A BIOLOGICAL REPORT ON A PROPOSED MARINE FARM LOCATED AT OTONGA POINT, QUEEN CHARLOTTE SOUND, MARLBOROUGH SOUNDS

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A report prepared for:

Marlborough Mussel Company
Grovetown
Blenheim
NEW ZEALAND

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1. INTRODUCTION

Marine farming has the potential to have a detrimental effect on the environment through lowering water quality and habitat modification. It is, therefore, important that the substratum and associated organisms below and adjacent to the proposed marine farm are properly identified.

To determine whether the species, communities, or habitats present at the proposed site have any special ecological, conservation, scientific, or resource value the Department of Conservation has produced a "Guideline for ecological investigations of proposed marine farm areas" (DOC 1995). This guide outlines criteria for assessing values of proposed mussel farms and identifies a preliminary list of significant species, communities and habitats.

The present survey provides a biological description of the substratum and the distribution and/or abundance of conspicuous species or features of particular ecological interest within and adjacent to a proposed farm extension located at Otonga Point, Queen Charlotte Sound, Marlborough Sounds (Figure 1).

In this report we provide the following:

i) A brief background on potential effects of mussel farms.
ii) A description of the area of the potential farm.
iii) A description of the general survey design and sampling methods used for the site.
iv) A description of the seabed habitats and depth profiles.
v) A description of the species present and their abundance.
vi) Potential threats to any biological organisms posed by the proposed activity were also discussed.

3. BACKGROUND

The environmental effects of mussel farms in the Sounds have been described in previous reports and publications (Kaspar *et al.* 1985; Cole & Grange, 1996; Davidson, 1998). These studies indicate that the mussel farms impacts on the seabed are localised and do not generally extend more than a few tens of metres horizontally from the boundary of the long lines.

The main effects are:

1) the sedimentation of organic-rich fine-grained particles
2) deposition and accumulation of live shellfish, faeces, pseudofaeces, and shell litter that can cause the benthic substrate to become anaerobic.
3) reduced levels of phytoplankton available in the water column to other organisms.

The main reason for surveying the seabed beneath proposed farms is that the consequences of increased sedimentation from mussel farms will depend on the nature of the benthic substratum. For example, a rocky reef containing organisms, which are sensitive to increased sedimentation, is likely to be severely affected by deposition beneath a mussel farm. Conversely, the ecological impact on organisms in mud and silt substrates is likely to be less significant (Davidson & Brown, 1999).

Organic enrichment beneath a marine farm can produce anaerobic (oxygen-depleted) sediments that is most likely to effect the infaunal communities which live in the sediment matrix, more than the epibenthic communities which live on the surface of the seabed. However, the effect of anaerobic sedimentation has not been described beneath shellfish culture areas in New Zealand.

There is some evidence that mussel shell depositions beneath farms can often act as a substrate for the formation of reef-type communities (Davidson & Brown, 1999) but may decrease the number of infaunal species due to increased sedimentation. Conversely,

there is also evidence that mussel clumps and shell litter can be relatively barren, with little apparent value as a reef community (Watson 1996).

Generally, deep marine farm sites, or sites exposed to strong currents are generally lass susceptible to adverse inputs than shallow sites in areas of weak currents. However, within these conditions, the seabed impacts at any particular site are difficult to predict in advance. It is generally accepted that a flat or a gently sloping muddy seafloor, in the absence of important species, is the most appropriate habitat over which to place marine farms.

3. STUDY AREA

The study area was located 500 metres south of Otonga Point on the southern side of Onauku Bay, within East Bay, Queen Charlotte Sound, Marlborough Sounds. The proposed farm covers an area of 4.2 hectares (141.55m X 300m) (Figure 1).

4. MATERIALS AND METHODS

Data collected during the study follow the guideline for ecological investigations of proposed farm areas in the Marlborough Sounds (DOC 1995). The proposed marine farm area was investigated on the 9 June 1999.

4.1 Site positioning

The corner boundaries for each of the proposed farms were located by visual identification of landmarks on the shore and measurement of distances using a vessel mounted radar and marked with buoys.

