

Economic Impact Analysis of the Cape Rodney Okakari Point (Leigh) Marine Reserve on the Rodney District

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A report prepared for the Department of Conservation

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Abstract

This analysis was initiated in light of the Department's Strategic Direction¹ and shows that aside from the known intrinsic and biological benefits, marine reserves can, in a broader context, make a considerable contribution to local economies.

The study looks at the economic impact of activities associated with the Cape Rodney – Okakari Marine Reserve (CROP) on the Rodney District by measuring the reserve's economic impact on variables such as the level of employment, expenditure and incomes.

The Cape Rodney Okakari Point Marine Reserve was established in 1975 and is the most popular marine reserve in New Zealand. The reserve received an estimated 375 000 visits in the year to February 28th, 2008.

The surveys show that around 60 % of visitors to the reserve are day visitors to the Rodney District and spend an average of \$29 per person. Around 30 % are overnight visitors to the region and spend an average of \$137 per trip. Seven percent of visitors live locally and 1 % owned property locally but lived outside the district. The majority of day visitors (54 %) said that if the marine reserve did not exist then they would not visit, or would be unlikely to visit, the district on the day they were interviewed

The Total Output in Rodney dependent on the existence of the marine reserve is estimated to be \$18.6 million per year. Some \$12.1 million of this is direct spend by visitors and the balance is the result of flow-on effect through the district economy. Associated with this output is Total Value Added of \$8.2 million per year and employment for 173 FTE's (full time equivalents) in Rodney, including 10 jobs in marine reserve-related activities.

DOC's total annual budget at the marine reserve varies but is approximately \$70,000 per year, including a total staff input of 0.8FTE.

¹ DOC Strategic Direction 2008-11: "The overarching purpose of the Department is to increase the value that New Zealanders attribute to conservation. This leads to enhanced care of New Zealand's unique heritage for people to benefit from and enjoy."

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1. Background

1.1 Study Background

It is well known that New Zealand's natural environment and its recreation opportunities underpin our tourism industry. Tourism contributes around \$17.2 billion per year, or 9.5 % to GDP. Overseas tourism accounted for \$8.1 billion or 18.7 % of our exports in 2005, making the industry New Zealand's largest foreign exchange earner.

To assess the economic impact of the direct use and indirect economic benefits of public conservation land, the Department of Conservation commissioned independent Christchurch economists, Butcher Partners Ltd, to study several regional terrestrial systems (DOC, 2006). This current study to investigate the economic contribution of the Cape Rodney – Okakari Point (CROP) Marine Reserve at Leigh to the Rodney District economy was overseen by Butcher Partners Ltd.

Some study of the value of the marine reserve at Leigh to the surrounding Rodney district has been attempted. In a 2002 study, the Rodney Economic Development Trust made a simple estimate of the amount spent by visitors (then 300 000 per year) to the marine reserve, placing the value to the local economy at \$12.5 million per year at that time (REDT, 2003).

1.2 Cape Rodney–Okakari Point Marine Reserve

The CROP Marine Reserve, which is less than 2 hours drive from Auckland, was established in 1975 and was the first marine reserve in New Zealand. The site provides the opportunity to observe many species including snapper, moki, blue cod, leather jackets and rock lobsters close to the shore. The ability to easily view fish is said to be one of the major attractions of the site. There is a sandy beach lined by pohutakawa and rock platforms allowing exploration of the intertidal rock pools. The bay is relatively protected by Goat Island which provides a safe, pleasant coastal setting. There is a very accessible sheltered beach, with rock pools and snorkeling/diving opportunities which are additional attractions of the Reserve.

The CROP Marine Reserve could be considered the most well known marine reserve in New Zealand, and received an estimated 375, 000 visits in the year to February 28th, 2008 (appendix 2). The reserve is busiest during summer public holidays when the weather is warmest, with close to 6000 people per day visiting on favourable days (DOC, 2003). Although the Long Bay Marine Reserve (Auckland Area) attracts upwards of 1,000,000 visitors annually, the attraction is primarily the beach and beach activities rather than the marine reserve

itself (McCrone, 2001). In contrast, a survey in 2005 showed that over 90% of visitors to the CROP Marine Reserve knew they were in a marine reserve and 72% of visitors went in the water to snorkel or swim (DOC, 2005).

1.3 Study Scope

Economists have a number of different methods by which to measure or estimate economic value.

The most comprehensive method involves cost-benefit analysis. The economic worth or benefit of some activity is compared with the cost of that activity. If the net benefits are positive, this indicates that the activity has economic merit and is more worthwhile the larger the net economic benefit. Estimating benefits is challenging and usually involves inclusion of historic costs and benefits with appropriate interest rates used to cover the opportunity costs of the investment in the activity over time. For marine reserves this might include any costs associated with the loss or displacement of fishing and other extractive opportunities. Full social cost-benefit analysis would include the direct value of the activity (for example, its use for tourism and recreation) and also more intangible economic values including non-use values. Examples include intrinsic value, aesthetic value and bequest value.

Another way in which economists measure economic value is by measuring the activity's economic impact on variables such as the level of employment, expenditure and incomes. This is called economic impact analysis. Economic impact analysis is more limited in its scope than is social cost-benefit analysis which estimates total economic value. One reason for this is that economic impact analysis only takes account of the market (or commercial) economic components associated with a resource or environmental initiative whereas social cost-benefit analysis would take account of non-market components (such as existence value) as well.

In practice, economic impact analysis usually has more policy clout than social cost-benefit analysis. The former is something which people can more easily relate to, particularly measures of jobs and income, while the latter is normally much more costly to complete because of the type of survey techniques involved and the results may be less objective and more controversial than those for economic impact analysis (Tisdell, 2007). While net benefit is a relevant measure for decisions on public and private investment, economic impact analysis is useful for a clearer understanding of the significance of an activity to a regional economy². The purpose of this research is

² For example, it is quite conceivable that economic impacts associated with a project may be a significant part of a regional economy, but have only a very small net benefit. Also, measures of net benefit are not generally available for any other sector, so it is not possible to make meaningful comparisons of the project with other sectors.

to help people understand how significant a marine reserve can be to a regional economy.

In light of the foregoing, it was decided to conduct an economic impact analysis for CROP Marine Reserve both to show how significant the reserve was to the Rodney District economy and also to allow result comparison with work carried out by Butcher Partners Ltd in several terrestrial conservation areas (Butcher 2006, DOC 2006). An economic impact assessment will also allow results to be viewed in a broader context with other economic activities, such as fisheries, agriculture or total tourism in the district.

The study does not look at the protection and species conservation values or the non-recreation ecosystem services associated with the marine reserve. Nor does the study address the economic impact of the reserve on local recreational or inshore commercial fisheries. Given that the reserve was established in 1975, it was decided that projection of fisheries value in the absence of the reserve would be subjective and problematic. The issue anyway is not about the most appropriate use of the reserve area as the marine reserve has been long established. The focus of the study is whether CROP makes a contribution to the local economy. Hence the study looks only at the economic impact of activities associated with the Cape Rodney – Okakari Marine Reserve on the Rodney District.

2. Methods

2.1 Economic Impact Variables Measured

Output:

Output is the value of sales by a business. This is the total turnover, or the sum of the value added and purchases from suppliers.

Value Added (income):

Value Added in a business is equivalent to output (sales) minus inputs purchased from other businesses. Value added includes household income as well as returns to land and capital (including interest, depreciation and profits) and taxes. It is analogous to Gross Domestic Product.

Household Income:

Household income is the part of value added that is paid to individuals for their labour. It includes wages and salaries and self-employed income.

Employment:

Number of employees and self employed persons expressed as full time equivalents (FTE's)

2.2 Region visits

The Rodney area was visited on 14 – 16 of October 2007. Businesses with direct dependence on the marine reserve were interviewed (Glass Bottom Boat Tours, Marine Reserve Guides, Goat Island Dive) as well as some indirect operators (University of Auckland Lab, Pakiri Beach Horse Rides, Leigh Motel, DOC, Rodney Economic Development Trust, Rodney District Council and the Walkworth i-Site Information Centre).

Data were collected on the number of visitors and fees charged in the most recent years from the businesses with direct dependence on the marine reserve. From this information, rough estimates could be made of the gross annual revenue obtained by each entity. Data were also collected on the level of employment in the enterprises covered.

