

**BEFORE THE BOARD OF INQUIRY
TAMARIND DEVELOPMENT DRILLING APPLICATIONS**

EEZ100016

IN THE MATTER

of the Exclusive Economic Zone and
Continental Shelf (Environmental
Effects) Act 2012

AND

IN THE MATTER

of a Board of Inquiry appointed under
s52 of the Exclusive Economic Zone
and Continental Shelf (Environmental
Effects) Act 2012 to decide on
Tamarind Taranaki Limited's marine
consent and marine discharge consent
applications

**STATEMENT OF EXPERT EVIDENCE OF FRASER JAMES COLEGRAVE
FOR TAMARIND TARANAKI LIMITED**

DATED: 20 July 2018

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CONTENTS

1.	Executive Summary	3
2.	Introduction	5
3.	Upstream Oil & Gas Activities	8
4.	Importance of the Oil & Gas Sector to the Taranaki Region	9
5.	Economic Rationale for the Project	11
6.	Regional Economic Impact Methodology	12
7.	Estimated Regional Economic Impacts	14
8.	Response to Issues Raised by Submitters	18

MAY IT PLEASE THE BOARD

1. Executive Summary

- 1.1. My evidence considers the likely regional economic impacts of the proposed drilling activity, plus the potential future impacts of increased production if the proposed drilling activity is successful.
- 1.2. I start by briefly explaining the role of development drilling within the upstream phase of the oil and gas (O&G) sector. In short, it is performed on existing/proven O&G reserves when production levels start to dwindle, to help locate new pockets of hydrocarbons nearby to existing wells so that future production is maximized over the remaining consented field life.
- 1.3. Next, I explain the economic significance of the O&G sector to the Taranaki region, and use a technique called location quotients to quantify its relative importance. The analysis confirms that the sector is far more important to Taranaki than any other region, with all production to date occurring there.
- 1.4. I then briefly explain the economic rationale for the proposed activities. Simply put, approximately \$400 million has been invested in exploration and development of the Tui field over the last 12 years. To help spread that cost over the greatest possible output, additional drilling is required to ensure that all remaining, commercially-viable reserves are rightfully extracted over the remaining consented life of the field, which terminates in November 2025.
- 1.5. This not only makes good commercial sense to Tamarind, but it also represents an efficient use and development of a natural resource.
- 1.6. I then describe my economic impact methodology, and identify the three channels via which regional impacts will flow. They are:
 - (a) The employment of (and wages paid to) numerous Taranaki residents, either directly or indirectly via project partners and suppliers;
 - (b) Increased local spending by people employed due to the project, which creates an additional round of project-related economic impacts; and

(c) The purchase of project services (such as engineering services) or the supply of materials, such as well cement, from regional businesses.

1.7. Applying this methodology to project information provided by Tamarind, I calculated the following regional economic impacts of the proposed activities.

Table 1: Overall Regional Economic Impacts of the Project

Impact Measures	Project Employment	Increased Local Spend	Local Project Purchases	Total Impacts
Value-Added \$m	\$8.2m	\$3.1m	\$4.4m	\$15.7m
Employment (FTEs)	90	50	30	170
Household Incomes \$m	\$8.2m	\$1.6m	\$2.1m	\$11.9m

1.8. In summary: the project could boost regional GDP by \$15.7 million, provide full-time employment for 170 people for one year, and generate an additional \$11.9 million in household incomes.

1.9. Further, If the proposed development activity is successful, it will boost production relative to the rate that could be expected absent it. This will create additional regional economic impacts, as shown below.

Table 2: Overall Regional Economic Impacts of Future Production

Impact Measures	Project Employment	Increased Local Spend	Local Project Purchases	Total Impacts
Value-Added \$m	\$50m	\$20m	\$40m	\$110m
Employment (FTEs)	30	50	100	180
Household Income \$m	\$50m	\$10m	\$20m	\$80m

1.10. In summary: over the next six years of remaining consented field life, future production could boost regional GDP by \$110 million, provide full-time employment for 180 people, and generate an additional \$80 million in household incomes.

1.11. Further, future field life is expected to provide an additional \$45 million in royalties to the Crown, and a further \$45 million in taxes, if the proposed development work is successful. Accordingly, not only will the proposal have significant regional economic benefits, but it will also provide significant ongoing fiscal benefits to Central Government too.

