ENVIRONMENTAL IMPACT ASSESSMENT REPORT

QUARRYING MANUFACTURING PROJECT PROPOSAL

VAITAMANGA-KI-UTA PT SEC 108,
TOKERAU TAPERE, ARORANGI, PUAIKURA

Submission to the Cook Islands National Environment Service

Report prepared by:
Island Quarries Limited (“IQL”)
for consideration by, and with assistance from
Landowners of Vaitamanga ki Uta section 108
(“the proposed Incorporation”)

February 2019
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendices</td>
<td>5</td>
</tr>
<tr>
<td>Glossary of Terms</td>
<td>5</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>6</td>
</tr>
<tr>
<td>1 Purpose of Study</td>
<td>10</td>
</tr>
<tr>
<td>2. Proposed Project</td>
<td>10</td>
</tr>
<tr>
<td>3. Environmental Impacts and Management</td>
<td>11</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>13</td>
</tr>
<tr>
<td>1.1 Proposal proponent</td>
<td>13</td>
</tr>
<tr>
<td>1.2 Proposal description</td>
<td>13</td>
</tr>
<tr>
<td>1.3 Proposal objectives and scope</td>
<td>14</td>
</tr>
<tr>
<td>1.4 Environmental Impact Assessment process</td>
<td>15</td>
</tr>
<tr>
<td>1.4.1 Methodology of the EIA</td>
<td>15</td>
</tr>
<tr>
<td>1.4.2 Objectives of the EIA</td>
<td>16</td>
</tr>
<tr>
<td>1.4.3 Submissions</td>
<td>16</td>
</tr>
<tr>
<td>1.5 Public Consultation</td>
<td>17</td>
</tr>
<tr>
<td>1.5.1 Relevant Legislation and Policy Requirement</td>
<td>17</td>
</tr>
<tr>
<td>1.5.2 Planning Process and Standards</td>
<td>18</td>
</tr>
<tr>
<td>2. Proposal Need and Alternative</td>
<td>18</td>
</tr>
<tr>
<td>2.1 Proposal justification</td>
<td>18</td>
</tr>
<tr>
<td>2.2 Alternatives to the proposal</td>
<td>19</td>
</tr>
<tr>
<td>3. Description of the Proposal</td>
<td>20</td>
</tr>
<tr>
<td>3.1 Location of the site</td>
<td>20</td>
</tr>
<tr>
<td>3.2 Staging - Description of the proposed works</td>
<td>21</td>
</tr>
<tr>
<td>3.3 Emergency management</td>
<td>22</td>
</tr>
<tr>
<td>3.4 Infrastructure Requirements</td>
<td>23</td>
</tr>
<tr>
<td>3.4.1 Transport</td>
<td>23</td>
</tr>
<tr>
<td>3.4.2 Energy</td>
<td>24</td>
</tr>
<tr>
<td>3.4.3 Water Supply and Storage</td>
<td>24</td>
</tr>
<tr>
<td>3.4.4 Storm Water Drainage</td>
<td>24</td>
</tr>
<tr>
<td>3.4.5 Sewage</td>
<td>25</td>
</tr>
<tr>
<td>3.5 Waste Management</td>
<td>25</td>
</tr>
<tr>
<td>3.5.1 Character and Quantity of Waste Materials</td>
<td>25</td>
</tr>
<tr>
<td>3.5.2 Solid Waste Disposal</td>
<td>25</td>
</tr>
<tr>
<td>4. Environmental Values and Management of Impacts</td>
<td>27</td>
</tr>
<tr>
<td>4.1 Land</td>
<td>27</td>
</tr>
<tr>
<td>4.1.1 Description of environmental values</td>
<td>27</td>
</tr>
</tbody>
</table>
4.1.2 Potential Impacts and Mitigation Measures ..................................................27
4.2 Climate ...........................................................................................................29
  4.2.1 Description of Environmental Values ......................................................29
  4.2.2 Potential Impacts and Mitigation Measures ...........................................29
4.3 Water Resource & Quality ...........................................................................30
  4.3.1 Description of Environmental Values ......................................................30
  4.3.2 Potential Impacts and Mitigation Measures ...........................................30
4.4 Air ..................................................................................................................30
  4.4.1 Description of Environment Values .........................................................30
  4.4.2 Potential Impacts and Mitigation measures ............................................30
4.5 Waste ............................................................................................................31
  4.5.1 Description of Environmental Values ......................................................31
  4.5.2 Potential Impacts and Mitigation Measures ...........................................31
4.6 Noise and Vibration .....................................................................................31
  4.6.1 Description of Environmental Values ......................................................31
  4.6.2 Potential Impacts and Mitigation Measures ...........................................31
4.7 Nature Conservation ....................................................................................32
  4.7.1 Description of Environmental Values ......................................................32
  4.7.2 Potential Impacts and Mitigation Measures ...........................................32
4.8 Cultural Heritage ..........................................................................................33
  4.8.1 Description of environmental values ......................................................33
  4.8.2 Potential impacts and mitigation measures ............................................33
4.9 Social and Cultural Values ..........................................................................33
  4.9.1 Description of Cultural Values ...............................................................33
  4.9.2 Potential Impacts and Mitigation Measures ...........................................33
4.10 Health and Safety .......................................................................................34
  4.10.1 Description of Environmental Values ....................................................34
  4.10.2 Potential impacts and mitigation measures ............................................34
4.11 Economy ......................................................................................................34
  4.11.1 Description of Cultural Values ...............................................................34
  4.11.2 Potential Impacts and Mitigation Measures ...........................................34
4.12 Hazards and Risk .......................................................................................30
  4.12.1 Description of Environmental Values ....................................................30
  4.12.2 Potential impacts and mitigation measures ............................................30
4.13 Erosion Control ..........................................................................................35
  4.13.1 Description of Environmental Values ....................................................35
  4.13.2 Potential impacts and mitigation measures ............................................35
4.14 Storage and Handling of dangerous Substance ........................................35
  4.14.1 Description of Environmental Values ....................................................35
4.14.2 Potential impacts and mitigation measures............................................................................35
5 Environmental Management Plan .................................................................................................................36
  5.1 Construction and Installation............................................................................................................36
  5.2 Operations .................................................................................................................................................36
  5.3 Stakeholders.............................................................................................................................................36
  5.4 Potential Environmental Issues........................................................................................................36
    5.4.1 Key Issues................................................................................................................................................36
  5.5 Environmental Management Procedures .....................................................................................36
  5.6 Communications and Project Management .................................................................................36
    5.6.1 Means of Communication..................................................................................................................37
  5.7 Monitoring and Reporting...................................................................................................................37
    5.7.1 Complaints ..............................................................................................................................................37
    5.7.2 Inspections..............................................................................................................................................37
  5.8 Summary of the EMP.............................................................................................................................38
6 References...............................................................................................................................................................42
Appendices .................................................................................................................................................................43
  Appendix A Terms of Reference ...................................................................................................................43
  Appendix B Study Team.................................................................................................................................43
  Appendix C Project Site Plan..........................................................................................................................46
  Appendix D Drawings.......................................................................................................................................47
  Appendix E Report On Activities to Prove Quarry Economics...............................................................48
  Appendix F Quarry Design & report By Geologist..................................................................................53
Appendices

A – EIA Terms of Reference
B – EIA Study Team
C – Site Plan
D – Profile Sketch
E – Report On Activities to Prove Quarry Economics
F – Quarry Design & Report By Geologist

Glossary of Terms Executive Summary

CEMP  Construction Environmental Management Plan
EIA   Environmental Impact Assessment
EMP   Environmental Management Plan
ESD   Environmental Significant Declaration
ICI   Infrastructure Cook Islands
IQL   Islands Quarrying Ltd. –Mining & Asphalt Manufacturing
mamsl metres above mean sea-level
NES   National Environment Service
NSDP  National Sustainable Development Plan
REA   Rarotonga Environment Authority
the proposed Incorporation. The Incorporation that landowners are currently taking steps to have considered by the High Court of the Cook Islands
TOR   Terms of Reference
Executive Summary

Tokerau Quarry Project;
Environment Impact Assessment Report,
February 2019
EXECUTIVE SUMMARY

If any member of the public has questions and concerns they may contact any of:
Samuel Napa (Snr) .......................50-070
Des Eggelton.................................55-020
Mr Chris Vaile .......................26-594 or 57-910

Introducing the proponent
The proponent of this project is Island Quarries Limited, a part of the Triad Group of companies that has been involved in a wide range of commercial and infrastructure development projects, undertakings and businesses for over 40 years.
In championing this initiative, principal, Mr Chris Vaile can point to half a century’s experience in roadbuilding and associated quarrying and materials processing. His Cook Islands experience dates back to the early 1970’s in terms of upgrading the Black Rock quarry to meet the volume and standard requirements needed for the purposes of the Rarotonga International Airport upgrade.
Since that time, Mr Vaile has successfully owned and operated a range of civil engineering and transport initiatives; his expertise in asphalt manufacture and laying, chipseal surfacing and road engineering is well known. It is out of concern for declining standards of suitable road building aggregates that, over the past decade, Mr Vaile has focussed increasingly on the need for a new source of high quality rock.
This project represents a valuable opportunity to resolve that question for the benefit of the whole Rarotonga community and the nation’s economy, over coming decades.