2.3 Visitor spending questionnaires

To estimate the extent of expenditure in the Rodney District related to the CROP Marine Reserve answers to several questions were required; How many people visit the marine reserve each year? How much longer did visitors stay in the Rodney District as a result of the existence of the marine reserve? Or put another way, how much less

time would they have spent in Rodney if there was no marine reserve?
How much money did visitors spend in Rodney?

Jenna Martin and Katrina Subedar, graduate students based at the Leigh Marine Lab, were employed to conduct visitor surveys. Visitors were identified as either day trip visitors to the Rodney District, overnight visitors to Rodney District, or living or owning property within the Rodney District (even if the property owner lived elsewhere). Interviewers showed a map so that people understood that Orewa is within Rodney District. A different questionnaire was tailored to each of the three groups to investigate how much longer people stayed in the Rodney District as a result of the existence of the marine reserve and how much money they spent. The three questionnaires including instructions for the interviewers are in appendix one. In surveys where respondents were asked to estimate spending, the interviewer then asked if the respondent would take a prepaid envelope containing the same spending questions to complete over the remainder of the day and send back to DOC to enable a comparison of estimated spending to actual spending (see appendix one). Survey respondents were asked questions relating to the spending of their entire group to increase the effective sample size.

One thousand surveys covering the spending of 3,800 people were conducted by the students between December 24, 2007 and June 13, 2008. The surveys were done in 4 time blocks of 250 surveys with each time block representing approximately quarter of the annual visitors. Block one from December 24 - January 9 was surveyed on most days and showed a predominance of New Zealand families on longer visits. Block two from January 10 - February 30 was interviewed most days with a mix of visitors on shorter visits. Block three was assumed to represent visitors in March, April, November and December 1- 23. Block three was surveyed in March when there were a number of school groups visiting. Block four was assumed to represent visitors in the 'off season' from May 1 – October 31 and was surveyed from May 17 – June 13; this group contained a higher portion of foreign visitors. In addition to these 1,000 surveys by the two students, the author conducted 160 surveys from January 11 – 14, 2008 as a quality control check.

The average spending from the four lots of data did not vary significantly from each other, or from the 160 quality control surveys. Hence the quality control surveys were included in the analysis, and the total sample was considered to be a reliable measure of average spending of all visitors. The motivation for carrying out the quality control surveys was the initial significant variance in results between interviewers for some questions from Lot 1 data. The quality control surveys found middle-ground means on the questions with interviewer variance, and results of surveys in Lots 2- 4 showed that the average for each interviewer merged towards those means. It was concluded that the original variance in results between interviewers was variation

associated with small sample sizes.

2.4 Visitor numbers

The Department has installed a permanent vehicle counter across the road at the culvert 30 metres north of the campground on Goat Island Road. A calibration exercise to enable estimates of visitor number to the marine reserve was conducted January 10 and 11 2008. The average number of passengers counted per car was 3.5. An adjusted estimate of total visitors to the marine reserve per car counted was calculated as 4.3 (accounts for counting error in children not visible in cars, or tinted car windows as well as visitors who walk to the reserve from the camp ground, traffic to the marine lab and boat visitors). For details on the calibration exercise see Appendix 2.

The vehicle counter has not worked continuously in recent years hence Rodney District Council installed a back-up counter alongside the Department counter from December 2007 – Feb 2008. Both counters worked and reported no significant difference in vehicle count during this time. Vehicle count figures used in this analysis were taken from March 1st, 2007 – February 28th, 2008. Over the 365 days car count data was complete for 279 days. Data for the remaining 86 days was taken from either the previous week or the previous year (see appendix 2). A total of 87,214 cars were counted. The calibration figure of 4.3 visits per car count was used to calculate an estimate of 375,020 visits for the year.

3. Results

3.1 Multipliers

Direct spending by visitors, either while at the marine reserve or as a result of a trip to visit the marine reserve has a flow-on or multiplier effect on the local Rodney economy. This multiplier effect³ augments the economic impact of direct spending to give a total economic impact. Multipliers for each category of visitor spending were calculated by creating and manipulating an approximate economic input-output model for Rodney District generated by Butcher Partners Ltd⁴. The model for Rodney was derived from the 2003-04 national model using a well-established non-survey procedure for deriving regional models.⁵ The multipliers used for calculation of Total Output, Value Added (business and personal income), Household income, and Employment are shown in Table 1, and are Type II multipliers, (i.e. which include the induced impacts of increased household spending as visitor spending at various businesses leads to increased household incomes in those businesses).

These multipliers are applied to the net increase in visitor spending attributable to the marine reserve, where the net increase is estimated by asking visitors how likely they would have been to visit the area in the absence of the marine reserve, and how much longer or shorter their trip would have been in the absence of the marine reserve.

	Output Multiplier	Value Added :Spend Ratios		Household Income : Spend Ratios		Employment : Spend Ratios (FTEs / \$m)	
		Direct	Total	Direct	Total	Direct	Total
Manufacturing	1.45	0.45	0.68	0.40	0.51	8.9	11.5
Retail Margins	1.58	0.53	0.85	0.46	0.61	14.1	17.7
Food / Restaurants	1.63	0.44	0.75	0.37	0.52	14.4	18.0
Accommodation	1.57	0.55	0.83	0.43	0.55	14.5	17.7
Activities	1.72	0.37	0.74	0.26	0.47	7.2	12.1

Table 1. Multipliers by Sector for Rodney District (derived by Butcher Partners Ltd)

³ For example, see explanation in Miller "Economic Multipliers: How Communities Can Use Them for Planning" University of Arkansas, http://www.uaex.edu/Other_Areas/publications/PDF/FSCDD-6.pdf

⁴ Copyright to Butcher Partners Ltd.

⁵ For a fuller description of this process see Jensen, R.C., Mandervill, R.D., and Karunaratne, N.O. [1979]; "Regional Economic Planning: Generation of Regional Input-Output Tables. London: Croom Helm

3.2 Visitor Mix

From March 1, 2007 to February 28, 2008 the reserve received an estimated 375,000 visits. Table 2 summarises survey results which show that 61% of these people were day visitors to the district, 30% visited and stayed overnight in the district, 7% lived locally and 1% owned property locally but lived elsewhere. It was assumed that spending in the district by local residents would not alter in the absence of the marine reserve, and hence they were excluded from the analysis in section 3.3.

Visitor type	Day	Overnight	Live or own property in Rodney	
			live	visiting
Portion of visits from surveys	61%	30%	7%	1%
Estimated visits per year	227962	114162	27750	5126
Average spend per person per trip in Rodney	\$ 28.79	\$ 137.21		\$ 209.02

Table 2. CROP Visitor breakdown

3.3 Visitor spend by Visitor Type and Industry Sector

The survey results showed that day visitors spent an average of \$29 per person within Rodney, with overnight visitors spending an average of \$137 per person per trip within Rodney. In the surveys, spending was broken down into the following categories:

- Activities directly relating to the marine reserve (i.e. glass bottom boat tours and rental of snorkeling, diving and kayaking gear);
- Activities not mentioned above (horse riding, wine tasting etc);
- Fuel;
- Retail (wine, markets, souvenirs etc);
- Food and drink (cafes, restaurants, bars etc); and
- Accommodation

Table 3 shows the expenditure breakdown for both day visitors and overnight visitors, and shows that total spending during trips to the District for visitors to the marine reserve was \$23.3 million per year, including \$6.6 million for day visitors and \$16.7 million for all overnight visitors.

Visitor type	Day Visitors		Overnight Visitors			
			Not owning house in Rodney		Owning holiday house in Rodney	
	portion	value	portion	value	portion	value
Total spend	100%	\$ 28.79	100%	\$ 137.21	100 %	\$209.02
Activities - marine reserve related	21%	\$ 6.05	6%	\$ 8.23	23 %	\$20.70
Activities - non-marine reserve	5%	\$ 1.44	6%	\$ 8.23	8 %	\$24.93
Retail - Food and Restaurants	41%	\$ 11.80	34%	\$ 46.65	38 %	\$46.36
Retail - Other	16%	\$ 4.61	8%	\$ 10.98	8 %	\$49.34
Fuel	17%	\$ 4.89	7%	\$ 9.60	23 %	
Accommodation	0%	\$ -	39%	\$ 53.51		
Number of Visitors		228,000		114,000		5,100
Spend by Visitors		\$6.6 m		\$15.6 m		\$1.1 m

Table 3. Visitor spending breakdown in \$ per person per visit. Note: Excludes 28,000 visits to the reserve by those who live permanently in Rodney.