- 1.12. I also respond to various matters raised in submissions. I show that claims of economic irresponsibility do not make sense, and that the converse is true. Further, I explain that the proposal will not somehow attract investment in cleaner energy technologies, as some submitters seem to suggest.
- 1.13. Finally, I note that several submissions have been received in support, which identify significant economic benefits. I agree, and therefore support the proposal on economic grounds.

2. Introduction

- 2.1. My full name is Fraser James Colegrave.
- 2.2. I hold a Bachelor of Commerce (first-class Honours) in Economics from the University of Auckland.
- 2.3. I am currently the managing director of Insight Economics Limited and have held this position since 2013. Prior to that, I was a founding director of Covec Limited, another economics consultancy, for 12 years.
- 2.4. I have successfully led and completed more than 350 consulting projects across a wide range of sectors. I also regularly provide expert testimony at hearings before various judiciaries, including Councils, the Environment Court, the High Court, Boards of Inquiry, and Independent Hearing Panels.
- 2.5. Amongst other things, I have estimated the likely regional economic impacts of several major projects across New Zealand, which are collectively worth more than \$10 billion. They include:
 - 2.5.1. NZ's largest developed gas field (Maui);
 - 2.5.2. A \$400 million 5-star hotel/convention facility (in PNG);
 - 2.5.3. A \$250 million infant milk formula plant in Pokeno;
 - 2.5.4. The velodrome and Cycling Centre of Excellence in Cambridge;
 - 2.5.5. NZ's largest mussel farm;
 - 2.5.6. The expansion of Millbrook Resort in Arrowtown;
 - 2.5.7. The upgrade and extension of Skyline resort in Queenstown; and
 - 2.5.8. NZ's largest dairy farm.

- 2.6. I have read the following information:
- 2.6.1. The Marine Consent Application and Marine Discharge Consent Application (the “Applications”) and the Impact Assessment and Annexures, which accompanied the Applications (the “IA”), in particular, the sections that relate to the economic impacts of the proposed activities;
 - 2.6.2. The statements of evidence by:
 - a. Mr Jason Peacock;
 - b. Mr Iain McCallum;
 - 2.6.3. Submissions; and
 - 2.6.4. Proposed consent conditions.
 - 2.6.5. EPA Key Issues Report, dated July 2018
 - 2.6.6. The following independent reviews commissioned by the EPA (the “technical reviews”):
 - b. *Technical Review and Analysis of Operational Activities associated with Sidetrack Development Drilling and Marine Discharge Consent - Assessment Report*, prepared by Oil and Gas Solutions Pty Limited, dated 22 May 2018; and
 - 2.6.7. Tamarind’s *‘Response to the s54 Request for Further Information’*, dated July 2018 (“RFI Response”).
- 2.7. My role in relation to Tamarind’s application has been to undertake an independent review of the IA as it relates to economic effects and to consider and assess the potential economic impacts of the proposed activities, to prepare expert evidence and to respond to any questions raised by the Board, EPA and/or submitters on this topic.

Code of conduct

- 2.8. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is entirely within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.
- 2.9. My qualifications as an expert witness are set out above. The issues addressed in this brief relate to the application for a marine consent and marine discharge consent and are matters within my area of expertise

Scope of evidence

- 2.10. In this evidence, I will:
- 1.1.2 Briefly describe the role of development drilling within the upstream phase of the oil and gas (O&G) sector.
 - 1.1.3 Illustrate the critical importance of the broader O&G sector to the Taranaki region;
 - 1.1.4 Explain the basic economic rationale for the project;
 - 1.1.5 Describe the methodology that I used to estimate the likely regional economic impacts of the proposed activities;
 - 1.1.6 Present my estimates of likely regional economic impacts; and
 - 1.1.7 Respond to issues raised by submitters that are within my area of expertise.
- 1.2 I consider that I have reviewed the best available information in assessing, and drawing conclusions about, the above matters, and in completing my Statement of Evidence.

3. About Upstream Oil & Gas Activities

3.1. The O&G industry comprises three main phases:

- (i) Upstream – finding and extracting O&G reserves.
- (ii) Midstream – storing and transporting O&G products.
- (iii) Downstream – refining, distributing, and selling O&G products.

3.2. This evidence focuses on the economic impacts of development drilling, which is an important part of the upstream phase. Development drilling is performed on existing/proven O&G reserves when production levels start to dwindle and approach uneconomic levels. Its purpose is to help locate new pockets of hydrocarbons nearby to existing wells so that future production over the remaining consented and/or useful life of the field is maximized.