4.2 Survey design

To attain an accurate representation of the benthos under the proposed areas two 90 metre transects were conducted at each site. Each transect consisting of a 90m lead rope marked at 5 metre intervals with cattle ear tags. Transects extended approximately 5 metres from MLWM at a 90° to the shore into the proposed farm. Where possible transects extended across the entire farm width. In addition, two 30 metre transects were conducted in the proposed area perpendicular to the 90m transect (see Figure 1 for transect location).

Two divers (using SCUBA) swam above the substrate along either side of the lead rope recording data on perspex plates. Habitat changes were noted along transect lines and species abundance and location were recorded. Species abundance was allocated a category: 1 = rare, 2 = occasional, and 3 = common. Densities (per $1m^2$) of important species (scallops, brachiopods, horse mussels) were also reported. Depth was recorded at 5 metre intervals (using dive gauges) to give an accurate profile of the seabed.

5. RESULTS AND DISCUSSION

Physical features

Transect 1 (east):

HABITAT: The shore was initially dominated by small boulders and broken rock that extended 10 metres offshore. From 10 to 35 metres offshore, pebbles, shells and silt predominated. From 40 to 90 metres the benthos consisted of a base of silt and mud covered with whole and broken shells. The habitat in the 30 metre perpendicular transects consisted of a base of silt and mud covered with whole and broken shells (Figure 2).

DEPTH: This is a gradually sloping site leveling out at 13m at the end of the 90 metre transect (Figure 2).

Transect 2 (west)

HABITAT: A rocky bedrock reef extended 30 metres offshore where it dropped rapidly dropped to a depth of 12 metres. From 30-90m off shore the habitat changed to broken rock with shell and silt (Figure 3).

DEPTH: Shallow bedrock reef rapidly descended to 12m depth 35m offshore. The profile gradually descended to 18m at 90m offshore (Figure 3).

SPECIES PRESENT

Two transects revealed a total of 20 species of invertebrates and 2 species of bony fish (Table 1). There were only 10 invertebrate species and 1 species of bony fish observed in transect 2 (Table 2).

SCALLOPS

Scallops, *Pecten novaezelandiae*, were present in transect 1 within the proposed site but not at significant trigger densities. None were observed in transect 2.

HORSE MUSSELS

Horse mussels, *Atrina zelandica*, were present in transect 1 within the proposed site but not at significant trigger densities. None were observed in transect 2.

BRACHIOPODS

Brachiopods, *Magasella sanguinea*, were identified 10-40m from shore in transect 1 but none were identified under the boundaries of the proposed site. None were observed in transect 2.

FISH

Triplefins, *Forsterygion lapillum*, were observed 0-10m off shore in high numbers in transect 1 and 2. Blue cod, *Parapercis colias*, were seen in low densities between 10-40m in transect 2.

DISCUSSION

The seabed impacts of mussel farms can vary from site to site, and depend on a variety of factors relating to farm management and environmental conditions. As conditions vary from site to site a reasonable scenario of impact would be a moderate enrichment of sediments and infaunal communities beneath the farms, along with an accumulation of shell litter with a variable value as reef habitat.

SITE SUITABILITY

The site is positioned over a relatively flat area of a silt seabed with shells. The presence of a solid rocky reef at the southeastern side of the farm is of concern but it occurs some distance from the proposed site. This site is considered to be an appropriate location for a shellfish farm in terms of ecological values as trigger species are not significantly abundant.