Survey respondents were asked to take home a postal survey to return to DOC in a pre-paid envelope with a table of actual spending to fill in after their visit. This was to compare estimated spending from the beach survey with respondents' actual spending. Response to the postal survey was very low with only 34 respondents. The data showed that day visitors (19 respondents) actually spent \$37.40 per person in Rodney; those same respondents estimated a spend of \$30.24 per person for the day in their beach survey. On average respondents underestimated their daily spend by \$7.15 or 19% of their spending (but this ranged from overestimating by \$47.50 to underestimating by \$291). Overnight visitors (15 respondents) reported spending 42 % more in their postal survey than they estimated in the beach survey (ranging from \$54 overestimate, to \$138 underestimate). The low response rate and high variance means that the postal survey results are unreliable, so they were not used to adjust the total spend per person in calculations shown in table 2 and 3. However, the postal survey does suggest that the economic impacts presented here are likely to understate actual impacts, as the survey respondents did appear to underestimate their spending overall to some extent.

3.4 Impact of the Marine Reserve on Visitor Itinerary and Spending in Rodney

While the 337,000⁶ visitors to Rodney who visited the marine reserve spent an estimated \$23.3 million within Rodney during their visit to the

⁶ 28,000 permanent residents of Rodney were excluded from the analysis on the grounds that the existence of the reserve was unlikely to affect their spending in Rodney District. It is assumed that if they had not gone to the reserve they would have spent the same amount of money elsewhere in Rodney.

district, this spend is not all as a result of the marine reserve's existence. Visitors were asked how likely it was that they would have come to Rodney District if the Marine Reserve did not exist, and their responses are shown in Figure 1. A significant proportion of visitors probably or definitely would have come to the District, even if there was not a marine reserve. We allocated a reasonable probability of coming to Rodney for each response group (see column 4 in Table 4). This was done by allocating 100% to 'No' and 0% to 'Yes', and evenly allocating a percentage value to the 'likely' to 'unlikely' answers in between. This was considered a simpler approach than asking those surveyed for a percentage probability that they would visit if the reserve did not exist.

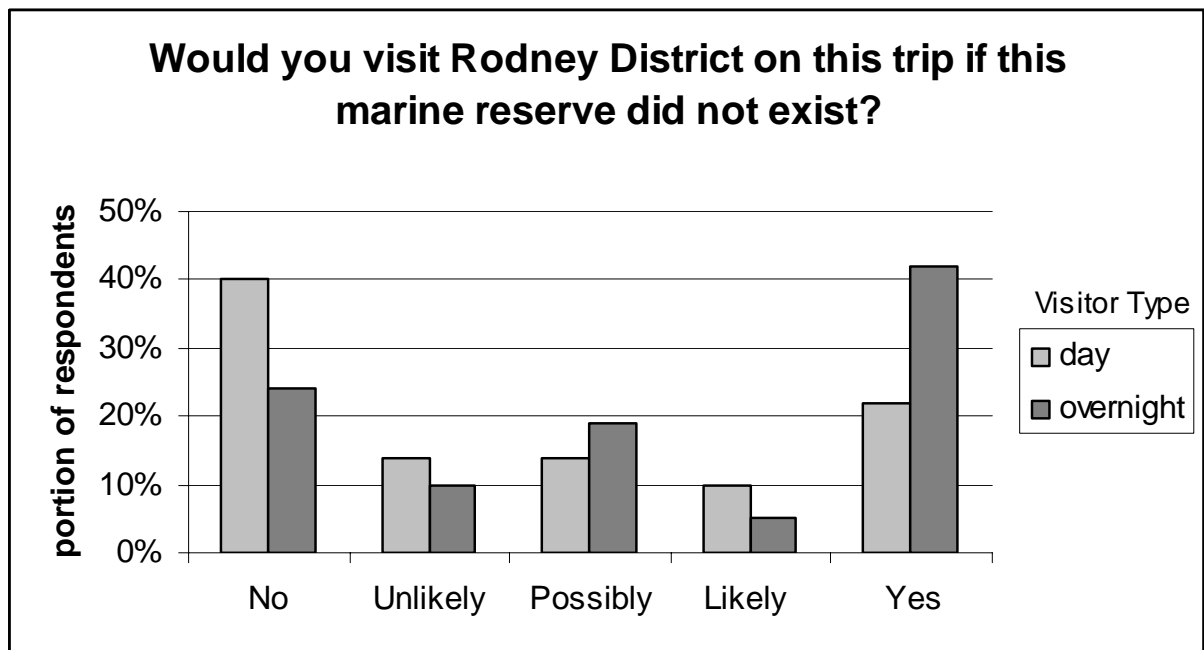


Figure 1 Effect of marine reserve on visits to Rodney District

We also asked visitors whether the absence of a marine reserve would have changed the duration of their stay in the district. Their answers are shown in column 5 of Table 4. As the table shows, visitors would stay less time in Rodney District if there was no marine reserve.

Adjusting the spend in each group by both these factors (see column 6 of Table 4) it is estimated that the direct spend in Rodney attributable to the existence of the marine reserve was \$12.1 million in the year ended Feb 2008.

Visitor type	Would you come to Rodney on this trip if the marine reserve did not exist?	Annual visitors	% who spend due to marine reserve	% less time in Rodney if no marine reserve	Spend per visitor due to marine reserve	Effect on spend \$m/yr	Total Effect on spend \$m/yr
1)	2) Survey response	3) DOC totals x survey portions	4) Study estimate	5) Study survey result	6) = 4 x spend per visitor + ((100% - 4) x 5 x spend per visitor)	7) = 6 x 3	
Day	No	90,610	100%		\$28.8	\$ 2.61	\$ 4.49
	Unlikely	32,361	80%	48%	\$25.8	\$ 0.83	
	Possibly	32,001	50%	28%	\$18.4	\$ 0.59	
	Likely	22,293	20%	12%	\$8.5	\$ 0.19	
	Yes	50,698	0%	18%	\$5.2	\$ 0.26	
Over-night	No	26,925	100%		\$137.2	\$ 3.69	\$ 7.00
	Unlikely	11,488	80%	24%	\$116.4	\$ 1.34	
	Possibly	21,540	50%	11%	\$76.0	\$ 1.64	
	Likely	5,744	20%	4%	\$31.6	\$ 0.18	
	Yes	48,465	0%	2%	\$3.0	\$ 0.15	
Visiting Owners	No	1,183	100%		\$209.0	\$ 0.25	\$ 0.57
	Unlikely	394	80%	24%	\$177.3	\$ 0.07	
	Possibly	1,971	50%	11%	\$115.8	\$ 0.23	
	Likely	394	20%	4%	\$48.2	\$ 0.02	
	Yes	1,183	0%	2%	\$4.6	\$ 0.01	
Total Visitors Spend due to CROP		347,250					\$12.05

Table 4. Effect of CROP Marine Reserve on visits to Rodney District and additional direct spend due to the reserve.

The Net Change in direct spend from Table 4 is shown in Table 5, broken down by the sectors established in the input-output model generated by Butcher Partners for Rodney.

	Day Visitors (\$m)	Overnight Visitors (\$m)	Total Visitors (\$m)
Imported Goods for resale	0.80	0.65	1.45
Local Manufacturing	0.30	0.26	0.56
Retail Margins	0.37	0.32	0.69
Food and Restaurants	1.83	2.59	4.42
Accommodation		2.74	2.74
Activities – Reserve-related	0.95	0.48	1.44
- Other	0.23	0.52	0.75
Total	4.49	7.57	12.05

Table 5 Direct Additional Spending in the District by Visitors due to the Marine Reserve

3.5 Economic Impact Analysis for 2007

Application of the economic multipliers calculated for the various industries to the expenditure shown in Table 5 led to the estimation of the Marine Reserve's total economic impacts on Rodney District in 2007. It is estimated that \$18.6 million of Total District Output (total turnover – including purchases from suppliers) was dependent on the CROP Marine Reserve, as was \$8.2 million of district business and personal income (Value Added) including \$5.5 million of household income. The reserve created employment for 173 FTE's (full time equivalent), including 10 jobs in marine-related activities that would otherwise not have been provided.