3.3. Given its high costs, and to ensure that drilling is well-targeted, development activity is usually undertaken only following extensive background research and analysis.

3.4. The drilling itself is, in this case, performed by a mobile offshore drilling unit (MODU), which is usually rented on a daily basis. Once towed into place, the MODU drills through the layers of rock below until it reaches the desired location. Throughout the drilling process, various rock and fluid samples are extracted and conveyed back for detailed geological analysis.

3.5. If no hydrocarbons are found, the well is deemed a 'dry hole' and no further development drilling activities are undertaken and the well will be plugged and abandoned according to strict regulatory requirements. If, however, additional hydrocarbons are discovered in potentially-commercial quantities, the newly-drilled well may then move into production. In this instance, and due to the reuse of existing infrastructure, hydrocarbons can be extracted for processing, distribution, and sale immediately after the drilling process is completed.

4. Importance of the Oil & Gas Sector to the Taranaki Region

- 4.1. Taranaki is the heart of New Zealand's O&G industry, with all production to date coming from the Taranaki basin. The basin itself covers an extensive area (of more than 100,000 square kilometres), and has a strong track record of successful oil and gas discoveries. Consequently, the Taranaki region is the base for most O&G firms operating in New Zealand, along with numerous smaller local companies, who provide ongoing support services. As a result, the O&G industry is far more important to the ongoing prosperity of Taranaki than any other region in New Zealand.
- 4.2. To illustrate the critical importance of the O&G sector to the Taranaki region, I used a simple empirical technique called 'location quotients'. These analyse a region's economic structure to identify sectors that account for a significantly higher or lower proportion of regional employment than the national average.
- 4.3. Specifically, the location quotient for each sector is calculated by dividing its share of regional employment by the corresponding share of national employment. For example, if a certain sector represents 5% of regional employment but 10% of national employment, the location quotient for that sector is $5\%/10\% = 0.5$. Conversely, if a sector accounts for 20% of regional employment, but only 10% of national employment, the corresponding location quotient is 2. Thus, the higher the location quotient, the greater the relative importance of that sector to the region.
- 4.4. With that definition in mind, the location quotients for the two sectors that are most closely-aligned with the O&G sector, namely "oil and gas extraction" and "exploration and other mining support services" are presented below.