Introducing key expert
A number of experts pooled their knowledge and expertise in preparing this EIA. Of special note, in this Executive Summary, though, is the role of internationally experienced geologist and quarry development expert, Simon J Carryer who was commissioned at the outset to undertake independent evaluation and provide a future plan for the development of the quarry, so that landowners, NES, REA and the general public could have confidence that the current proposal reflects current best practice in New Zealand in terms of resource management issues.
Mr Carryer’s input has covered both the verification of quarry material qualities and the design along with suggested ongoing management of the quarry site. Mr Carryer has provided a fully integrated detailed design with comments that is attached as an addendum to the EIA report.
**Introducing the Proposed Project**

The project is one to establish a rock-quarry, crusher and asphalt plant facilities on court-investigated native freehold land within the valley and upper watershed that is Vaitamanga Ki-Uta section 108, Tokerau Tapere, Arorangi District.

The overall goal of the project is to provide a safe working environment in the quarrying or mining of good quality basalt rocks for crushing at the crusher plant to be established there, for the production of good-grade metal chips required by the construction and roading industries, together with a state-of-art asphalt plant to continue the work of hot-mixing the roads of Rarotonga.

It is estimated that over the next 10 years (i.e. the term for which project permit approval is sought) is about 140,000m$^3$ of usable material (solid measure) will be extracted out of which, the following quantities are expected:

- 30,000 m$^3$ of overburden (soil, clay and boulders)
- 110,000 m$^3$ of massive basaltic rock (280,000 tonnes of aggregate)

Looking beyond that first 10 years term, a further 120,000 m$^3$ of rock ((300,000 tonnes of aggregate) is considered to be available within the proposed pit which at current rates of production would be sufficient for an additional 20 years of production. A project permit for that full 30 year term is **not** sought at this time.

The need for a new quarry has become an urgent priority for this country, so as to ensure the provision of quality construction materials as a means to ensure the sustainability of the future private and public sector building and infrastructure construction programmes.

Following considerable island wide investigations, together with a number of landowner discussions right around Rarotonga (there having been half a dozen sites examined), and NES input, the site at Vaitamanga-ki-Uta Pt 108 was selected as the most suitable site.

This decision was made on the basis that a quarry operation on section 108 can meet the many environmental and operational considerations while providing a sustainable supply of good quality material into the future.

During the island wide investigations it became clear that suitable sites within the confines of Rarotonga for sustainable quarries are very limited,

The site selected has the agreement of the majority of landowners and with their support along with the support of the NES, investigations over a modest time frame, were undertaken to prove the quarry source would meet qualities based around New Zealand standard specifications for the following materials

- Sealing chips for road surfacing
- Basecourse material for road foundation works
- Fines for asphalt manufacture
- All in mix for concrete manufacture.
**Overview of Environmental Impacts and Management**

The more significant impacts are highlighted below along with the proposed mitigation measures.

**Land impacts**
- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.
- Development increases impervious surface, thus increasing the likelihood of surface flooding.
- Vegetation clearance

Mitigation measures:
- IQL to implement erosion and sediment control measures on project site.
- Allow for pervious surfaces in the landscape areas, and incorporate low impact design measures for stormwater management.
- Limit the development of roadways to the existing road network.
- Remove trees only as necessary.
- In terms of aesthetics, natural vegetation surrounding the quarry should be retained (such as in a buffer area) so as to help minimise dust emissions.

**Climate impacts**
- Climate change – structural integrity of newly established facilities are compromised as a result of more intense tropical cyclones, temperature increases, prolonged drought and increased rainfall.

Mitigation measures:
- Design incorporates climate proofing with the application of relevant construction standards, specifications and suitable materials.

**Water resources & quality impacts**
- Water shortage during dry months (May to October).
- Groundwater and lagoon contamination due to earthworks and soil erosion.

Mitigation measures
- Design incorporates rainwater harvesting and storage.
- Contractor to implement erosion and sediment control measures on project site.

**Waste impacts:**
- Solid waste generated during construction.

Mitigation measures
- Recycle green waste materials
- Dispose of other waste in an approved manner.
Health and safety impacts:

- Public, construction personnel injury during construction.
- Noise
- Dust

Mitigation measures

- IQL implements approved health and safety plans, monitored by Contract management personnel.
- Use of noise protection equipment
- Sprinkling of access roads and terracing during non-rainy and windy days

Erosion control impacts

- Erosion control fails to prevent environmental pollution.

Mitigation measures

- Routine inspections of sediment control systems by the IQL management personnel to ensure systems are effective, and any possible signs of failure are identified early and rectified.

Included within is the desire to site water storage by way of terraced ponds – these are likely to have future uses beyond the design life of the quarry

Reason why the project permit should be issued

The workings of the EIA provide many positives to the establishment of a quarry operation and Carryer’s final conclusions briefly provided below concluded:

- That a substantial deposit of hard basalt rock exists within the land block.
- Evidence derived from investigations suggest the quality of rock is likely to improve deeper into the face.
- It is feasible to develop a quarry to produce in the order of 25,000 tonnes of aggregate per annum

For the reasons outlined in detail in the EIA, this resource can be developed safely, sustainably, and with minimal environmental impact on the public. Delivering, in fact, considerable public benefit by securing a reliable, sustainable source on-island of engineered stone and aggregate of a sort that is critical to the ongoing development of the island and thus growth of the economy.

No practical alternative exists to this proposal unless the country is prepared to entertain further degradation of quality standards in engineered stone and aggregate.
Purpose of Study

This Environmental Impact Assessment (EIA) is presented to the National Environment Service (NES) for public consultation and for the approval of the Rarotonga Environment Authority (REA).

Over the later part of 2017 and over 2018, landowners of the land Vaitamanga ki Uta Section 108 have allowed Triad Pacific Petroleum Limited (for this purpose trading under the style “Island Quarries”) access to their land to undertake exploratory work to see whether the land contained rock of sufficient quantity and quality as to make it economically feasible to establish a quarry (with associated rock processing) on the land.

Landowners have given this exploratory initiative their full support, on the understanding that the work undertaken would result in this report. Prior to filing with NES, the report has been released to key landowner representatives in draft for comment and consideration.

The REA will appreciate that the exploratory work and the preparation of this report have been an important part of landowner consideration of the proposal. IQL now submits this application with the blessing of owners who see REA consideration and the project permit process as important elements in their own decision-making. Landowners themselves are in the process of negotiating the form, scope and governance of the proposed Incorporation.

Accordingly, IQL now seeks a project permit from the Rarotonga Environment Authority (REA) to develop and establish a quarry and manufacturing proposal (the Project).

2. Proposed Project

The project is proposing to establish a rock-quarry, crusher and asphalt plant facilities on court-investigated native freehold land within the valley and upper watershed now named by the High Court as Vaitamanga Ki-Uta section 108, Tokerau Tapere, Arorangi District.

Today, the demand for good-quality crushed basalt stones by the construction industry is huge, being needed for the high-grade concrete aggregate in demand for the construction of infrastructural projects, residential and commercial accommodations, road construction and sealing, runway pavements. This quality aggregate product is key to the economic development requirements of the island of Rarotonga.

The overall goal of the project is to provide a safe working environment in the quarrying or mining of good quality basalt rocks for crushing at the nearby crusher plant for the production of good-grade metal chips required by the construction industry.

It is estimated that over the next 10 years (i.e. the term for which project permit approval is sought) is about 140,000m$^3$ of usable material (solid measure) will be extracted out of which, the following quantities are expected:

- 30,000 m$^3$ of overburden (soil, clay and boulders)
- 110,000 m$^3$ of massive basaltic rock (280,000 tonnes of aggregate)

Looking beyond that first 10 years term, a further 120,000 m$^3$ of rock ((300,000 tonnes of aggregate) is considered to be available within the proposed pit which at current rates of production would be sufficient for an additional 20 years of production. A project permit for that full 30 year term is not sought at this time.
The material to be extracted will consist of massive basaltic rocks which will be eventually crushed at the newly established stone crushing plant adjacent to the proposed rock quarry to produce aggregates for the infrastructure, building industry and production of roading asphaltic etc.

The objective of the project is to sustain Government infrastructure services and the construction industry in developing an effective infrastructure that underpins a healthy economy and achieves social satisfaction.

Refer to Figure 1 for the proposed development site.

3. Environmental Impacts and Management

The more significant impacts identified through this assessment and in implementing this projects on Rarotonga are highlighted below along with the proposed mitigation measures.

**Land impacts**

- Earthworks during the rainy season increase the potential for soil erosion and sediment laden water entering the water ways.
- Development increases impervious surface, thus increasing the likelihood of surface flooding.
- Vegetation clearance

Mitigation measures:
- IQL to implement erosion and sediment control measures on project site.
- Allow for pervious surfaces in the landscape areas, and incorporate low impact design measures for stormwater management.
- Limit the development of roadways to the existing road network.
- Remove trees only as necessary
- In terms of aesthetics, natural vegetation surrounding the quarry should be retained (such as in a buffer area) so as to help minimise dust emissions.