		% spend	Output		Value Added		Employment		Household Income	
			\$m	\$m	\$m	\$m	FTE's	FTE's	\$m	\$m
			Direct	Total	Direct	Total	Direct	Total	Direct	Total
Day	Retail margin	9%	0.4	0.6	0.2	0.4	5.2	6.6	0.1	0.2
	Imported retail goods	18%	0.8	0.8	-	-	-	-	-	-
	Locally produced retail goods	7%	0.3	0.4	0.1	0.2	2.6	3.4	0.1	0.2
	Food & Restaurants	41%	1.8	3.0	0.8	1.4	26.4	33.0	0.7	1.0
	Activities - Marine related	21%	1.0	1.6	0.4	0.7	6.9	11.5	0.2	0.4
	Activities - non MR	5%	0.2	0.4	0.1	0.2	1.7	2.8	0.1	0.1
	Day Totals	100%	4.5	6.8	1.6	2.8	42.8	57.2	1.3	1.9
Over-night	Accommodation	39%	2.7	4.3	1.5	2.3	39.9	48.6	1.2	1.5
	Retail margin	4%	0.2	0.4	0.1	0.2	3.6	4.6	0.1	0.1
	Imported retail goods	7%	0.5	0.5	-	-	-	-	-	-
	Locally produced retail goods	3%	0.2	0.3	0.1	0.1	1.8	2.4	0.1	0.1
	Food & Restaurants	34%	2.4	3.9	1.0	1.8	34.1	42.5	0.9	1.2
	Activities - MR related	6%	0.4	0.7	0.2	0.3	3.1	5.2	0.1	0.2
	Activities - non MR	6%	0.4	0.8	0.2	0.3	3.2	5.4	0.1	0.2
O/night totals	100%	7.0	10.9	3.1	5.1	85.8	108.6	2.5	3.4	
Visiting Owners	Retail margin	11%	0.1	0.1	0.0	0.0	0.9	1.2	0.0	0.0
	Imported retail goods	19%	0.1	0.1	-	-	-	-	-	-
	Locally produced retail goods	9%	0.1	0.1	0.0	0.0	0.5	0.6	0.0	0.0
	Food & Restaurants	39%	0.2	0.4	0.1	0.2	3.2	4.0	0.1	0.1
	Activities - MR related	10%	0.1	0.1	0.0	0.0	0.4	0.7	0.0	0.0
	Activities - non MR	12%	0.1	0.1	0.0	0.1	0.5	0.8	0.0	0.0
	V/Owner totals	100%	0.6	0.9	0.2	0.3	5.5	7.2	0.2	0.2
Total All Visitors			12.1	18.6	4.9	8.2	134	173	3.9	5.5
Implied Average Multipliers				1.55		1.68		1.29		1.4

Table 6. Total Economic Impacts of CROP Marine Reserve (2007)

4. Discussion

4.1 Interpreting Economic Impact Analysis

Net or Gross Impacts

It is worth noting that many reports focus on TOTAL spending in the area by all visitors to the attraction, whereas in this report we have considered only that part of total spending which would not have occurred in the absence of the reserve. Had we taken the alternative approach, our results would have been almost twice as large⁷.

Choice of Study area

The results of an economic impact analysis depend on the size of the area of study chosen, and the location in which the impacts are being measured. In this study we consider the economic impact on Rodney District of activities rising in relation to the marine reserve. The choice of geographic boundary reflected what was believed to be the most relevant boundary from the perspective of those who are interested in or concerned about the reserve, that is, the impact on the local economy. The choice of study area plays a significant role in the final figures obtained. The examples below illustrate this point by comparing this study at Leigh to the previous analysis conducted on Fiordland National Park (Butcher 2006).

Effects of Study Area Size on Impacts

The economics of some systems studied may be such that the all the direct impact occurs within the study area. This is not the case for the marine reserve at Leigh, where many of the economic impacts associated with the marine reserve occur outside the Rodney district.

A key component of this study was to assess how much money was spent in Rodney by visitors due to the existence of the marine reserve. It was not an objective of the study to consider spending outside of Rodney due to the marine reserve. Some 58% of visitors to the reserve were day visitors. Although not recorded directly, it was noted that a number of these day visitors bring a picnic lunch from Auckland; most of these visitors also fill their vehicle with petrol in Auckland. A significant proportion of overnight visitors come to Rodney with food, particularly those camping (43 % of overnight visitors) and staying at private accommodation (33 % of overnight visitors). In contrast the Fiordland study area included Queenstown-Lakes District and all of Southland District in its study area. This larger study area included towns large enough to have supermarkets and large petrol stations, hence the proportion of spend outside the region associated with the average visit to Fiordland would have been considerably less than for

⁷ Total direct spending in the district by visitor to the reserve was estimated to be \$23.3 million, but only \$12.1 million of this was attributed to the reserve. The balance would have occurred even if the reserve did not exist.

Leigh.

Leigh also attracts a large number of SCUBA divers from both around New Zealand and abroad. New Zealand has an estimated 150 000 divers and Dive New Zealand often recommends Leigh in response to dive site inquiries from abroad (pers. comm. Graham Older, Dive NZ). With Leigh being such a sheltered and enjoyable dive within a few hours of Auckland, a large portion of New Zealand divers would have either trained for their dive certification at Leigh or visited at some stage. Most of these dive training schools, organised trips, gear rental and sales would be based in Auckland. This contrasts again with Fiordland where hiking has less equipment, few courses, and the guided trips and gear rental is probably purchased mostly within the region. The significant spending generated outside the study area at Leigh would lead to an understatement of gross economic impacts when compared to the Fiordland study.

Implications of Study Area Size when making Comparisons between Studies

Region size must be considered when comparing the results to other studies. Where a study region's economy is small and within close proximity to a large economic centre outside the study area, as is the case at Leigh, money will cycle less within the region, making the flow-on economic impact within the region comparatively small. Where a region is large and includes centres of substantial size, more goods are supplied from within the region so money can cycle more, creating larger economic impact. For example a day visitor to Leigh might buy a \$4 sandwich in Leigh for lunch which in fact was made in Auckland, and a \$20 pizza in Auckland for dinner. The \$2 mark-up on the sandwich is the only economic impact on Rodney. In contrast a day visitor to Milford Sound who spends the same \$24 would find their sandwich was made in the region, their pizza was bought within the region, its dough was made at the same local bakery that made the sandwich, toppings were all bought locally and some were grown locally; hence the economic impact is much greater than the \$24 spent, compared to just \$2 in Rodney.

Increases in Study Area lead to More Substitutions and hence Lower Net Impacts

If the objective of the study is to estimate a large economic impact why would researchers not simply increase their region of study? Because another key component of the analysis is to consider what people would do instead if the resource did not exist. If visitor spending would remain similar and be spent elsewhere within the region, then the economic impact does not count as being a net increase due to the resource being studied. So in Fiordland a large region could be studied as many visitors to Fiordland would not even come to the region if Fiordland did not exist. If the marine reserve did not exist at Leigh visitors might spend more time in Auckland, so to include Auckland in the region would render all this alternate spending as having no

economic impact on the region. However, by looking at the Rodney District this alternate spending has a big impact on the region, so the marine reserve at Leigh does have a large economic impact on the Rodney District.

4.2 How does the Economic Impact Compare?

The direct economic activity associated with Department activities at the marine reserve is around \$70 000 per year including employment of 0.8 FTE's. Capital expenditure is excluded, but depreciation and capital charges are included. DOC's accounting records indicate that approximately half the Department's spending is visitor asset spending (maintaining the car park and access), 25 % is compliance and law enforcement, and 25 % is public awareness and biological monitoring.

This study shows that this very small investment in protecting an inshore coastal area for scientific research and biological integrity has a large economic impact on the Rodney District. The Total Output in Rodney dependent on the existence of the marine reserve is \$18.6 million per year and 173 FTE's in Rodney District are dependent on the marine reserve. This is a very significant return to the people of Rodney District as a result of public investment by the Department.