Figure 1: Regional Location Quotients for Oil & Gas Extraction

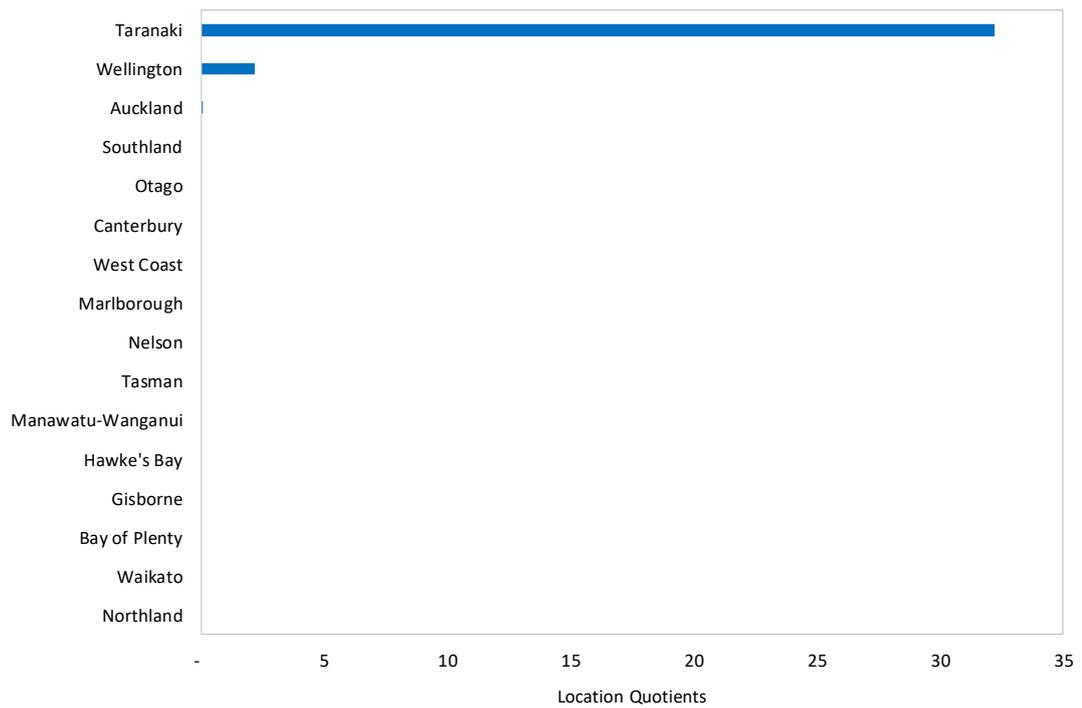
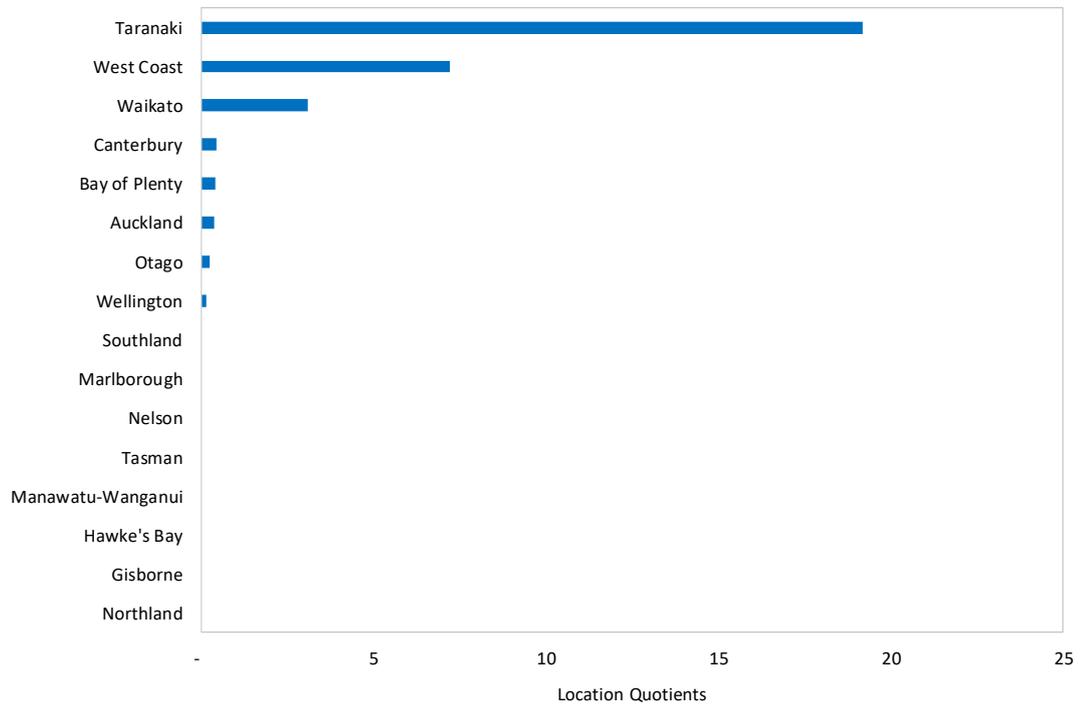


Figure 2: Regional Location Quotients for Exploration and Mining Support Services