**Climate impacts**

- Climate change – structural integrity of newly established facilities are compromised as a result of more intense tropical cyclones, temperature increases, prolonged drought and increased rainfall.

Mitigation measures:
- Design incorporates climate proofing with the application of relevant construction standards, specifications and suitable materials.

**Water resources & quality impacts**

- Water shortage during dry months (May to October).
- Groundwater and lagoon contamination due to earthworks and soil erosion.

Mitigation measures
- Design incorporates rainwater harvesting and storage.
- Contractor to implement erosion and sediment control measures on project site.

**Waste impacts**:

- Solid waste generated during construction.

Mitigation measures
- Recycle green waste materials
Dispose of other waste in an approved manner.

**Health and safety impacts:**
- Public, construction personnel injury during construction.
- Noise
- Dust

**Mitigation measures**
- IQL implements approved health and safety plans, monitored by Contract management personnel.
- Use of noise protection equipment
- Sprinkling of access roads and terracing during non-rainy and windy days

**Erosion control impacts**
- Erosion control fails to prevent environmental pollution.

**Mitigation measures**
- Routine inspections of sediment control systems by the IQL management personnel to ensure systems are effective, and any possible signs of failure are identified early and rectified.

The proposed Environmental Management Plan (EMP) sets out the responsibilities of the respective parties in mitigating and monitoring potential impacts. The EMP includes the establishment of communication systems and regular inspections during the construction works. The project is of national significance and as such, there is a high level of commitment to ensuring the project is delivered successfully.
1. Introduction

Island Quarries Limited, making this application with the active support of a significant number of landowners, is seeking the approval of the Rarotonga Environment Authority (REA) to develop and establish a quarry and manufacturing proposal (the Project).

The building and infrastructure industry providing us with such essential elements of our country’s built infrastructure, such as residential and commercial buildings, roadways, harbours and airports, is essential to building and maintaining the nation’s economic strength and mobility.

With the increasing difficulty in sourcing sufficient quantities of material available for quality work, it is essential for the REA to give prompt and careful consideration to the first proposal in over 20 years that offers a solution to the growing challenge of quality aggregate procurement.

A lot has changed in the past 20 years; IQL can confidently state that never in the history of the Cook Islands has as much detailed consideration and planning gone into the design of a proposed quarry. IQL is confident that the proposal put forward below is consistent with New Zealand industry practice, and it has spent considerable time and money in the exploratory phase to demonstrate its willingness and ability to operate to those standards, moving forward.

As a threshold matter, therefore, REA can be confident that both in design and implementation, the quarry operations will be carried out in a way that ensures minimal impact to the environment with the help of the monitoring team of the Compliance and Advisory division and conditions set out by the REA.

This Environmental Impact Assessment report was prepared to assist in facilitating the approval process, in line with the requirements of the National Environment Service. This report will be available for public review and comment prior to final consideration by the REA.

This report describes the project, what it seeks to address, and the potential risks to the environment resulting from implementing this project. As such, mitigation and monitoring measures are proposed, to reduce or eliminate potential impacts on the environment.

1.1 Proposal proponent

Island Quarries Limited, in conjunction with landowners, for that purpose intending to form the proposed Incorporation.

IQL is 100% locally owned; it has been incorporated as a wholly owned subsidiary of Triad Pacific Petroleum Ltd (owned by the Vaile Family Trust, all beneficiaries of which are Cook Islanders). It is expected that Charles Strickland Junior – with specialist knowledge, experience and expertise and a licensed NZ quarry manager) will be a shareholder, and once the proposed Incorporation is formalized, it, too, may hold shares in the company; for now, arrangements with landowners are for royalty calculated directly on quarried material.

1.2 Proposal description

IQL is proposing to establish rock-quarrying and processing plant facilities within the valley that comprises the land Vaitamanga Ki-Uta Section 108, Tokerau Tapere, Arorangi District,
The history of this land can be briefly described – it is, largely, former agriculture land which has reverted to au and a range of invasive species and native regrowth.

During the agriculture boom years between 1950 -70 export, the 25 acre land Vaitamanga Section 88M and the 54 acre land section 108 was extensively cultivated. Some 14 acres were planted in crops with a mix of vegetables, citrus, coconut, mangoes, bananas, pawpaws and avocados trees as shelter belt on boundaries (rather than the more common pistati tree (Jambolan, syzygium cumini)), along with cattle farming and grazing. On the hill slopes pineapples were grown. To access other parts of the land access roads were formed for trucks through both properties to pick up the produce for export or processing by the Island Foods cannery in Avarua.

The eastern boundary of the upper watershed is delineated by the pristine craggy ride-line that is dominated by the prominent mountain peak 439 metres above mean sea level (mamsl) overlooking Avarua’s coastal plain north, and Arorangi’s coastal plain west and south.

The Tokerau Valley and its upper watershed, apart from the narrow valley corridor is completely enclosed by mountain ridges, north, east and south to form almost an insular ecosystem, modified as a result of the activities described above, enclosed by craggy ridge lines. The topography typifies Rarotonga’s mountain region of valleys and ridges carved by rainwater-fed-streams, over many millennia ago.

Land elevation at the entrance into the valley is 35 to about 40 metres amsl. The ground level at the confluence of two small mountain streamlets is about 120 metres amsl giving a fall westward of over a distance 400 metres, a hydraulic gradient of 1 in 8 for the water flow along the seasonal Tokerau stream, discharging flow into the Main Vaitamanga Stream at the Arametua 550 metres west.

1.3 Proposal objectives and scope

The overall goal of the project is to provide a safe working environment in the quarrying or mining of good quality basalt rocks for crushing at the nearby crusher plant for the production of good-grade metal chips required by the construction industry.

The rock quarry will consist two parts—the upper part for removing overburden and quarrying weathered rock for basecourse materials and the lower part of the site to quarry the hard-rocks for aggregate. The total area will be approximately 14,000m². The combined total rock quarry has the following dimensions:

Length: 240m
Width: 110m

The rock quarry will be an open-pit mining and will be quarrying from a reduced level of 65 to 150 metres.

It is estimated that over the next approximately 25 years about 180,000 m³ of material will be extracted out of which, the following quantities are expected:

- 40,000 m³ of overburden (soil, clay and boulders)
- 140,000 m³ of massive basaltic rock (equivalent to 360,000 tonnes of aggregate)
The material to be extracted will consist of massive basaltic rocks which will be crushed at the newly established stone crushing plant adjacent to the proposed rock quarry to produce aggregates for the production of asphaltic concrete, ready-mixed concrete, etc.

Dump trucks, of average carrying capacity 10 to 15 tonne, will deliver quarried rocks from the site to the primary crusher of the stone crushing plant by an internal road within the site without having to use any public road. The rocks will be subjected to a series of processes to produce aggregates of various sizes.

It is expected that the quarry over its entire potential life could operate for at least 25 years with an annual turnover of extractable material of 10,000 m³ of basaltic rock. A geological study of the area has established the quality and continuity of the resource (see attached geological report). However, the current application does not seek approval for removal of 250,000 m³, envisaging removal of approximately half that amount, and at that point, seeking a further project permit on the basis of a detailed design prepared with reference to the known reserves and geology as revealed by actual quarrying activity.

The objective of the project is the sustainability of the construction industry in the support of the development of an effective infrastructure that is conducive of a healthy economy and social satisfaction.

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**Fig. 1: Above is the Location of the Proposed Development Site**

**1.4 Environmental Impact Assessment 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.

**Application stage**
This stage involves the preparation of a Terms of Reference (TOR) for the EIA by the NES and the preparation and lodgment of the EIA report by the applicant.

The NES assesses development proposals under Section 36 of the Environment Act 2003. Applicants are required to produce EIA reports if a proposal is considered to have any environment impacts.

See Appendix A; this EIA follows the published TOR guidelines and criteria of NES.

**Public notification stage**
Section 36(5) of the Environment Act 2003 requires the EIA report to 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.

**Approval 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:

- The application is approved. The NES provides the applicant with an EIA Approval with conditions;
- The application is deferred until the applicant has satisfactorily addressed issues raised by the REA or public submissions; or
- 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. The proposed Environmental Management Plan (EMP) for this project is detailed in section 5.

**1.4.3 Submissions**
The public can submit comments on the proposal and EIA over the 30-day period, commencing from the date of release. All submissions must be in writing and addressed to the National Environment Service, which will be referred to the developer to address or provide feedback.
1.5 Public Consultation

On the face of matters, modification of the site does not call for public consultation; there are no cultural or burial grounds within the entire upper watershed area, nor are there rare plants that exist and need to be protected.

As noted above, the Tokerau Valley watershed is an almost insular, degraded former agriculture ecosystem with its only practical use being extraction and processing of the natural basalt rock resource within the bounds of its ridge line periphery.

On the one hand this is needed for the socio-economic development of the country at the national level to sustain current life style and living standards. On the other, with proper planning and end of life remediation, the land contours will make it more practical to use for alternative purposes.

The exploratory works and processing have demonstrated that the proposed works do not produce noise, dust or visual impacts that could reasonably be of concern to members of the public, taking place in a remote, enclosed, off-road location.

The principal issues are, therefore, ones affecting those in the immediate vicinity in terms of access to and from the quarry, with heavy truck movements – largely matters for ICI as road manager of the ara metua and for owners of Vaitamanga section 88, over which access is laid.