Although CROP Marine Reserve was selected as a show-case study, there are many other similar sites with potential to be of equally impressive value. New Zealand currently has 32 marine reserves; while some are in isolated locations receiving minimal visitors, others are in popular, attractive locations which also contribute significantly to their local area, although the extent of their contribution is yet to be quantified (e.g. Poor Knights, Hahei, Abel Tasman, Long Bay). The newest marine reserve established is Taputeranga, on the Wellington South Coast. Given its location it is also expected to contribute to local economic activity. It is already a popular dive spot and with plans for a marine education centre nearby it will certainly create an important tourist destination. The Department is currently developing research plans with Victoria University, which is rebuilding its marine research lab next to the marine reserve, to further study these economic impacts in due course. The Department recognises the importance of drawing on a wider range of skills through collaboration to achieve its goals.

The Department is committed to achieving conservation results through wider community collaboration and its new Strategic Direction 2008 – 2011 reflects its overarching purpose to increase the value that New Zealander's attribute to conservation. The Department is seeking to entrench conservation as an essential part of the sustainable social and economic future of New Zealand by promoting the benefits and values of conservation and demonstrating that conservation contributes to economic prosperity. This study shows that aside from the known

intrinsic and biological benefits of marine reserves, in a broader context some of our marine reserves make a considerable contribution to local economies.

Crothers and McCormack (2008) estimated the local Leigh fishers would contribute to household incomes in the town approximately \$800,000 per annum. Although the household income associated with the marine reserve was calculated for all of Rodney District, the value (\$5.5 million) still implies a real shift in the focus of economic activity for the area from what was once primarily a fishing village. This shift in economic value creation away from resource extraction in favour of newer economic activities such as tourism is being seen at many levels from small communities (Collins 2008, Gibbs 2008, Orams 2000) up to national levels.

Statistics New Zealand releases data on the marine economy but notes that for marine tourism most spending can not be isolated from National Accounts. Hence marine equipment retailing was the only classification included in the marine tourism and recreation category. However, the Allen Consulting Group published a study on the economic contribution of Australia's marine industries. The report, which covered an economic impact assessment of Australia's marine tourism, marine fisheries and seafood, refining of petroleum from offshore sources, shipping, shipbuilding, and port based industries, found that the marine tourism sector was the largest of the marine related industries in terms of direct value added and employment in 2002-2003. Marine tourism contributed \$11.3 billion in direct value added (43 % of the total for all marine industries) and \$28.2 billion in indirect (or total) value added (61 % of the total for all marine industries). Marine tourism was also the second largest contributor to exports after offshore gas and oil (Allen, 2004).

While social acceptance of these sorts of economic shifts can take time to build, this report assists in highlighting the considerable economic value created by marine reserves, and shows the real quantifiable economic value of conserving marine sites. Crothers and McCormack (2008) record shrinkage in the Leigh-based fishing activity at a time when the tourism value for the Rodney District of the marine reserve is increasing. From an economic activity aspect the Rodney District appears to be better off for having the CROP marine reserve.

The study also shows that conservation is an important part of our economy and society in material economic value, as well as the value of conservation to our national identity and way of life.

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Appendices

A1: Questionnaires and Notes to Interviewers

Objective.

Find out how much spending in the Rodney District as a whole depends on the CROP (Leigh) Marine Reserve

There are three parts to this:

1. How much longer did you stay in the Rodney District as a result of the existence of the marine reserve? Or put another way, how much less time would you have spent in Rodney if there was no marine reserve.
2. How much did you spend per day (or per visit) in Rodney?
3. Multiply (1) x (2) to get the change in visitor spending resulting from the park.

Questionnaires

There are three different sets of questionnaires depending if visitors to the marine reserve are day visitors to Rodney, overnight visitors to Rodney, or local to Rodney. It is important to show the map so that people understand that Orewa is within Rodney District. Use the;

Blue survey questionnaire for **day trip** visitors to the **Rodney District**

Green survey questionnaire for visitors **overnighting** in the Rodney District

Pink survey questionnaire for those who **live or own property** within the Rodney District (even if property owner lives elsewhere).

Note non-responders: Please note down the number of people who decline to be interviewed

Spending Tables: Interviewers doing a similar questionnaire at Tongariro National Park reported good results from getting expenditure for a group as a whole (typically 2 – 4 people). This is good to do as it gives us a larger population sample for the same number of interviews. **Make sure you specify number of people to whom expenditure applies.**

My contact info if you or any respondents would like to discuss the questionnaire further: Lou Hunt (Contractor to DOC) 027 342 1700

Hi, my name is _____ and I'm doing a survey about the regional economic effects of the marine reserve at Leigh for the Department of Conservation. To do this, we need to find out something about visitor expenditure. Would you be able to spend five minutes to answer a few questions? All your answers will be completely confidential.

Are you visiting today on a day trip from outside the Rodney District, a visitor overnighting in the Rodney District, or do you live or own property within the Rodney District? [show the map so that people understand that Orewa is within Rodney District]

Blue survey questionnaire for day trip visitors to the Rodney District

Interviewer _____

Date _____

Survey Site _____

1) Where do you normally live?

Auckland Area (other than Rodney)

Rest of New Zealand

Overseas

Which Country _____

2) How many hours do you expect to spend

At the marine reserve?	< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
In Rodney District [show map]?	< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
How long have you been in Rodney so far?	< 1 hr	1 – 3 hrs	3 – 6hrs	6 – 9 hrs	>9 hrs

3) If this marine reserve did not exist would you have still come to the Rodney District today? [show map of district]

Yes (go to question 4)

Likely (go to question 4)

Possibly (go to question 4)

Unlikely (go to question 4)

No (go to question 6)

4) If the marine reserve did not exist, would you have stayed less time / the same time / more time in Rodney District?

Same (go to question 6)

Less Time (go to question 5)

More Time (go to question 5)

Not sure (go to question 6)

5) How many fewer or extra hours would you have stayed in the Rodney District?

How much LESS time?	< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
How much MORE time? prompt	< 1 hr	1 – 3 hrs	3 – 6hrs	6 – 9 hrs	>9 hrs

6) Which of the following activities do you or members of your immediate group expect to spend money on during this trip to the region? (**Interviewer: Please note number of group members in each box**)

Total Number	Already used	Future use today				
		Yes (95%)	Very likely (80%)	Poss-ibly 50 %	Not Likely 20 %	No (5%)
Glass bottom boat						
Snorkel gear rental						
Dive gear rental (within Rodney)						
Dive gear rental (outside Rodney)						
Kayak rental (within Rodney)						
Kayak rental (outside Rodney)						

- 7) We'd like to find out about the spending of your group, or if you can't tell us about the group then we'd like to find out about your personal spending. Which can you tell us about? Group / Individual
- 8) How many people, including yourself, does this spending relate to?
 Adults _____ Children _____
 (Note: a child is 14 years old or younger)

Type of Spending	Spent already	Extra expected during this visit in Rodney
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Transport (fuel, rental) (check within Rodney)		
Food (groceries, drinks, lunch, dinner, ice creams)		
Retail (souvenirs, clothes, markets, Morris and James, wine)		
Other (please specify) _____		

- 9) If there was a visitor centre associated with the marine reserve would you be likely to visit it? Yes / No
- 10) What level of entry fee would you be prepared to pay per adult?
₁ 0 - \$ 4
₂ \$ 5 - \$ 8
₃ \$ 9 - \$12

That concludes the survey questions, thanks for you time. You have been asked to estimate activities and spending for the rest of your stay. Would you mind taking this prepaid envelope containing the same questions to fill out over the rest of today with actual spending?

Y/N Postal response number _____

Green survey questionnaire for visitors **overnighting in the Rodney District**

Interviewer _____ Date _____ Survey Site _____

1) Where do you normally live?

- Auckland Area (other than Rodney)
- Rest of New Zealand
- Overseas

Which Country _____

2) How many people are in your immediate group, including yourself?
Number in immediate family or friends – not whole tour group

Adults _____

Children _____
(Note: a child is 14 years old or younger)

3) How many hours do you expect to spend at the marine reserve today

< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
--------	-----------	-----------	-----------	--------

4) How many nights have you stayed so far in the Rodney District on this visit?
(show map)_____

5) How many nights do you expect to stay **in total** in the Rodney District?

6) How many trips in total do you expect to make to the marine reserve on this visit to Rodney _____

7) If this marine reserve did not exist would you have still come to the Rodney District for this trip? [show map of district]

- Yes (go to question 8)
- Likely (go to question 8)
- Possibly (go to question 8)
- Unlikely (go to question 8)
- No (go to question 10)

8) If the marine reserve did not exist, would you have stayed less time / the same time / more time in Rodney District?