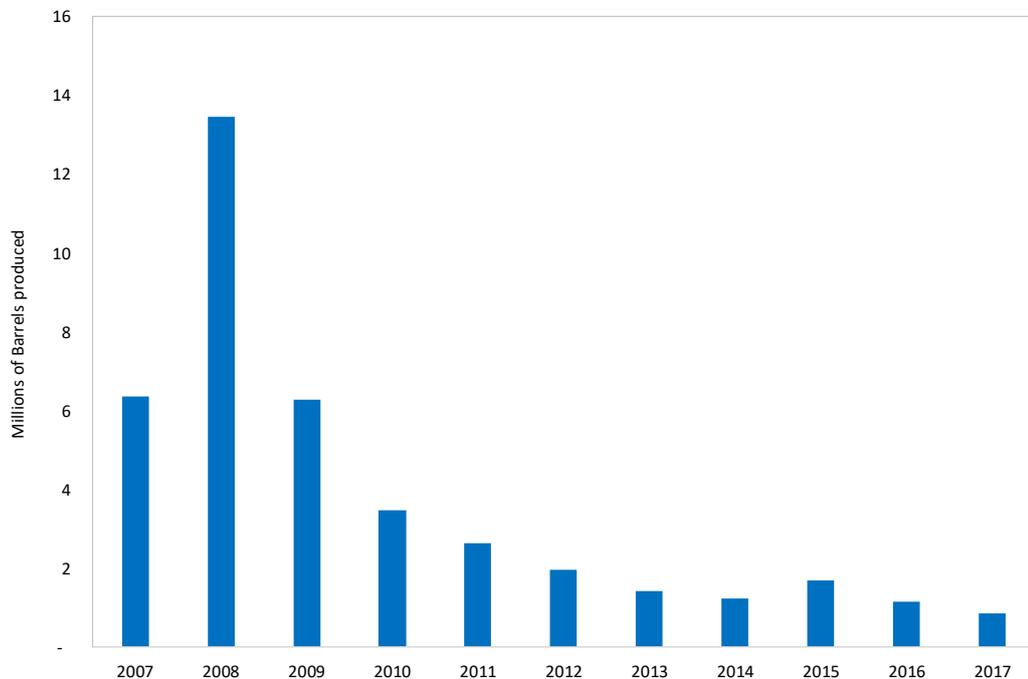


- 4.5. According to Figure 1, Taranaki’s location quotient for oil and gas extraction is more than 30, which means that it is over 30 times more important (as a source of employment) to the Taranaki region than the national average.¹
- 4.6. Similarly, Figure 2 shows that exploration and mining support services are nearly 20 times more important to Taranaki (as a source of employment) than the national average. Accordingly, it follows that the future prosperity of the O&G sector is of critical important to the future prosperity of the Taranaki region and its residents.

5. Economic Rationale for the Project

- 5.1. As noted in the impact assessment (IA), the Tui Petroleum Mining Permit (PMP 38158) was granted in November 2005 for a period of 20 years, with production commencing in July 2007². Although production started strongly, with up to 50,000 barrels being produced daily, it quickly waned. This is depicted in Figure 3, which plots production data published by MBIE.

Figure 3: Tui Field Annual Oil Production (millions of barrels)



¹ As most readers will appreciate, the Taranaki region is the only area of New Zealand where oil and gas extraction activities occur. The supposed occurrence of this activity in Wellington and Auckland (as implied by the graph) simply reflects the fact that some Taranaki-based workers report to a head office in those regions. In reality, however, Taranaki is the only place where this activity occurs, and hence is the only region whose location is greater than zero.

² Refer to the IA, page 7

- 5.2. Figure 3 confirms that production started strongly, with nearly 14 million barrels of oil produced in in the Tui field in 2008, which was the first full calendar year following commencement. However, production fell by more than 50% the following year, and has gradually declined ever since (except for a small increase in 2015).
- 5.3. As also noted in the IA, approximately \$400 million has been invested in exploration and development of the Tui field over the last 12 years.³ This represents a significant 'sunk cost', which the field's operators naturally wish to amortise over the greatest possible levels of future output. To maximise that output, additional development drilling is required to ensure that all remaining, commercially-viable reserves are rightfully extracted over the remaining consented life of the field, which terminates in November 2025. This is the basic economic rationale for the proposed activities.
- 5.4. Given the significant costs incurred thus far in field exploration and development, not only does the proposal make commercial sense from Tamarind's perspective, but it also represents an efficient use and development of a natural resource. Indeed, absent the proposed work, significant outlays would invariably be required to start exploration elsewhere. To the extent that those future costs can be delayed/deferred, the proposal maximises the economic efficiency of Tamarind's operations by producing the greatest possible output at the least possible cost.

6. Regional Impact Methodology

- 6.1. The proposed activity entails the side-track drilling of up to five development wells from four existing production wells in the Tui field over a period of 5-9 months. According to Tamarind, this will cost nearly US\$70 million, which is approximately NZ\$100 million at today's exchange rates.
- 6.2. While some of that expenditure will naturally leak out of the region, a significant proportion will be captured locally and thus deliver significant regional economic effects. These regional economic benefits will flow via three related channels.