If any member of the public has concerns they may contact any of Samuel Napa (Snr) and/or Des Eggelton and/or Mr Chris Vaile for further details relating to this project.

1.5.1 Relevant Legislation and Policy Requirement

The Environment Act 2003 provides the legal framework for the administration of any land prior to development. It informs the functions and roles of NES, which amongst other things embraces the protection and management of the environment and its resources in a sustainable way.

This project is covered under Part 5 Environment Impact Assessment, Section 36 (1-3) of the National Environment Act 2003.

Section 36 (1) states: No person shall undertake activity likely to cause significant environment impacts except in accordance with a project permit issued under this section. A project permit is obtained from the permitting authority, the REA. Section 36 (2): A person who proposes to undertake an activity of the kind referred to in subsection (1) shall apply to the permitting authority for a project permit in respect of the activity in accordance with the procedures (if any) prescribe by regulations. Section 36 (3): Every application for a project permit shall be submitted to the Service and shall include an environmental impact assessment, setting out details of:

a) The impact of the proposed project upon the environment, in particular
   i. The adverse effects that the project will have on the environment; and
   ii. A justification for the use or commitment of depletable or non-renewable resources (if any) to the project; and
   iii. A reconciliation of short-term uses and long-term productivity of the resources; and
b) The proposed action to mitigate adverse environmental effects and the proposed plan to monitor environmental impacts arising out of the project; and
c) The alternatives to the proposed project.

The Public Health Act 2004, Section 13 establishes “building health standards” which include provisions of adequate and convenient water supply for human consumption and sanitary purposes; adequate and convenient means for storage and disposal of waste; adequate and convenient toilets; and adequate drainage, lighting, space and ventilation.

The Cook Islands National Heritage Trust Act 1999 establish a Natural Heritage Trust with the necessary resources and powers to investigate, identify, research, study, classify, record, issue, preserve and arrange publications, exhibitions, displays and generally educate the public on the science of, and traditional practices and knowledge relating to, the flora and fauna of the Cook Islands.

The Cook Islands Dangerous Goods Act 1984 make provision with respect to the packing, marking, handling, carriage, storage, and use of certain flammable, oxidising, and corrosive materials, and certain compressed, liquefied, dissolved, and other gases. The Act requires promoting public safety in the storage and handling of dangerous goods and is referenced to AS 1940:2004 The Storage and Handling of Flammable and Combustible Liquids.

1.5.2 Planning Process and Standards

Work on this land has occurred to date with the active support of key landowners and the moves to formalize the proposed Incorporation mark a commitment both by IQL and landowners to work closely together to make sure the project delivers a quarry to the required quality standards.

Lessons learned from previous quarrying initiatives as well as the ongoing Rarotonga Road improvement upgrade have been integrated into the project design and implementation plans.

The planning processes are confined to the existing land boundary. There are no changes to the use of the land.

Since the Cook Islands does not have quarry & mining standards to abide to, New Zealand and Australian standards and codes has been referenced and are reflected in the construction designs for compliance.

2. Proposal Need and Alternative

2.1 Proposal justification

The need for a new quarry has become an urgent priority for this country, so as to ensure the provision of quality construction materials as a means to ensure the sustainability of the future private and public sector building and infrastructure construction programmes.

Following considerable island wide investigations, together with varying land owner discussions, and National Environment input, the site at Vaitamanga-ki-Uta Pt 108
was selected as the most suitable site.

This decision was made on the basis that a quarry operation on section 108 can meet the many environmental and operational considerations while providing a sustainable supply of good quality material into the future.

During the island wide investigations it became clear that suitable sites within the confines of Rarotonga for sustainable quarries are very limited.

The site selected has the agreement of the majority of land owners and with their support along with the support of the NES, investigations over a modest time frame, have been undertaken to prove the quarry source.

Both the REA and NES will appreciate that a wide range of project permits are issued each year for projects that will fail, or prematurely fail, if they are not constructed using aggregates of the right quality.

The 2017-2018 exploratory phase has demonstrated that rock at the site of the proposed quarry will meet qualities based around New Zealand standard specifications for the following materials

- Sealing chips for road surfacing
- Basecourse material for road foundation works
- Fines for asphalt manufacture
- All in mix for concrete manufacture

Other quarry operators are facing increasing challenges in supplying rock of this quality. ICI – Government’s prime infrastructure provider – is well aware of those challenges. In the meantime with only two other quarry operations existing on Rarotonga, and with mining and manufacturing the island’s natural rock resources for their raw material in high demand, there is an urgent need to open up and properly develop an alternative source of quality supply.

2.2 Alternatives to the proposal

Alternative strategies considered include:

- Various alternative sites have been considered for the purposes of extracting suitable quantities of high quality rock. For example, consideration was given to a site at Inave Tapere, Arorangi, in a valley adjacent to the proposed site. Unfortunately that site had a much higher quantity of overburden materials requiring removal to get to the required hard rocks. This option would have higher annual maintenance costs and limited lifespan.

- IQL confidently states that it is economically impractical to import suitable aggregate from overseas; costings have demonstrated this on repeated occasions.

- This being so, the challenge on Rarotonga is to find a site with limited environmental impact that can be economically quarried. Overburden removal is the largest challenge. As now seen in the Vairauara valley operations, there comes a point where it is simply not economic to remove the amount of earth and “rotten rock” needed to access good, massive basaltic rock. There being no market for the millions of tons of overburden needed to further develop the existing quarries, they each have only a limited capability to produce sufficient quantity of quality stone.
• There is no practical alternative to the use of good basalt rock for a range of engineering-critical applications.

### 3.1 Location of the site

The Project is located within the existing boundary Vaitamanga Ki Uta Section 108, Tokerau Tapere, Arorangi, Puaikura.

There is an existing access dirt road across Section 88M, Tokerau Tapere, Aorangi, Puaikura, 550 metres from the Ara Metua (back road) up to the bottom of the hill. IQL, with landowners’ consent, has cleared overgrown vegetation on an existing access road from end of existing access road to property boundary at the higher end of section.

The section is located on the hill slopes and ridges of Tokerau and approximately 550m inland from the Ara Metua-back road. It is drained by Tamaiti stream that does not run continuously; rather, after heavy rainfall the stream flows briefly, perhaps may last less than a week.

The proposed development site is about 25,000 square metres in land area. The ridge section is located to the south of the Tamati Stream and access road climbing from 20m at the toe to 120m of the first ridge (Ridge 1). The second ridge (Ridge 2) thereafter climbed to a further height of 200m.

The section is covered with different species of scrubs and trees, representing secondary growth typical of former agricultural lands; none of them an endangered species. Adjacent land sections are undeveloped. The nearest house is approximately 350m away, but that is not immediately down from the valley, which is an important consideration in terms of likely environmental impact; quarrying operations will be invisible, so that the principal impact will be of access traffic to and from the quarry site.

The soil profile is mainly organic soil at the lower strata and light to massive clay towards the upper strata.
3.2 Staging - Description of the proposed works
The Project is staged in two phases;

Phase 1: Working along the north face of the ridge the crest of which forms the boundary of Section 108.

- From the existing access into the hillsides a machine access road 6 metres wide is cut up to a specific level gradient across the contours to reach the exposed rock face at about the 90m contour level.
- Having reached the rock extraction site, prepare the site for extracting the desired basalt-rocks.
- The working of the quarry may be executed by benching the rock face in steps down the slopes.
- The overburden will be stock piled at a strategic point close by for reuse later on.
- The rest of the extraction processes remains a specialist operation based on skilled judgment experience and common sense.

Phase 2: Establishment of crushing & Asphalt plants at the higher flatter area located uphill to the east of the proposed quarry site. This area will include aggregate stockpile

- Civil works and construction;
- Fit-out and furnishing; and
- Commissioning.

Photo 1. Excavation to prove resource

3.3 Emergency management

Emergency Management procedures recommended for this project are important to ensuring the safety of staff, general public and construction workers. A Site Specific Safety Plan will form part of the Contractors outputs in the establishment phase of the Project.
The Site Specific Safety Plan will set out the safety procedures to be followed onsite for the duration of the Project. This will assist supervisors in the management of works and advise workers what work procedures are to be used onsite, also providing information for new staff onsite. It is expected that the Site Specific Safety Plan will be reviewed regularly and updated as required.

The Site Specific Safety Plan will include as a minimum:

- Onsite responsibilities and contact details;
- Onsite hazards and required controls – Construction Sign boards, Hazard Register;
- Site Specific Safety Meeting (Site Supervisor);
- Safety barriers;
- Personal Protective Equipment (PPE) i.e. safety boots, hi-glows vests;
- Emergency procedures – first aid box, first aid people, evacuation, injury response;
- Accident, incident and near miss reporting, investigation and system improvement;
- Safety training and reviews;
- Training and induction;

WorkSafe New Zealand’s industry statistics for workplace fatalities for calendar years 2011-2016, had Agriculture, Construction and Forestry Industry as the top three (3) for workplace loss of life (WorkSafe New Zealand, 2016). The construction industry requires all staff and personnel to be aware of the potential hazards by taking all practical steps to ensure their own safety and that of others on the project site. Due to the size and nature of the project, it is recommended that experienced Contractors and sub-contractors be employed, who possess the necessary technical skill and knowledge of the construction industry.