- Same (go to question 10)
- Less Time (go to Q 9)
- More Time (go to Q 9)
- Not sure (go to Q 10)

9) How many fewer or extra hours would you have stayed in the Rodney District?

How much LESS time?	< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
How much MORE time? prompt	< 1 hr	1 – 3 hrs	3 – 6hrs	6 – 9 hrs	>9 hrs

10) What forms of accommodation will you be using while you are in the District and how many nights in each?

	Nights
Private home / Visiting friends or relatives (VFR)	
Hotel	
Motel / Motor Inn	
B&B	
Backpacker / Youth Hostel	
Camping ground / holiday park (incl paying tent, campervan etc.)	
Free camping (tent, cabin, campervan etc)	
Marae	
Home stay / Farm stay	
Holiday Home or Timeshare	
Other	

- 11) Which of the following activities have you or members of your immediate group used or expect to use **TODAY**. Note number of group members in each box

Total Number	Already used today	Expected use today				
		Yes (95%)	Very likely (80%)	Possibly 50 %	Not Likely 20 %	No (5%)
Glass bottom boat						
Snorkel gear rental						
Dive gear rental (within Rodney)						
Dive gear rental (outside Rodney)						
Kayak rental (within Rodney)						
Kayak rental (outside Rodney)						

- 12) Which of the following activities have you or members of your immediate group used or expect to use on **this trip excluding** today. Note number of group members in each box

Total Number	Already used before today	Expected use after today				
		Yes (95%)	Very likely (80%)	Possibly 50 %	Not Likely 20 %	No (5%)
Glass bottom boat						
Snorkel gear rental						
Dive gear rental (within Rodney)						
Dive gear rental (outside Rodney)						
Kayak rental (within Rodney)						
Kayak rental (outside Rodney)						

- 13) We'd like to find out about the spending of your group during this trip to Rodney, or if you can't tell us about the group then we'd like to find out about your personal spending. Which can you tell us about? Group / Individual

- 14) How many people are in your immediate group, including yourself does this spending relate to? Adults _____ Children _____

(Note: a child is 14 years old or younger)

15) Type of Spending	Spent during last 24 hrs in Rodney	If less than 24 hrs so far, extra expected during the balance of first 24 hours
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Transport (fuel, rental) (check within Rodney)		
Food (groceries, drinks, lunch, dinner, ice creams)		
Retail (souvenirs, clothes, markets, Morris and James, wine)		
Accommodation		
Other (please specify) _____		

- 16) Please consider any spending on this trip in Rodney prior to that just questioned as well as expected spending in Rodney from tomorrow. **Prompt with days X spending above**

Type of Spending	Spent prior to previous question	Expected spending
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Transport (fuel, rental) (check within Rodney)		
Food (groceries, drinks, lunch, dinner, ice creams)		
Retail (souvenirs, clothes, markets, Morris and James, wine)		
Accommodation		
Other (please specify) _____		

- 17) If there was a visitor centre associated with the marine reserve would you be

likely to visit it? Yes / No

18) What level of entry fee would you be prepared to pay per adult?

- 0 - \$ 4
- \$ 5 - \$ 8
- \$ 9 - \$12

That concludes the survey questions, thanks for you time.

Did they estimate spending in Q 15? If so...

You have been asked to estimate activities and spending over the balance of your first 24 hrs. Would you mind taking this prepaid envelope containing the same questions to fill out over the balance of the 24 hours so we can compare with your estimated spending? **Interviewer: Write finish time on sheet**

Y/N Postal response number_____

Pink survey questionnaire for those who live or own property within Rodney District

Interviewer _____ Date _____ Survey Site _____

- 1) Is your property in Rodney
₁ rented
₂ owned
- 2) Did this marine reserve at Leigh affect your decision to rent / purchase your property in Rodney?
₁ Yes, I probably would not be in Rodney otherwise
₂ Yes, I would have considered property out of Rodney otherwise
₃ Perhaps, it was one of the factors effecting our/my decision
₄ No, I would be in Rodney anyway

Comments-

- 3) How many hours do you expect to spend at the marine reserve today?

< 1 hr	1 – 3 hrs	3 – 6 hrs	6 – 9 hrs	>9 hrs
--------	-----------	-----------	-----------	--------

- 4) Which of the following activities have you or members of your immediate group used or expect to use **TODAY**. Note number of group members in each box

Total Number	Already used today	Expected use today				
		Yes (95%)	Very likely (80%)	Poss-ibly 50 %	Not Likely 20 %	No (5%)
Glass bottom boat						
Snorkel gear rental						
Dive gear rental (within Rodney)						
Dive gear rental (outside Rodney)						
Kayak rental (within Rodney)						
Kayak rental (outside Rodney)						

- 5) Where do you normally live?
₁ Within Rodney district (**end of survey, thank for time**)
₂ Auckland Area (continue with Q6)
₃ Other (please state _____) (continue with Q6)
- 6) How many nights have you stayed in the Rodney District on this visit? (show map) _____
- 7) How many more nights do you expect to stay in the Rodney District on this visit? _____
- 8) How many trips per year would you estimate you make to Rodney?
 Trips _____ Days _____

- 9) Would you spend as much time in the Rodney District if the marine reserve did not exist?
- Yes (go to question 15)
 - Likely (go to question 15)
 - Possibly (go to question 13)
 - Unlikely (go to question 13)
 - No (go to question 13)

- 10) How much more or less time would spend in the Rodney District if the marine reserve did not exist?

Less time	Days per year _____
More time prompt	Days per year _____

- 11) Which of the following activities have you or members of your immediate group used or expect to use on **this trip excluding** today. **Note number of group members in each box**

Total Number	Already used before today	Expected use after today				
		Yes (95 %)	Very likely (80 %)	Possibly 50 %	Not Likely 20 %	No (5 %)
Glass bottom boat						
Snorkel gear rental						
Dive gear rental (within Rodney)						
Dive gear rental (outside Rodney)						
Kayak rental (within Rodney)						
Kayak rental (outside Rodney)						

- 12) We'd like to find out about the spending of your group during this trip to Rodney, or if you can't tell us about the group then we'd like to find out about your personal spending. Which can you tell us about? **Group / Individual**
- 13) How many people are in your immediate group, including yourself does this spending relate to? **Adults** **Children**

(Note: a child is 14 years old or younger) _____

14)

Type of Spending	Spent during last 24 hrs in Rodney	If less than 24 hrs so far, extra expected during the balance of first 24 hours
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Transport (fuel, rental) (check within Rodney)		
Food (groceries, drinks, lunch, dinner, ice creams)		

Retail (souvenirs, clothes, markets, Morris and James, wine)		
Other (please specify) _____		

- 15) Please consider any spending on this trip in Rodney prior to that just questioned as well as expected spending in Rodney from tomorrow. **Prompt with days X spending above**

Type of Spending	Spent prior to previous question	Expected spending
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Transport (fuel, rental) (check within Rodney)		
Food (groceries, drinks, lunch, dinner, ice creams)		
Retail (souvenirs, clothes, markets, Morris and James, wine)		
Other (please specify) _____		

- 16) If there was a visitor centre associated with the marine reserve would you be likely to visit it? Yes / No
- 17) What level of entry fee would you be prepared to pay per adult?
- 1 0 - \$ 4
 2 \$ 5 - \$ 8
 3 \$ 9 - \$12

That concludes the survey questions, thanks for you time.

Did they estimate spending in Q 14? If so...

You have been asked to estimate activities and spending over the balance of your first 24 hrs. Would you mind taking this prepaid envelope containing the same questions to fill out over the balance of the 24 hours so we can compare with your estimated spending? **Interviewer: Write finish time on sheet**

Y/N Postal response number _____

Postal response # _____
 time _____

Interview

On the **day you were surveyed** please state the **number of people** in your immediate group who took part in each of the following activities

	To time of interview	During rest of day
Glass bottom boat		
Snorkel gear rental		
Dive gear rental (within Rodney)		
Dive gear rental (outside Rodney)		
Kayak rental (within Rodney)		
Kayak rental (outside Rodney)		

On the **day you were surveyed** please calculate you total spending within Rodney District (includes Orewa). How many people does this spending relate to?