³ Refer to the IA, page 3

- 6.3. First, the project will employ numerous Taranaki residents, either directly or indirectly via project partners and suppliers. This increased employment will manifest not only as increased household incomes and employment – which are key economic measures – but also as increased regional GDP. This is because GDP can be measured in several different ways, one of which is to add up the payments made to factors of production, such as labour.
- 6.4. Second, a proportion of project-related wages paid to regional employees will be spent locally, and thus create additional economic stimulus via the so-called ‘induced effect’. For example, a proportion of wages paid locally will be spent on weekly groceries and other household essentials, which increases the demand for – and hence output of – various regional sectors. As a result, it creates an additional round of project-related economic impacts, which my analysis includes.
- 6.5. Finally, a proportion of project expenditures will accrue to regional project partners, either from the provision of project services (such as engineering and planning services) or the supply of materials, such as well cement. These regional expenditures will also generate direct regional economic impacts in the form of increased employment, incomes, and regional GDP.⁴
- 6.6. To summarise, the regional economic impacts of the proposed activity were calculated via the following steps:
- 6.6.1. Identifying the level of project-related employment and household incomes that are likely to accrue to the region, which form part of the project’s direct regional economic impacts.
- 6.6.2. Subtracting taxes, savings and other forms of expenditure ‘leakage’ from the regional household incomes calculated in the previous step. Then mapping the remainder, which reflects increased regional spending, to sectors of the regional economy using household spending profiles contained in the New Zealand Household Economic Survey. Then overlaying corresponding

⁴ Some of these regional project expenditures may create further impacts to the extent that direct project suppliers need to source additional inputs from their own suppliers, and so on, to complete the project. These flow-on effects are also captured via my economic impact methodology, which is based on a special type of analysis called multiplier analysis. The appendix provides a short introduction to multiplier analysis and explains how I used it in this evidence.

regional economic multipliers (which are described in the appendix) to derive the resulting flow-on effects.

6.6.3. Determining likely regional expenditures associated with the project, and mapping each to sectors of the regional economy. Then, overlaying the corresponding regional economic multipliers to determine the resulting regional economic impacts.

6.6.4. Summing the various impacts above to determine the overall (direct and flow-on) economic impacts of the proposed activities, which are measured in terms of regional incomes, employment, and GDP.

6.7. While this evidence focusses on the tangible, regional economic impacts of the proposed drilling, I acknowledge that there may be further impacts if commercially-viable quantities of additional hydrocarbons are identified for potential future extraction. To reflect that possibility, I also briefly consider the potential economic benefits, including fiscal effects, of additional production that might flow from the proposed drilling work.

7. Estimated Regional Economic Impacts

Direct Employment and Wages Paid

7.1. Tamarind supplied me with a detailed schedule of employment requirements. It identified the number of people employed by key project resource, the proportion of each group's time that will be dedicated to the project, and the likely duration of each group's involvement. Table 1 summarises that data.

Table 3: Project Employment Requirements by Key Resource

Key Project Inputs	Employees per shift	No of shifts	% of time on this project	Years Involved
Core rig & rig-based personnel	120	2	100%	0.5
Other rig-related	60	1	100%	0.5
FPSO Umuroa	30	2	20%	0.5
Supply vessels	15	2	100%	0.5
2 Helicopters	10	1	20%	0.5
Service companies in Taranaki	100	1	30%	1.0
Tamarind staff in Taranaki	12	1	100%	1.5

- 7.2. Table 3 shows that many people will be required to complete the project. In fact, I calculated that it will provide employment for more than 500 people. However, some workers will be involved only on an ad-hoc basis and/or for only about half a year. Even still, the project is expected to provide full-time employment for about 220 people for one year, and will generate wages and salaries of about US\$14.4 million. Of this, over 40% is expected to accrue to Taranaki residents.
- 7.3. Hence, assuming an exchange rate of NZ\$1 = US0.70, the project will provide full-time employment for 90 Taranaki residents for one year, and provide about \$8.2 million in regional household incomes. These represent the direct employment-related regional economic impacts of the project (where incomes paid to regional residents also represent direct increases in regional GDP).

Flow-On Effects of Increased Regional Spending

- 7.4. As noted earlier, a significant proportion of the \$8.2 million in wages paid to regional residents will be spent locally and hence create additional economic impacts. To calculate those, I first subtracted likely tax payments (including GST), contributions to savings, and spending that will leak out of the region (while on holidays etc.). The remainder of approximately \$4.1 million was assumed to be spent locally.
- 7.5. Next, I mapped the \$4.1 million of extra regional spending to sectors of the regional economy and overlaid corresponding regional economic multipliers to derive the resulting economic impacts. Table 4 presents the results.