In the event of extreme weather warnings, the project development and construction onsite will cease. All construction machinery, equipment, materials shall be safely stored or stockpiled on or off site and temporary structures to be safely secured from cyclonic winds. Utility services such as water and power shall be turned off and construction electricity power box shall be protected from cyclone winds and rain. Construction activities on-site will recommence when it is deemed safe and notified by relevant authorities.

Emergency site access construction site will be established and maintained during the construction period. Revised evacuation plans will be provided for at construction site for emergencies.

3.4 Infrastructure Requirements

3.4.1 Transport

The existing access road will remain, however, to be reconstructed to include improved sub-base and base-course to cater for the heavier carting truck loads and side road drainage installed. The access road will be 6 meters wide to resolve the rotational problem of trucks and fire trucks.

The western boundary of the Land is required to accommodate the following proposed road access and at the lower end of the ridge will accommodate car parking and the installation of the quarry crushing plants and aggregate stock pile and the location of the asphalt plant facilities.
Telecommunication services can be provided to the site. However there is good reception at the base of the ridge.

Refer also to Appendix A2, for the proposed concept and layout plans.

![Photo 2: Existing Access road from the Ara metua (600 metres) to the base of the site](image)

### 3.4.2 Energy

Project installation equipment and machinery shall be self-supplying through air compressors and welding plants connected to generators stationed on the work barge.

Necessary welding works on shore will be from diesel powered plants and there will be very little reliance on mains electricity.

Post construction/commissioning will not require any power from mains electricity, as all the power for discharge of fuels will be from the tanker.

### 3.4.3 Water Supply and Storage

Water supply is essential for the island and all development proposals are recommended to install water storage.

Due to the use and size of the proposal, storage ponds and tanks are included into the development. The storage supply is also tapped into to provide additional water for other purposes such as plant and machinery maintenance. A grounds person provides maintenance on all plants and appliances to include water storage supply.

### 3.4.4 Storm Water Drainage

The existing Tamati Stream runs through the site. It is proposed to culvert much of the length of the stream as it passes through the site and excavate a pond at the upper end of the culvert.
All water from the quarry and working area will be diverted into sediment ponds at the lower end of the site from where stormwater will either seep into the ground or, in times of flood overflow back into the stream below the site.

### 3.4.5 Sewage

A sewerage system will not be required on site, a Porta-Loo will be utilized.

### 3.5 Waste Management

#### 3.5.1 Character and Quantity of Waste Materials

Waste to be generated from the Project includes:

GREEN WASTE: Trees and vegetation waste can be converted into a valuable resource (mulch) for landscaping plants, or can be transported to the Contractors yard for disposal, or use as firewood.

In summary, the project adopts waste management principles:

- Reuse;
- Refuse;
- Recycle; and
- Reduce.

#### 3.5.2 Solid Waste Disposal

Solid waste is not warranted for disposal on the property. It is encouraged to adopt the waste management practice of 4R’s: Recycle, Reduce, Refuse and Reuse. The material waste during the construction will consist of the following with a description of the waste management strategy to dispose or reuse:
Photo 4: Exploration Drilling with Percussion Rig

Photo 5: View of Valley Floor Process Area
4. Environmental Values and Management of Impacts

4.1 Land

4.1.1 Description of environmental values

The project is contained within the existing boundary, where existing ground conditions are improved through minor excavation. Disturbance activities are limited to building foundation construction, access road construction, through to surface water drainage channels. All land activities are to follow the approved design plans.

4.1.1.1 Soils

Ground conditions on steep mountain slopes are typified by exposed rock-face where volcanic soil residue is thinly spread; with mountain vegetation of “Mato” and other trees whose gnarled roots cling precariously to the exposed rock face which is indicator that the mountain land form, structurally, is created from igneous-rock (residual basalt rocks) of good quality material for crushing into Industrial Building Materials.

4.1.2 Potential Impacts and Mitigation Measures

Existing contours of the landscape are altered to the level where the project can provide practical measures to alleviate potential impacts to the land.

Excavation exposed soils are to be stabilised with mulch, grass to prevent surface runoff. Sediment control measures are to be applied such as diverting clean surface water away from the construction site and the use of silt fences and sand bags.
4.1.2.1 Landuse Suitability

Quarrying of the sort proposed represents one of the very few uses to which this land, as currently contoured, could ever be used.

The site will be progressively benched, geoformed and rehabilitated in accordance with the usual standards and procedures mandated for quarry rehabilitation in New Zealand; REA members have visited the site and will therefore be aware both of its narrowness and steepness; it cannot, at present, be used for any other purpose. Proper rehabilitation methodology should produce safe access and limited potential for other purposes that are not, at present, economically feasible.

4.1.2.2 Land Contamination

Land can also be contaminated through sub-standard wastewater treatment systems, careless disposal of solid waste (plastic, tin, glass), and mechanical defects in machinery (fuel and oil leaks).

Current legislation calls for wastewater disposal systems to be designed by a registered designer of wastewater treatment units specifically for use in the Cook Islands (regulated by the Public Health (Sewage and Wastewater Treatment and Disposal) Regulations 2014).

The Cook Islands have adopted the 4 R’s of recycling waste: Reuse, Recycle, Refuse, Reduce. Section 3.5.2 provides a description for Solid Waste Disposal.

4.1.2.3 Soil Erosion

Soil Erosion has taken place over aeons to create Rarotonga’s coastal plain and only residual clay pockets of soil remain, thus exposing the structural rock formation of the ridges and valley sides, with mountain trees adapting to their changing environment.

The project will not take any unnecessary risks when working on the craggy slopes and in scoping and will aim for the best method to prevent too much soil erosion exposure and clogging the streams. We will be directed on what conditions the REA has set and ensure
this carried out to ensure compliance. IQL will construct the necessary ponding and silt containment systems to ensure neighboring properties are not prone to soil intrusion by this project. Silt mats fencing may be constructed if need be in affected areas.

4.2 Climate

4.2.1 Description of Environmental Values

The climatic factors that affect the island are the cyclone season, (November-April), and the drought season (May-October).

Water supply is essential for the island and since all development proposals are recommended to install water storage, IQL is not planning on using significant amounts of water in its operations; it does not rule out connection to the reticulated supply for limited purposes, but with Te Mato Vai looking to charge commercial users for potable fresh water, IQL will likely work up any needed storage in the context of flood control management – ie, capture of storm water.

The World climate is under constant change, and is reported to have a significant effect on low lying coastal lands a result of Climate Change, increasing climate risks such as tropical cyclones with frequent strong storms and wind gusts, sea level rises and storm surges, temperature increases and prolonged droughts, increase rainfall/land based flooding.

Engineering judgment for planning, development and infrastructure items are typically undertake a risk based approach, whereby thought is given to the level of risk through the likelihood, probability and consequence from extreme weather events due to Climate Change.

Following factors can be considered for risk based approach:

- The design life of the development or infrastructure item;
- Consequences of the development suffering damage;
- Consideration to the level of extreme weather event- likelihood and magnitude of the weather event;
- Climate change impacts.

4.2.2 Potential Impacts and Mitigation Measures

The impacts and mitigation measures for Phase 1 and 2 include:

**Tropical cyclones with frequent strong storms and wind gusts:** The proposed quarrying activities involve rock and heavy earthmoving machinery and quarry machinery; all operations, by their nature, will have high resilience to tropical cyclones. Any necessary built structures will meet all applicable Building Code standards.

**Sea level rises and storm surges:** Short of a catastrophic loss of Antarctic ice, inundating the entire coastal areas of Rarotonga, this site – far inland and well elevated - will not be affected in any way by sea level rise or storm surge.
**Temperature increases and prolonged droughts:** The inclusion of rain water harvesting, and onsite storage in the context of silt control measures, will provide for a cost-effective alternative water source to reduce the demand of the public water supply.

### 4.3 Water Resource & Quality

#### 4.3.1 Description of Environmental Values

Surface waterways will be affected especially during the rock quarrying phrase and heavy rainfall periods; high sediment flow will need to be controlled using approved methods – erosion and sediment control procedures.

Ground water is located at depth and can be contaminated by nutrients from several sources, agriculture chemicals from inland plantations, animal wastes, and sub-standard wastewater treatment systems. All forms of nutrients travel through underground streams, to reach the lagoon, which will damage the lagoon environment.

The soil profile for the proposal are permeable weathered basalt rocks to impermeable clay, surface water flows to the lowest elevation, and is directed by drainage systems to the nearest water channel.

Surface water runoff will occur, with drainage systems installed to keep the site free of water ponds.

Wastewater containment will employ the use of “Porta-loos” during the construction period. These are maintained by the service provider on a daily basis.

Plant and machinery fuel/oil are harmful and toxic substances. This will be stored in a secure location, safety procedures will be followed to ensure that these substances do not contaminate the stream waterways.

#### 4.3.2 Potential Impacts and Mitigation Measures

During the construction phase, drainage systems have been constructed, as REA is aware, following best practice. They will be utilized in flood control/silt control/ storm water harvesting aspects of quarry design.