Adults _____ Children _____

Type of Spending	Up until interview	Rest of Day
Activities mentioned above		
Activities not mentioned above (horse riding, wine tasting etc)		
Food (groceries, drinks, lunch, dinner, ice creams)		
Retail (souvenirs, clothes, markets, Morris and James, wine)		
Accommodation		
Other (please specify) _____		

Thank you for your time to complete the questionnaire

If you want to take place in the prize draw for respondents (\$100 Sawmill Café voucher and Glass Bottom Boat Tours vouchers for 4), please write your name and address here.

Name _____

Address _____

A2: Estimating visitor numbers at Cape Rodney Okakari Point Marine Reserve from car counters.

The survey described below resulted in the updated calibration figure of approximately 4.3 people per car.

Background

The Department of Works and Infrastructure have installed various car counters across Goat Island Road for use in assessing visitor numbers to the CROP Marine Reserve. A value of 3.5 people per car has been used to extrapolate the car count data to estimate visitor numbers. This number was assessed some years ago by the Auckland Conservancy Rec Planner. This latest calibration exercise was conducted as part of a larger project to assess the economic value of the marine reserve to the Rodney District.

Method

Survey data was collected on January 10th and 11th 2008 (Friday and Saturday) during fine weather with high visitor numbers. Data was collected for all vehicles departing the marine reserve between 4:19pm and 5:19pm on the 10th (93 vehicles) and all vehicles arriving between 9am and 4pm on the 11th (657 vehicles).

Data and analysis can be viewed DOC DM-246960. Location of the survey is shown in figure A1. Number of adults and children visible in each car were counted. Groups walking across the counter were also asked if they had driven over the counter (see figure A2). If the group had not driven over they were asked if they thought they would drive over the counter at any stage on this visit. If they answered “No” then the number of adults and children in the group were counted.



Figure A1. Survey was conducted from just north of the car counter (counter visible crossing the road at the culvert).



Figure A2. Cars parked south of the counter from 12:30pm 11/1/08, at 3pm 52 cars were parked south of the counter.

Results and Discussion

Table A1, combined counts for Friday and Saturday

		per car	double the children per car
total cars	750		
total people in cars	2613	3.48	
total adults	2002	2.67	
total children	611	0.81	1222
total people (incl bikers / walkers)	2741	3.65	3224
child %	22.29		4.30 37.90

An average of 3.48 people were counted per car of the 750 cars counted. When the total people count included those who would not drive across the counter during their trip the average people per car increased to 3.65. Of those not driving over, all but one were parked at the camp ground. So those parked further up the road had all driven over the counter (bar one).

It was noted that the counts of people per car was an underestimate for two reasons. Firstly some cars have tinted windows. With tinted windows the count must be made quickly while it is possible to see through the front windscreen. As the car passes back seat passengers can not be seen. However, it is estimated most adults could still be counted through the front windscreen but probably children were undercounted. Secondly anyone not visible is not counted, this would primarily be children shorter than their window. It was noted that not many young children were counted. To assess the extent of this problem survey data from groups interviewed on the beach was consulted.

The average group size interviewed on the beach was 4.34 people with 2.64 adults

and 1.70 children. The groups interviewed were restricted to groups of less than 10 and were not necessarily in one car, however the adults per group was very close to the adults per car figure of 2.67. The children counted per car (0.82) therefore appears to be approximately half of the children present on the beach. I have therefore doubled the number of children counted per vehicle as shown in table one to give an approximate calibration figure of 4.3 people per car. This is also closely aligned to the 2002/3 CROP visitor survey where the average group size was 4.31 - no data on adult to children ratio was collected (note groups > 10 people were removed prior to calculating this figure to compare with the economic survey data as larger groups were assumed to come in > 1 vehicle).

An estimated 5000 trips per year across the counter are not visiting the marine reserve but heading to the University of Auckland Marine Lab. Although this accounts for approx 5 % of traffic the vehicles tend to carry one passenger. All vehicles were included in the calibration hence this 5 % with one passenger swayed the total passengers per car to the low side. Therefore the 5000 vehicles should be left in the count of visitors to the marine reserve. This over-count of about 5000 visitors probably covers the “on water visitors” (4-5 boats per day over the year with 3 passengers on average) which are otherwise not counted.

Vehicle counter

Table A2 vehicle counter data

Year	Month	Date	Day	Real Data	Replacement Data	Source of replacement data
2007	Mar	1	T		232	Thurs March 8th -10th 2007
2007	Mar	2	F		331	
2007	Mar	3	S		653	
2007	Mar	4	S	787		
2007	Mar	5	M	641		
2007	Mar	6	T	321		
2007	Mar	7	W	267		
2007	Mar	8	T	227		
2007	Mar	9	F	232		
2007	Mar	10	S	331		
2007	Mar	11	S	653		
2007	Mar	12	M	552		
2007	Mar	13	T	183		
2007	Mar	14	W	195		
2007	Mar	15	T	156		
2007	Mar	16	F	239		
2007	Mar	17	S	208		
2007	Mar	18	S	389		
2007	Mar	19	M	295		
2007	Mar	20	T	220		
2007	Mar	21	W	225		
2007	Mar	22	T	233		
2007	Mar	23	F	220		
2007	Mar	24	S	231		
2007	Mar	25	S	477		
2007	Mar	26	M	340		
2007	Mar	27	T	228		
2007	Mar	28	W	177		
2007	Mar	29	T	192		
2007	Mar	30	F	99		
2007	Mar	31	S	176		
2007	Apr	1	S	261		
2007	Apr	2	M	203		

2007	Apr	3	T	225
2007	Apr	4	W	229
2007	Apr	5	T	201
2007	Apr	6	F	172
2007	Apr	7	S	554
2007	Apr	8	S	617
2007	Apr	9	M	768
2007	Apr	10	T	495
2007	Apr	11	W	281
2007	Apr	12	T	253
2007	Apr	13	F	200
2007	Apr	14	S	201
2007	Apr	15	S	266
2007	Apr	16	M	266
2007	Apr	17	T	242
2007	Apr	18	W	231
2007	Apr	19	T	189
2007	Apr	20	F	248
2007	Apr	21	S	214
2007	Apr	22	S	312
2007	Apr	23	M	349
2007	Apr	24	T	146
2007	Apr	25	W	197
2007	Apr	26	T	508
2007	Apr	27	F	196
2007	Apr	28	S	215
2007	Apr	29	S	171
2007	Apr	30	M	122
2007	May	1	T	142
2007	May	2	W	119
2007	May	3	T	108
2007	May	4	F	135
2007	May	5	S	204
2007	May	6	S	311
2007	May	7	M	107
2007	May	8	T	112
2007	May	9	W	111
2007	May	10	T	109
2007	May	11	F	105
2007	May	12	S	238
2007	May	13	S	190
2007	May	14	M	78
2007	May	15	T	99
2007	May	16	W	113
2007	May	17	T	117
2007	May	18	F	108
2007	May	19	S	230
2007	May	20	S	137
2007	May	21	M	83
2007	May	22	T	107
2007	May	23	W	84
2007	May	24	T	102
2007	May	25	F	99
2007	May	26	S	170
2007	May	27	S	134
2007	May	28	M	84
2007	May	29	T	88
2007	May	30	W	97
2007	May	31	T	80
2007	June	1	F	97
2007	June	2	S	158
2007	June	3	S	360
2007	June	4	M	226
2007	June	5	T	93
2007	June	6	W	75
2007	June	7	T	101