Table 4: Flow-on Effects of Increased Local Spending

Impact Measures	Values
Value-Added \$m	\$3.1m
Employment (Full Time Employees (FTE))	50
Household Incomes \$m	\$1.6m

- 7.6. Table 4 shows that increased local spending by project-related workers could provide additional regional economic boosts equal to \$3.1 million of regional GDP, full-time work for 50 people for one year, and an additional \$1.6 million in regional household incomes.

Purchases of Services and Supplies from Regional Businesses

7.7. In addition to estimating employment requirements, Tamarind also provided a breakdown of estimated project expenditures, including the proportion of each that is likely to be spent within the region. The resulting regional project expenditures totaled just over NZ\$9.5 million (excluding wages and salaries), which I mapped to sectors of the regional economy based on the nature of the underlying services and supplies required. Then, I overlaid the corresponding regional economic multipliers to derive the economic impacts tabulated below.

Table 5: Impacts of Purchasing Local Services/Supplies

Impact Measures	Values
Value-Added \$m	\$4.4m
Employment (FTEs)	30
Household Incomes \$m	\$2.1m

7.8. According to Table 5, the purchase of project services and supplies from regional businesses could boost regional GDP by \$4.4 million, provide full-time work for 30 people for one year, and yield an additional \$2.1 million in regional household incomes.

Overall Regional Economic Impacts of the Project

7.9. The overall regional economic impacts of the project are summarized in the table below, and include the direct effects of project-related employment, increased local spending by regional project employees, and the purchase of supplies and services from local businesses.

Table 6: Overall Regional Economic Impacts of the Project

Impact Measures	Project Employment	Increased Local Spend	Local Project Purchases	Total Impacts
Value-Added \$m	\$8.2m	\$3.1m	\$4.4m	\$15.7m
Employment (FTEs)	90	50	30	170
Household Income \$m	\$8.2m	\$1.6m	\$2.1m	\$11.9m

7.10. In summary: the project could boost regional GDP by \$15.7 million, provide full-time employment for 170 people for one year, and generate an additional \$11.9 million in household incomes. Clearly, the regional economic impacts of the proposed activities represents a significant benefit to Taranaki.

Regional Economic Impacts of Future Production

7.11. If the proposed development activity is successful, it will boost production relative to the rate of production that could be expected absent it. Indeed, that is the sole purpose of the proposed activities, with the IA suggesting that it could boost future crude oil revenues by up to \$500 million.

7.12. To calculate the impacts of future production, Tamarind estimated likely staff and resourcing requirements to the end of field life. I used those to derive the following estimates of potential future impacts using the same broad methodology as above. The resulting estimates include:

- The direct benefits of ongoing employment and wages for Tamarind’s Taranaki-based staff;
- Increased local spending by those workers; and
- Future purchases of field supplies and services from local businesses.

Table 7: Overall Regional Economic Impacts of Future Production

Impact Measures	Project Employment	Increased Local Spend	Local Project Purchases	Total Impacts
Value-Added \$m	\$50m	\$20m	\$40m	\$110m
Employment (FTEs)	30	50	100	180
Household Income \$m	\$50m	\$10m	\$20m	\$80m

7.13. In summary over the next six years of remaining consented field life, the future production could boost regional GDP by \$110 million, provide full-time employment for 180 people, and generate an additional \$80 million in household incomes. Hence, not only will the proposed drilling work have significant economic impacts, but so would future production if the development activity is successful.

7.14. In addition to the regional economic impacts derived above, Tamarind also provided initial estimates of likely fiscal impacts. In short, future field life is

expected to provide an additional \$45 million in royalties to the Crown, and a further \$45 million in taxes, if the proposed development work is successful. Accordingly, the project will not only benefit the region directly via increased GDP, incomes and employment, but it will also provide significant ongoing fiscal benefits to Central Government too.

- 7.15. I therefore consider the proposed drilling activities will result significant economic and financial benefits to Taranaki and New Zealand.