### 4.4 Air

#### 4.4.1 Description of Environment Values

Air within the area is not known or reported to have been contaminated from harmful substances. Apart from machinery exhaust fumes and from dust, both of localized impact only, there is no direct effect on the atmosphere from the proposal.

#### 4.4.2 Potential Impacts and Mitigation measures

Dust will be addressed in instances that neighbors are affected. However, dust would typically be expected to be problematic within 50 metres of the dust generating source; there is no nearby resident within 350m. IQL will work with residents in the more general area, having them notify IQL if, for instance, unusual wind conditions carry dust to their location. Spraying of the processing machinery product trains with water would ensure air
particles/light dust are not transported such a great distance to neighboring residential properties. Trial crushing in the exploratory phase has shown this not be a problem in practical terms. The valley does not run to the watershed with the Avatiu valley as do its two neighbours (see maps and plans above). Therefore it is more sheltered than other valleys and not prone to winds that would otherwise be generated from the main ridgeline. The valley is exposed to the west, but those winds will drive dust into the uninhabited interior.

Air quality for transport and other machinery can be reduced through ensuring vehicles are fitted with a Warrant of Fitness that complies with current regulations for exhaust emissions. and that machinery is regularly serviced.

4.5 Waste

4.5.1 Description of Environmental Values
Waste is produced and identified from four sources, Liquid Waste, Solid Waste, Building Waste, and Household Waste. All forms of waste have an impact on the Environment, and each have solutions aimed to minimise these impacts.

Liquid Waste is toilet and kitchen wastewater. This wastewater is designed by a Wastewater Designer, to be in compliance with relevant Public Health Standards, Public Health (Sewage and Wastewater Treatment and Disposal) Regulation 2014.

Solid Waste is materials of plastic, glass, tin, aluminum and paper. These items are collected and packaged by contractors, for shipment overseas.

Green Waste is collected by contractors and stockpile at a designed site where these can be put to other uses.

Household Waste is paper wrapping, plastic, glass, aluminium items, separated and packaged, to be collected by contractors for disposal at the Waste Disposal Center.

4.5.2 Potential Impacts and Mitigation Measures
The main contractor will undertake all measures to ensure all construction waste generated will be collected, safely stored and transported off-site. No unsuitable materials will be used as foundation backfill. In addition the main contractor will ensure that liquid waste from plant machinery and construction material is contained and not to be discharged and contaminate nearby stream waterways.

4.6 Noise and Vibration

4.6.1 Description of Environmental Values
The values in play are visual, noise and dust. The remote location means this quarry has no visual impact outside its land. Noise has not proved an issue over the time of trial processing operations. There will be occasional blasting but that will be momentary and remote from properties likely to be affected.

4.6.2 Potential Impacts and Mitigation Measures
One attraction of this site is its location, far inland, and confined within a self-contained valley; this greatly limits noise propagation.
Rock quarrying, crushing and asphalt plant noise is further reduced through confining the noise of rock breaking apparatus, hammering, vehicle noise etc, recognizing and retaining a good measure of the mature vegetation on the steep sides of the valley as these play an important role in assisting with noise absorption.

Transport vehicles emit some noise but are operated to noise standards that are considered appropriate and reasonable for the main road of Rarotonga. Off-road vehicles will not be operated in areas where third parties are likely to be able to hear them.

The quarry project does present a range of workplace hazards, therefore, for OSH purposes entry to the site is permitted only to individuals who are associated with the project.

IQL will be working within working hours of 7:30am -5pm to ensure the residents in the area are not disturbed at such hours outside this time

4.7 Nature Conservation

4.7.1 Description of Environmental Values

Nature conservation is significant to the completed project, through maintaining existing trees and vegetation, and the introduction of the landscape plan.

Although some of the vegetation will be removed to accommodate the proposed development, a good deal of that is regrowth and of foliage that, as REA members visiting have seen, is not rare, or threatened species.

As noted above, during the Productive years in the 1950 -70's of export, the 25 acre land Vaitamanga Section 88M was extensively cultivated with 14 acres in crop mix of vegetables, citrus, coconut, mangoes, bananas, pawpaws and avocados trees as shelter belt on boundaries instead of common pistati tree. (Jambolan, syzygium cumini )On the hill slopes pineapples were grown. To access other parts of the land access roads were formed for trucks to pick up the produce for export or Island Foods cannery in Avarua. The land has since reverted to regrowth bush with a heavy preponderance of au and other opportunistic species.

4.7.1.1 Terrestrial Flora & Fauna

Vegetation along the property boundary is typical of existing species in the area. The existence of rare or threatened species was not located on the site. The plant community indicates some cultural significance of certain species; young coconut trees, kapok (mamau) trees, these will be maintained and protected during the quarrying work.

4.7.1.2 Aquatic Biology

The proposal project will be specifically confined to the upper area areas of the property. The stormwater drainage will be diverted at the adjacent Tamati Stream. Therefore, aquatic fauna may comprise of eels and mosquito fish. No known rare or threatened aqua species were encountered during our site visits.

4.7.2 Potential Impacts and Mitigation Measures

The prominent kapok and albizia trees in the vicinity of the site will not impact on the proposed quarry site; both, in any event are introduced, and the albizia is a problematic invasive species that can and should be removed. At present this area does not provide a
habitat for any vulnerable or endangered fauna, and it is likely that any water eels located in the stream will not be impacted during landscaping works, not least given its totally dry state for much of the year.

4.8 Cultural Heritage

4.8.1 Description of environmental values

Areas and places of cultural significance around the project site have been identified:

- Former agricultural farming up the hills – evidence of bananas trees and coconut trees from activities in the mid-twentieth century
- Tokerau Stream

The quarrying works will be carried out at a distance from these sites. Project information will be shared with relevant custodians to inform them of the work to be carried and that there would be no direct impact to these sites.

4.8.2 Potential impacts and mitigation measures

Recognise that regrowth on the valley sides, even of invasive species and au, can both stabilize slopes and significantly absorb sound; avoid unnecessary foliage removal and encourage regrowth of species as per consultation with landowners.

4.9 Social and Cultural Values

4.9.1 Description of Cultural Values

The island of Rarotonga is the main and most populated island, with a population of 13,097 (census 2011), out of the country’s total population of 17,791. Rarotonga houses the centre of Government, Government Ministries and is the commercial hub of the nation. Entry and departure to the other islands is through Rarotonga via the international airport in Nikao and main port at Avatiu.

Tourism, offshore banking, marine resources and agriculture are the largest industries in the Cook Islands. Tourism in particular has experienced unprecedented growth over the last few years, with over 160,000 visitors per annum and continues to grow.

The project work sites will have very little, if any, impact on the surrounding airport, businesses and recreational activities.

The majority of the work will be carried out inland away from the general public.

4.9.2 Potential Impacts and Mitigation Measures

Significant noise from quarrying and crushing plants along with machinery activity are a natural component of quarrying operations.

Dust from actual crushing will be contained by a sprinkler system fed from the proposed ponds. This system, in common use throughout the world, has not been previously used in the Cook Islands.

Noise levels will be minimal. The existing T&M quarry in the valley to the north of Section 108 is closer to residential buildings than the proposed quarry. The T&M quarry has, over
the many years of operation, not been the subject of any known complaints. The proposed quarry is sufficiently distant from any residential property to ensure that noise levels will be minimal. Furthermore the narrow valley and the dense foliage at the lower end of the valley will minimize the dissipation of noise outside the quarry site. As work will be restricted to daytime and quarry traffic will also be restricted to these hours any traffic noise will blend with normal road traffic.

4.10 Health and Safety

4.10.1 Description of Environmental Values
Protection to the health and safety of workers is crucial on all quarry and similar high hazard sites.

4.10.2 Potential Impacts and Mitigation Measures
Recruitment of Charles Strickland Junior as consultant and quarry manager will ensure his New Zealand expertise, experience and long exposure to NZ OSH best practice should ensure this quarry operates to a high OSH standard.

Fueling of machinery, plant and generators will be undertaken on site. The provision with respect to the packing, marking, handling, carriage, storage, and use of certain flammable, oxidising, and corrosive materials, and certain compressed, liquefied, dissolved, and other gases will be carried out in accordance with all applicable Dangerous Goods standards. Mr Chris Vaile, directing this entire initiative has over 4 decades of experience in dangerous goods handling and will be overseeing this as a subset of overall Triad Group dangerous goods practices.

4.11 Economy

4.11.1 Description of Cultural Values
Construction and engineering for climate change resilience, climate change adaptation and sustainable growth of the economy all depend on critical infrastructure and construction that, in turn, depends on quality materials being available – consistently and at reasonable price.

4.11.2 Potential Impacts and Mitigation Measures
The quarry will have no measurable negative impact on the economy – quite the reverse; the only conceivable negative impact is confined to the introduction of added competition in the market and that negative impact will be to existing operators. Under all existing legislation and policy, open and fair competition is seen as the bedrock of a healthy, growing economy.

4.12 Hazards and risks

4.12.1 Description of Environmental Values
There are very few hazards or risks affecting the environmental values of a small, narrow, degraded subvalley that has previously been extensively modified for twentieth century agricultural purposes. The environmental risks are primarily operational and OSH related.
during the period of quarrying; at the end of that period the risk is of inadequate rehabilitation for any reason.