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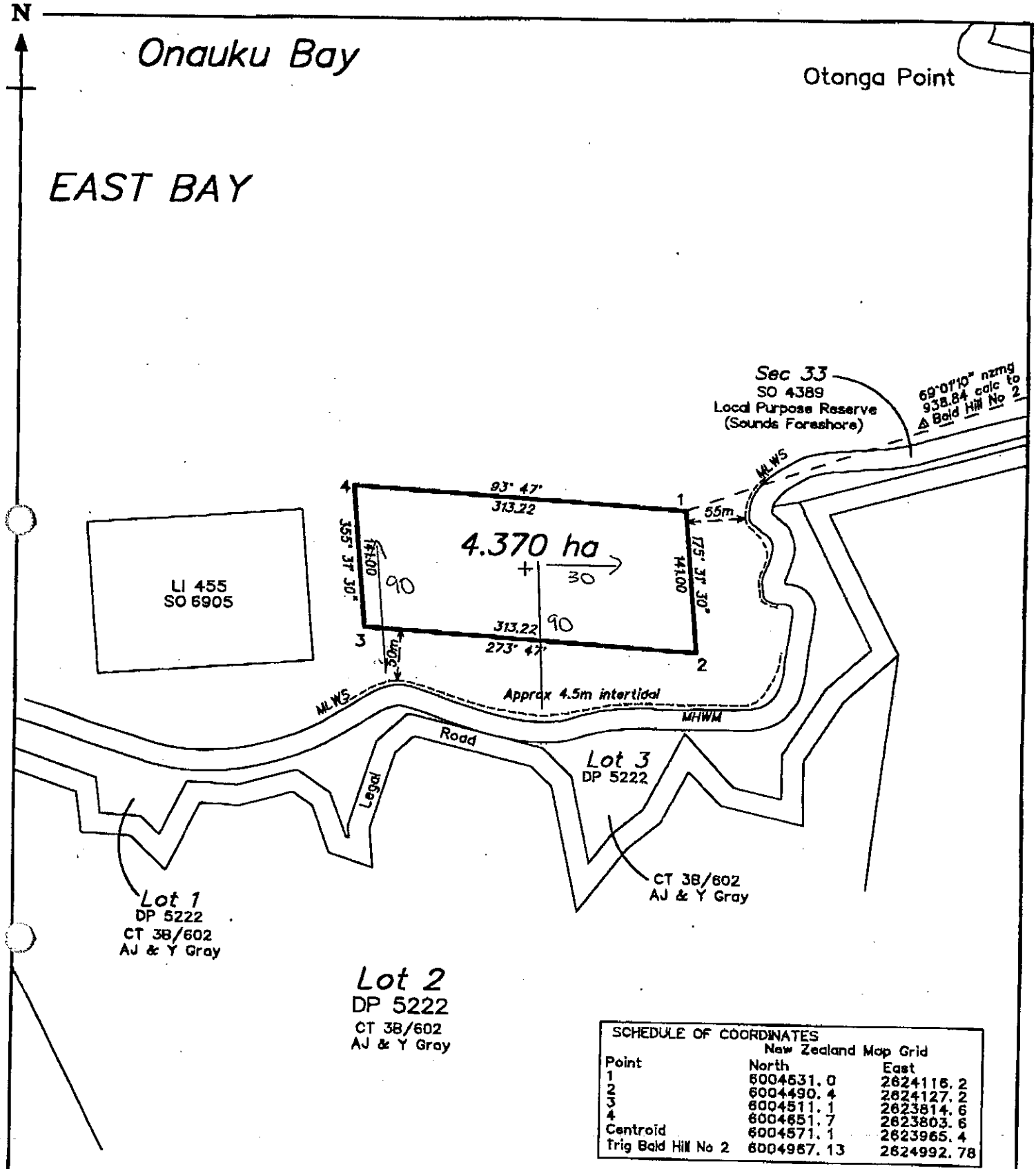

SCHEDULE OF COORDINATES

Point	New Zealand Map Grid North	East
1	6004631.0	2624116.2
2	6004490.4	2624127.2
3	6004511.1	2623814.6
4	6004651.7	2623803.6
Centroid	6004571.1	2623965.4
Trig Bald Hill No 2	6004967.13	2624992.78

Plan of Proposed Coastal Permit

Marlborough Mussel Co

NOTE: The position of this application has not been surveyed.
MHWM Plotted from DP 5222