8. Response to Issues Raised by Submitters

- 8.1. Some submitters appear to believe that the proposed drilling activity is economically irresponsible, and that declining the application may attract greater investment in cleaner energy solutions.⁵
- 8.2. I respectfully disagree. First, the proposed activity merely seeks to extend the economic life of an activity that has already been consented and in which Tamarind has invested several hundred million dollars. Accordingly, the proposed activity is not irresponsible. In fact, the converse is true.
- 8.3. By undertaking the proposed drilling and maximizing future production of the field, Tamarind can produce hydrocarbons at a much lower average cost than would otherwise be the case, while also delaying the need for costly exploration elsewhere. Accordingly, the proposed activity is economically responsible, not irresponsible.
- 8.4. Further, I disagree that denying the application will somehow attract investment in cleaner energy technologies. Indeed, I am not aware of any entity that would be persuaded to suddenly undertake such expensive and speculative research if this specific consent is denied.
- 8.5. As most readers will appreciate, the economics of clean energy technologies depends on several factors, most of which are beyond our control. For example, the financial viability of alternative energy research depends fundamentally on the prevailing world prices of oil and gas, neither of which

⁵ Refer to submissions of Oil Free Wellington and Brent Barrett.

will be materially-influenced by the proposed drilling, nor any possible future production enabled by it. I therefore disagree with this statement.

- 8.6. Finally, I note that several submissions have been received in support of the proposal, which identify significant potential economic benefits⁶. I agree with those submissions, and consider that the proposal represents an efficient use of a scarce, finite, natural resource.



FRASER JAMES COLEGRAVE

20 July 2018

⁶ Worley Parsons, Elemental Group, Fitzroy Engineering Group Limited, HNZ New Zealand Limited, Kinetic Well Services Ltd, Port Taranaki Ltd, Iain Christopher Scott, Taranaki Health Foundation, Atlas Professionals NZ Ltd, BW Offshore Singapore Pte Ltd (NZ Branch)

Appendix: Introduction to Multiplier Analysis

- 1.3 As noted several times above, my assessment of the project's likely regional economic impacts incorporates a technique called multiplier analysis. As its name suggests, multiplier analysis incorporates sector-specific multipliers.
- 1.4 These multipliers, in turn, are derived from detailed matrices called input-output tables, which describe the various supply chains that comprise the regional economy. Specifically, input-output tables show the particular set of inputs that each sector needs to produce one unit of its output, plus the industries and end-users to which each sector sells its output. As a result, input-output tables enable the wider economic impacts of a change in one sector to be traced through the regional economy to estimate the overall impacts, including flow-on effects. These are typically measured in terms of regional GDP, household incomes, and employment.
- 1.5 Consider the following example. Suppose a local construction company wins a large, new building contract. In addition to extra labour requirements, the company will also need to source a range of additional building products from its suppliers to complete the job. Those suppliers, in turn, will need to source various inputs from their suppliers, and so on. The input-output table traces all these interdependencies so that the wider economic impact of the new building work can be estimated.
- 1.6 Specifically, the economic impacts estimated by multiplier analysis comprise two parts:
- **Direct Effects** – these are the direct economic effects of the entity (or entities) in question, plus the economic effects of their immediate suppliers.
 - **Flow-On Effects** – these are the overall economic impacts of the wider supply chain that support the entity's immediate suppliers. In addition, they capture the additional economic stimulus of increased spending by people employed as a result of the project (either directly or indirectly).
- 1.7 The overall regional economic impact of the project equals the sum of the direct effects and flow-on effects, which are typically measured in terms of:

- Total contributions to regional value-added (GDP),
- The number of regional residents employed full-time, and
- Total wages and salaries paid to regional workers, which are reported in economic impact assessments as ‘household incomes.’

1.8 To see how they work, the following table shows Taranaki’s regional economic multipliers for the ‘exploration and other mining support services’ sector, which is expected to capture a significant share of regional project expenditures.

1.9 These multipliers essentially translate the project’s likely expenditure in each regional sector into resulting measures of economic impact. They are usually expressed as proportions of sector output, however the multipliers for employment are expressed per million dollars of output instead.

Table 8: Regional Economic Multipliers for Exploration & Other Mining Support

Measures of Economic Impact	Direct	Flow-on	Total
Value-added/GDP	0.26	0.08	0.34
Employment (per million \$ of output)	0.88	0.35	1.23
Household Incomes	0.13	0.02	0.15

1.10 These multipliers show, for example, that each dollar of project expenditure spent in this sector will directly generate 26 cents of GDP, with a further 8 cents of GDP generated indirectly via flow-on effects. Hence, the total impact of each dollar spent in this sector will be 34 cents of regional GDP. The same interpretation applies to the multipliers for both employment and household incomes.