4.12.2 Potential impacts and mitigation measures
Operational and OSH considerations are set out above.

In terms of rehabilitation, proper quarry design is key; risks are mitigated by having a properly qualified and experienced geologist plan the quarry development on a whole of life basis and in having the regulator on a periodic basis be satisfied that work is continuing in accordance with that plan.

4.13 Erosion Control

4.13.1 Description of Environmental Values
Erosion Control is the prevention of sediment loss from exposed soil surfaces. Disturbed soil surfaces face the risk of erosion through wind, and erosion by running water.

Where drainage channels are absent, adjacent properties become deposition areas for sediment. When erosion control measures and drainage systems are established, environmental values are protected from contamination of soil sediment and debris.

4.13.2 Potential impacts and mitigation measures
As seen in the Vairauara valley, a failure to properly bench any quarry into safe working levels can produce with cliffs topped by unstable overburden; this is the principal erosion control risk – not, presently, adequately controlled in other locations.

The current proposal mitigates that risk by retaining a competent, experienced and qualified geologist, working to plans as advised by him, and on a regular basis updating those with regard to conditions as found as a result of ongoing excavation.

As noted above erosion may produce silt, but silt control and storm water harvesting and storage are an integral part of this proposal.

4.14 Storage and Handling of dangerous Substance

4.14.1 Description of Environmental Values
See as noted above in para 4.10.
In addition, note also the use of explosives and detonators.

4.14.2 Potential impacts and mitigation measures
See as noted above in para 4.10.

In terms of explosives and detonators, these do pose a risk to life and property if not properly handled. Charles Strickland Jnr is appropriately registered and qualified to undertake this work. In terms of storage, explosives precursors are not, themselves explosive and are stored separately to avoid mixing. Detonators are kept securely off-site in locked storage and brought on to site only immediately prior to use.
5 Environmental Management Plan

The Environmental Management Plan (EMP) has been developed to address and manage potential impacts to the environment (biological, physical, social, cultural, and economic) that are considered significant or adverse. The EMP recommend the followings activities for implementation during the projects and following completion. Key activities are listed below.

5.1 Construction and Installation

- Setting out in Phase 1 for quarrying ridge 1 and
- Phase 2 for works for establishing the crushing and asphalt plants facilities within the boundary of the project site;

5.2 Operations

- Asset Management system is established to better performs Property Management and Maintenance.
- Control of solid and liquid waste.

5.3 Stakeholders

Project-related stakeholders includes the following:

- Cook Islands Government
- Project Governance Group / Infrastructure Committee
- Islands Quarrying Ltd (Proponent)
- Landowners of Vaitamanga PT section 88M
- Regulatory authorities (NES, ICI, Public Health)
- Utility service providers (Water works, TAU and Bluesky)
- Contractors/ suppliers.

5.4 Potential Environmental Issues

5.4.1 Key Issues

The key issues significant related with the project are:

1. Land
2. Climate
3. Water Resource and Quality
4. Waste
5. Social
6. Health and Safety
7. Erosion Control

5.5 Environmental Management Procedures

The proponent will be required to develop, implement and maintain procedures, which comply with and amplify the environmental and social management requirements and do not breach any conditions which may be imposed during the REA approval process.

5.6 Communications and Project Management

Daily inspections of environmental control measures will be undertaken by the proponent. The inspections will be conducted visually prior to commencement of each day’s work and
where appropriate during the working day. A final daily inspection will also be undertaken at the end of the workday to ensure that systems and structures are in place.

Where necessary any damage or reduced capacity of environmental control measures will be corrected. If required, environmental control measures may be upgraded.

The environmental controls implementation system will be audited to ensure its continued effectiveness.

5.6.1 Means of Communication
IQL is the first point of contact for all local Agency, Authority, Public communications, and formal communication should be directed to the IQL office.

5.7 Monitoring and Reporting
Monitoring is an essential part of the EMP as it establishes the project's performance against set objectives. A schedule for monitoring and reporting must be developed at the outset to:

- Identify any negative impacts to the project
- Assess the effectiveness of control measures
- Demonstrate compliance with regulatory conditions
- Identify necessary corrective action

Monitoring of the installation for the project is required to ensure proper management of the site during the construction process. It safeguards the project, the community, and stakeholders from irreversible impacts.

In addition, monitoring is required as a result of a complaint.

5.7.1 Complaints
Complaints provide a valuable feedback mechanism, and assist to minimize potential impacts, allowing project practices to be refined and improved. All complaints must be directed to IQL who shall maintain a complaints register, complaints are recorded using a standard form and put into a tracking spreadsheet.

A copy is then forwarded to the NES, to keep all Stakeholders informed. An initial response to the complaint will be provided within 24 hours of receiving the complaint by the IQL, and copied to Stakeholders. Any complaint not satisfactorily resolved, is decided at a combined meeting of relevant Stakeholders.

5.7.2 Inspections
Due to the size and nature of the project, IQL will be responsible for monitoring the work to ensure that the work is undertaken to the required standards. Inspections by local Regulatory Authorities such as NES are required, to ensure activities comply with permit approvals.
Photo 8: The Fauna vegetation at the base of the ridge will remain as a buffer between the quarry site and the landowner’s agricultural land.

5.8 Summary of the EMP

Refer to Table 1.
<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Activity</th>
<th>Construction</th>
<th>Operation</th>
<th>Potential Impact</th>
<th>Mitigation</th>
<th>Monitoring/Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Construct</td>
<td>Perform all activity within boundary limits of the property</td>
<td>Maintain the property in a clean and tidy condition at all time</td>
<td>Erosion of excavated soil from heavy rainfall</td>
<td>Stabilisation of exposed soil with mulch, grass to prevent surface runoff, silt fence and sand bags for sediment controls. Limit the development of roadways to the existing road network</td>
<td>IQL representative and Engineers representative to maintain daily construction records</td>
</tr>
<tr>
<td>Vegetation/Disturbance</td>
<td>Quarrying site</td>
<td></td>
<td></td>
<td>Visual impact Mitigation of Fauna Aesthetic impact</td>
<td>Removal of existing vegetation will be carried out in phase depending on quarry mining Implementation of controlled site restoration Remove trees only as necessary In terms of aesthetics, natural vegetation surrounding the quarry should be retained (such as in a buffer area) so as to help minimise dust emissions.</td>
<td>IQL representative and Engineers representative to maintain daily construction records</td>
</tr>
<tr>
<td>Climate</td>
<td>Construction Activity</td>
<td>The operation site is climate proofed to the variations of climate weather for the Region.</td>
<td>Cyclone season (November –April) Drought season (May-October)</td>
<td>Plant facilities on site to withstand high wind speeds. Rainwater harvesting to be incorporated during low pressures on the main</td>
<td></td>
<td>IQL representative and Engineers representative to maintain daily construction records. Contractor representative to ensure project site is safe and secure. EMCI to provide Cyclone warnings &amp; status</td>
</tr>
<tr>
<td>Water Resources &amp; Quality</td>
<td>Civil engineering methods to be observed</td>
<td>Property maintenance of drainage works</td>
<td>Water supply shortage. Contaminants</td>
<td>Establish adequate drainage systems, with water runoff directed away from</td>
<td></td>
<td>IQL representative and Engineers representative to maintain daily construction records</td>
</tr>
<tr>
<td>Waste</td>
<td>A general clean-up is required during the construction phase each day and at the completion of the project</td>
<td>Collect and store solid Waste for collection. Implementing the 4R's – Reuse, Refuse, Recycle and Reduce</td>
<td>Discharged into ground water, site to nearest drainage system-Tokerau stream. Utilise existing vegetation and adjacent agricultural land to assist with plant uptake of Nutrients and filtration of runoff contaminants.</td>
<td>Records. Conduct regular inspections and record all minor and major faults</td>
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<td></td>
</tr>
<tr>
<td>Accidental Spillage of fuel and oil</td>
<td>Project site</td>
<td>Ground pollution Stream pollution Pollution of groundwater table</td>
<td>Oil and fuel will not be stored on quarrying site</td>
<td>IQL will implement a site inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td>Keeping key stakeholders informed during Construction phase</td>
<td>Improved training that will support programmes in line with the EMP</td>
<td>Complaints from adjacent landowners and general public. Landowner issues are not satisfactory addressed.</td>
<td>Obtain appropriate permits. Communicate closely with key stakeholders and provide sufficient information to the public. Address complaints within 24 hours.</td>
<td>Support existing national NSDP EMP, policy and project goals and objectives. Contractor representative and Engineers representative to maintain daily construction records and monitor noise issues from general public and residents</td>
<td></td>
</tr>
<tr>
<td>Health &amp; Safety</td>
<td>Facilitate a safe working environment and encourage industry best practice throughout the implementing phase. Identify hazards and risk onsite during construction</td>
<td>Property management incorporating health and safety in the workplace</td>
<td>The project site is a hazardous place of potential risks for injury, accidents or harm.</td>
<td>Develop, implement and maintain health and safety procedures on the site. Identify any significant hazards and appropriate means of eliminating or mitigating those hazards.</td>
<td>IQL will implement a site specific health and safety plan and cover all people on site and the general public</td>
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</tr>
<tr>
<td>Noise &amp; seismic emission &amp; seismic vibration</td>
<td>Quarrying site</td>
<td>Adverse impact on hearing</td>
<td>Use of noise protection equipment</td>
<td>IQL will implement a site specific health and safety plan and cover all people on site and the general public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust emission into the atmosphere</td>
<td>Quarrying site</td>
<td>Deposition of Dust on flora etc.</td>
<td>Sprinkling of access roads and terracing during non-rainy and windy days</td>
<td>IQL will implement a site specific health and safety plan and cover all people on site and the general public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Control</td>
<td>Major earthworks and excavation during construction works</td>
<td>Natural landscaping provide for low impact design. Property management of landscaping</td>
<td>Erosion and sediment control measure fail during a wet weather event</td>
<td>Perform routine checks of erosion and sediment control methods by IQL engineer’s representative, and local Authority</td>
<td>IQL representative and Engineers representative to maintain daily construction records. Conduct regular inspections and record all</td>
<td></td>
</tr>
</tbody>
</table>
6 References


Appendices

Appendix A  TOR

This EIA has been prepared in accordance with the published requirements of the REA and the NES, which, as will be apparent from the headings and methodology referred to above has been followed, in terms of headings, matters to be addressed etc as relevant to this particular application for project permit.

