106m
104m
102m
100m
98m
96m
94m
92m
90m
88m
86m
84m
82m
80m
78m
76m
74m
72m
70m
68m
66m
64m
62m
60m
58m
56m
54m
52m
50m
48m
46m
44m

BDY

A

25°

Plant deep rooted plants (vetiver grass) along top of cut crest

Proposed Building Platform
FL 90m
Level Platform 28m by 8m wide

30°

39°

Plant deep rooted plants (vetiver grass) along cut crest

38°

FL 90m

Retain existing for vegetation buffer

44°

33°

Proposed CUT bench
3m wide

Plant deep rooted plants (vetiver grass) along cut crest

32°

FL 66m

Retain existing for vegetation buffer

30°

Plant deep rooted plants
(Vetiver Grass) along fill batter

Level Platform #3

48°

4°

BDY

BDY

A'

1.5m Wide Bench

4m V.Height
at 80°

4m V.Height
at 80°

80°

80°

8m v.height

Shallow Spoon Drain
1m wide by 0.3m deep

Note: Recommend that a Retaining Wall be constructed for future development.

GEOLOGY: Pokoinu Hill Soils

Infer Datum: Mean Sea Level

0 10 20 40 60 80m

REVISION:	BY:	APP'D:	DATE:	PROJECT TITLE:	DRAWING TITLE:	CLIENT:	JOB REF: E2414		DATE	SHEET No.	Total No. of SHEETS:
				Maii Hillside Development	Slope Profile	Paavo & Tara	DRAWN BY:	PZ	16/03/25	S05	S05
				Maii Heights, Ngatangiia	Existing & Proposed Works	CAD REF: E2414.dwg	CHECKED:				
						SCALE: N.T.S.	APPROVED:				