2007	June	8	F	77
2007	June	9	S	131
2007	June	10	S	61
2007	June	11	M	91
2007	June	12	T	71
2007	June	13	W	114
2007	June	14	T	79
2007	June	15	F	72
2007	June	16	S	176
2007	June	17	S	128
2007	June	18	M	86
2007	June	19	T	85
2007	June	20	W	58
2007	June	21	T	75
2007	June	22	F	74
2007	June	23	S	138
2007	June	24	S	130
2007	June	25	M	64
2007	June	26	T	91
2007	June	27	W	95
2007	June	28	T	86
2007	June	29	F	64
2007	June	30	S	138
2007	Jul	1	S	61
2007	Jul	2	M	78
2007	Jul	3	T	104
2007	Jul	4	W	88
2007	Jul	5	T	90
2007	Jul	6	F	64
2007	Jul	7	S	103
2007	Jul	8	S	143
2007	Jul	9	M	88
2007	Jul	10	T	109
2007	Jul	11	W	160
2007	Jul	12	T	147
2007	Jul	13	F	104
2007	Jul	14	S	132
2007	Jul	15	S	93
2007	Jul	16	M	66
2007	Jul	17	T	76
2007	Jul	18	W	80
2007	Jul	19	T	92
2007	Jul	20	F	68
2007	Jul	21	S	99
2007	Jul	22	S	112
2007	Jul	23	M	76
2007	Jul	24	T	81
2007	Jul	25	W	76
2007	Jul	26	T	75
2007	Jul	27	F	85
2007	Jul	28	S	177
2007	Jul	29	S	85
2007	Jul	30	M	94
2007	Jul	31	T	89
2007	Aug	1	W	94
2007	Aug	2	T	93
2007	Aug	3	F	95
2007	Aug	4	S	125
2007	Aug	5	S	155
2007	Aug	6	M	75
2007	Aug	7	T	84
2007	Aug	8	W	108
2007	Aug	9	T	86
2007	Aug	10	F	94
2007	Aug	11	S	164
2007	Aug	12	S	101

2007	Aug	13	M	82	
2007	Aug	14	T	97	
2007	Aug	15	W	71	
2007	Aug	16	T	76	
2007	Aug	17	F	119	
2007	Aug	18	S	91	
2007	Aug	19	S	182	
2007	Aug	20	M	97	
2007	Aug	21	T	112	
2007	Aug	22	W	95	
2007	Aug	23	T	85	
2007	Aug	24	F	85	
2007	Aug	25	S	193	
2007	Aug	26	S	182	
2007	Aug	27	M	83	
2007	Aug	28	T	122	
2007	Aug	29	W	78	
2007	Aug	30	T	102	
2007	Aug	31	F	107	
2007	Sep	1	S	177	
2007	Sep	2	S	142	
2007	Sep	3	M	99	
2007	Sep	4	T	107	
2007	Sep	5	W	104	
2007	Sep	6	T	99	
2007	Sep	7	F	79	
2007	Sep	8	S	170	
2007	Sep	9	S	125	
2007	Sep	10	M	108	
2007	Sep	11	T	107	
2007	Sep	12	W	105	
2007	Sep	13	T	108	
2007	Sep	14	F	111	
2007	Sep	15	S	218	
2007	Sep	16	S	140	
2007	Sep	17	M	87	
2007	Sep	18	T		90
2007	Sep	19	W		106
2007	Sep	20	T		96
2007	Sep	21	F		84
2007	Sep	22	S		155
2007	Sep	23	S		295
2007	Sep	24	M		186
2007	Sep	25	T		164
2007	Sep	26	W		187
2007	Sep	27	T		186
2007	Sep	28	F		172
2007	Sep	29	S		349
2007	Sep	30	S		177
2007	Oct	1	M		111
2007	Oct	2	T		164
2007	Oct	3	W		153
2007	Oct	4	T		223
2007	Oct	5	F		207
2007	Oct	6	S		295
2007	Oct	7	S		193
2007	Oct	8	M		94
2007	Oct	9	T		92
2007	Oct	10	W		96
2007	Oct	11	T		109
2007	Oct	12	F		101
2007	Oct	13	S		200
2007	Oct	14	S		157
2007	Oct	15	M		83
2007	Oct	16	T		115
2007	Oct	17	W		102

2007	Oct	18	T		121	
2007	Oct	19	F		119	
2007	Oct	20	S		314	
2007	Oct	21	S		446	
2007	Oct	22	M		93	
2007	Oct	23	T		129	
2007	Oct	24	W		129	
2007	Oct	25	T		107	
2007	Oct	26	F		114	
2007	Oct	27	S		249	
2007	Oct	28	S		123	
2007	Oct	29	M		126	
2007	Oct	30	T		150	
2007	Oct	31	W		128	
2007	Nov	1	T		122	
2007	Nov	2	F		134	
2007	Nov	3	S		292	
2007	Nov	4	S		289	
2007	Nov	5	M		126	
2007	Nov	6	T		121	
2007	Nov	7	W		115	
2007	Nov	8	T		111	
2007	Nov	9	F		120	
2007	Nov	10	S		209	
2007	Nov	11	S		274	
2007	Nov	12	M		141	
2007	Nov	13	T		150	
2007	Nov	14	W		154	
2007	Nov	15	T		141	
2007	Nov	16	F		134	
2007	Nov	17	S		160	
2007	Nov	18	S		265	
2007	Nov	19	M		148	
2007	Nov	20	T		137	
2007	Nov	21	W		180	
2007	Nov	22	T		194	
2007	Nov	23	F		173	
2007	Nov	24	S		339	
2007	Nov	25	S		290	
2007	Nov	26	M		140	
2007	Nov	27	T		179	Dec 4th 2007
2007	Nov	28	W		139	Dec 5th 2007
2007	Nov	29	T	185		
2007	Nov	30	F	158		
2007	Dec	1	S	327		
2007	Dec	2	S	324		
2007	Dec	3	M	178		
2007	Dec	4	T	179		
2007	Dec	5	W	139		
2007	Dec	6	T	132		
2007	Dec	7	F	168		
2007	Dec	8	S	299		
2007	Dec	9	S	126		
2007	Dec	10	M	154		
2007	Dec	11	T	176		
2007	Dec	12	W	204		
2007	Dec	13	T	184		
2007	Dec	14	F	180		
2007	Dec	15	S	330		
2007	Dec	16	S	361		
2007	Dec	17	M	205		
2007	Dec	18	T	167		
2007	Dec	19	W	195		
2007	Dec	20	T	233		
2007	Dec	21	F		233	Dec 20th 2007
2007	Dec	22	S	367		

2007	Dec	23	S	330	
2007	Dec	24	M	349	
2007	Dec	25	T	364	
2007	Dec	26	W	500	
2007	Dec	27	T	671	
2007	Dec	28	F	764	
2007	Dec	29	S	905	
2007	Dec	30	S	1100	
2007	Dec	31	M	584	
2008	Jan	1	T	1049	
2008	Jan	2	W	1285	
2008	Jan	3	T	918	
2008	Jan	4	F	776	
2008	Jan	5	S	781	
2008	Jan	6	S	519	
2008	Jan	7	M	410	
2008	Jan	8	T	351	
2008	Jan	9	W	315	
2008	Jan	10	T	532	
2008	Jan	11	F	627	
2008	Jan	12	S	880	
2008	Jan	13	S	903	
2008	Jan	14	M	481	
2008	Jan	15	T	525	
2008	Jan	16	W	492	
2008	Jan	17	T	504	
2008	Jan	18	F	464	
2008	Jan	19	S	781	
2008	Jan	20	S	507	
2008	Jan	21	M	238	
2008	Jan	22	T	245	
2008	Jan	23	W	344	
2008	Jan	24	T	447	
2008	Jan	25	F	400	
2008	Jan	26	S	953	
2008	Jan	27	S	1294	
2008	Jan	28	M	937	
2008	Jan	29	T	416	
2008	Jan	30	W	424	
2008	Jan	31	T	421	
2008	Feb	1	F	420	
2008	Feb	2	S	798	
2008	Feb	3	S	563	
2008	Feb	4	M	397	
2008	Feb	5	T	393	
2008	Feb	6	W	1023	
2008	Feb	7	T	292	
2008	Feb	8	F	369	
2008	Feb	9	S	599	
2008	Feb	10	S	240	
2008	Feb	11	M	256	
2008	Feb	12	T	251	
2008	Feb	13	W	310	
2008	Feb	14	T	178	
2008	Feb	15	F	239	
2008	Feb	16	S	530	
2008	Feb	17	S	503	
2008	Feb	18	M	234	
2008	Feb	19	T	353	Tues 20th Feb 2007 - Tues 1st March 2007
2008	Feb	20	W	298	
2008	Feb	21	T	264	
2008	Feb	22	F	346	
2008	Feb	23	S	703	
2008	Feb	24	S	567	
2008	Feb	25	M	300	
2008	Feb	26	T	256	

2008	Feb	27	W	286
2008	Feb	28	T	264
Totals				
				70062.5
				17152
Car count (2 columns above)				87214.5
Visitors (= cars x 4.3)				375022.35