Specifically, this is an application to carry out quarrying activity in a remote valley on the Western side of the island of Rarotonga and accordingly, its terms of reference are to consider the likely environmental impacts of that proposed activity, measuring both the proposal and its impacts with reference to those published requirements.

To avoid confusion and unnecessary duplication, the published requirements of the REA and NES are not reproduced in full here, but copies are available if required, both from the offices of NES or, if requested, from the Applicant.

Appendix B  Study Team

Study Team

The Study Team consist of:

- Atatoa Herman - Civil, Coastal and Environment Engineer        July 2017
  Position: Project Engineer
  Employer: AJ Herman Consults
  Nationality: New Zealand - Cook Islands Maori
  Education: P.grad.dip Earth Science –coastal & environment science (Waikato University, NZ); 1998
  - Bachelor of Engineering (civil)-Canterbury University, NZ; 1986
  Membership of Professional Association: Cook Islands Institute of Professional Engineers
  Countries of work experience: New Zealand and Cook Islands

- Des Eggleton – civil engineer    July 2017
  Position: Project Manager
  Employer: Frame Group CI Ltd
  Name of Staff:  Des Eggleton
  Nationality:  New Zealand
  Education:  - NZ certificate of Engineering (Civil). NZCD
  Membership of Professional Association: Registered Engineering Associate No.2531
  Countries of work experience: New Zealand and Cook Islands

- Simon Carryer – consultant geologist        July 2017
Position: Project Geologist and Quarry Design & Environmental Management Specialist
Nationality: New Zealand
Education: Bachelor of Science (geology) University of New Zealand 19662
          Master of Science (geology) University of Canterbury 1965
Membership of Professional Association: Fellow, Australasian Institute of Mining &
          Metallurgy
Countries of work experience: International

Paul Maoate –ICI civil engineer             July  2017

Position: Civil and Geotechnical Engineer
Employer: ICI
Nationality:  New Zealand - Cook Islands Maori
Education:
- Diploma of Engineering (Civil)|UNITEC Institute of Technology|April 2009
Membership of Professional Association: Cook Islands Institute of professional Engineers
Countries of work experience: New Zealand and Cook Islands
• Samuel Napa (Snr) – Water engineer    July 2017

Position: TETL Ico. Representative
Employer: Private Consultants
Nationality: New Zealand - Cook Islands Maori
Education: Cook Islands and New Zealand
Countries of work experience: New Zealand and Cook Islands
Appendix C  Project Site Plan

Viatamanga-ki-Uta Part section 108 Proposed Quarry Site Plan
Appendix D  Profile Sketch

**Fig. 3: Schematic Diagram Showing Methodology of Quarrying Operation from the north face**

**METHODOLOGY OF EXTRACTION**

Generally the methodology of rock extraction from the quarry will be carried out in four distinct phases:

(i) The removal of overburden  
(ii) The rock extraction per benching section  
(iii) Collection and disposal of rocks to the crushing plant  
(iv) Site rehabilitation
14th January 2019

To Whom It May Concern
Kia Orana,

**ISLAND QUARRY’S Ltd EIA : Vaitamanga-ki-Uta Part Sect 108**

**Report On Activities To Prove Quarry Economics**

The following information forms the activities and events that have taken place to assist Island Quarry’s to evaluate the quarry economics in support of the EIA.

**1.0 Formal Actions**

1.1 May 2018  Exploration Permit request made of NES
- To widen existing road to allow good access for equipment to be carted for exploration works.
- Exploration holes of 10 each with 25mm diameter, penetrating 9 metres deep
- Clearing and levelling of drilling platform

1.2 June 13th Exploration Permit confirmed in memo from NES dated 13th June with a time validity of 6 months

1.3 August : The company’s New Zealand specialist Mr Simon Carryer provided to the NES a report outlining further works required to be undertaken so as to finalise an all encompassing EIA application for the establishment of a quarry on the land.

His report summarized the situation per the following points and requested approval to undertake further works.

- The investigations so far completed on the site have confirmed the potential for a significant deposit of basalt rock suitable as a source of roading aggregate.
- Further investigation will be required to evaluate the deposit, particularly the potential for improvement of the quality away from the ground surface.
- The drilling so far completed has confirmed the persistence of the rock exposed at surface to depth.
- Physical testing of the rock recovered from near the surface of the deposit indicates that, at worst, the rock will be suitable for lower grades roading aggregates and possibly for higher grade aggregates.
- Further sampling and testing is necessary before any comprehensive assessment of the deposit can be made.

1.4 September : The NES by way of the Rarotonga Environment Authority, following meetings and an on site inspection gave approval
for further works to be undertaken in a memo dated 6th September.

This approval set out ten conditions : Condition 7 stated ------
• “That the rock material to be moved downhill must not exceed the proposed limit of 2000 cubic metres within a 12 week period.

Further on the 28th September the NES ‘compliance team’ following a site visit discussed and agreed to a further request :
• to clear another access road further up parallel to the existing road to the quarry site, allowing this to run in 100 metres.

1.5 November : A time extension to allow investigative works to be completed was requested and approved with an extension of 12 weeks.

2.0 Rock Face Work Progress

Initial works following the exploration permit being issued went smoothly with the access road to the rock face widened, and the area in the vicinity of the rock face levelled in preparation for the drilling of test bores.
Upon carrying out the rock drilling, the rock proved to have considerable number of fissures which made it difficult to impossible to recover samples for testing and analysis.

Given this situation there became a need to request to move further rock --- hence our August request to NES.

The September NES approvals allowed us to start managing the removal of materials and to form an access to above the rock face so as to prove the extent of the rock.

This new access enabled explorations to be carried out further in and on top of the rock face that had been exposed. The opening of this access proved relatively straightforward given an old track was located, and followed thereby providing access inland with minimal foliage destruction.

3.0 Lower Level Works.

The NES approvals allowed for the set up of a portable crusher so as to prepare and assess crushed materials for a number of possible uses being,
• Sealing chips for road surfacing
• Basecourse material for road foundation works
• Fines for asphalt manufacture
• All in mix for concrete manufacture.

Rock was recovered from the original rock face and stockpiled lower down ready to be tested in the crusher.

Given the restrictive nature of the site (minimum amount of flat area) Island Quarry’s proceeded to place a culvert along a portion of the stream so as to provide a site for the crusher.

The picture that follows shows the culvert being positioned.

![Box Culvert Units Placed In Stream Bed.](image1)

Loose material from above the rock workings was then compacted over the culvert and a flat area established to enable the portable crusher to be positioned in this area.

![Setting up Crusher Work Site](image2)

All this was regularly inspected by NES during which they agreed that we clean and clear the stream bed further inland. This approval was based on the opportunity to check the stream form and the area below the natural waterfall further upstream that
could offer a storage area for a ‘pumped hydro’ for future power generation in this area.

Further the availability of stored water at the site will assist in reducing and controlling dust from quarry operation by the inclusions of sprinklers during crushing. This is a common practise overseas but rarely if ever applied in the Cook Islands.

A silt trap was positioned downstream of the culvert to control, and avoid any silt moving along the stream outside of the general site, in the advent of rain and heavy runoff.

The restrictive site required any rock crushed, to be moved from the site to stock piles, some of which was used on road maintenance work in a contract with ICI to assist in improvements to Rarotonga’s roading network.

4.0 Summary

- The inland portion of the land block offers great potential to form a quarry allowing royalties to be received by the land owners and good construction materials for the Cook Islands industry.
- The site is well out of sight of the passing public and located such that noise from the operation is very minimal.
- Good access is available to and from the site.
- The upper area of the stream offers potential for the construction of a “pumped hydro” storage power generation facility without severe destruction of foliage in the area.
- A water storage facility included in this work would allow a sprinkler operation to be positioned so as to control dust at times of crushing.
- The materials removed and tested have proved to be of superior quality to other sources that presently provide to the Cook Islands construction industry.
Appendix F Quarry Design And Report By Geologist