MARLBOROUGH DISTRICT COUNCIL

SCALE 1:5000

50 0 50 100 150 200 250 300 350 400 450 metres

Datum: New Zealand Map Grid

Prepared by: DRAUGHTING Plus

Date 10/6/99

MF_831a.gcd

FIGURE 1

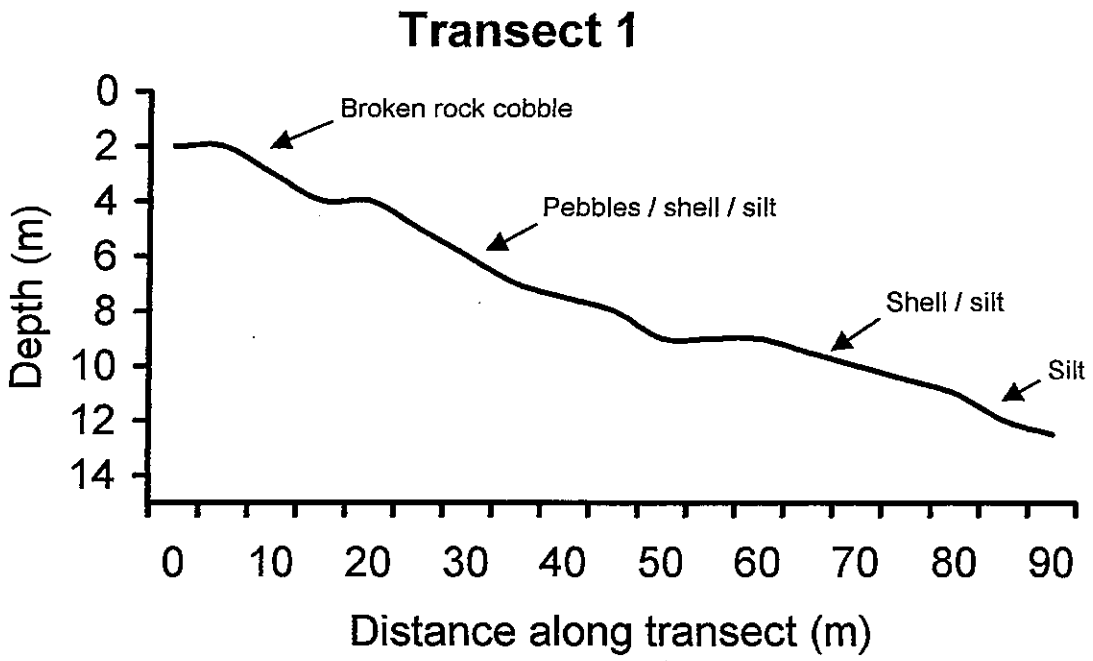

Figure 2. Subtidal shore profile with substrates and habitats within an area proposed as a marine farm in East Bay.

Table 1 Substrate and Species observed along a 90m transect in East Bay.

Depth(m)	Distance(m)	Habitat	Species	Common name	Abundance (1<2<3)
0-3	0-10	Broken rock cobble	Cellana spp various.	limpet	3
			Evichinus chloroticus	urchin	3
			Galeolaria hystrix	tube worm	3
			Forsterygion lapillum	triplefins	3
			Corallina spp.	paint	3
			Turbo smaragdus	cats eye	3
			Rhodomenia	red algae	2
			Trochus viridus	topshell	2
			Coscinasterias calamaris	11 arm star	2
			Perna canaliculus	green mussel	1
			Pagurus sp.	hermit crab	1
3 - 7.5	10-40	Pebbles/ shells/ silt	*Paterillea regularis*	cushion star	3
			Brachiomma sp.	canworms	3
			Galeolaria hystrix	tubes	3
			Stichopus	sea cucumber	2
			Evichinus chloroticus	kina	2
			Magasella sanguinea	lamp shell	1
			Parapercis colias	cod	1
7.5 - 11	40-80	Silt/ shell	*Coscinasterias calamaris*	11 arm star	3
			Paterillea regularis	cushion star	3
			Cnemidocarpa sp.	saddle squirt	2
			Crella incrustans	encrusting sponge	1
11 - 12.5	80-90	Silt	*Pecten novaezelandica*	scallops	1
			Atrina zelandica	horse mussel	1
			Crella incrustans	encrusting sponge	1
13	20m Transect	Silt	*Coscinasterias calamaris*	11 arm star	3
			Crella incrustans	encrusting sponge	1
			Pecten novaezelandica	scallops	1

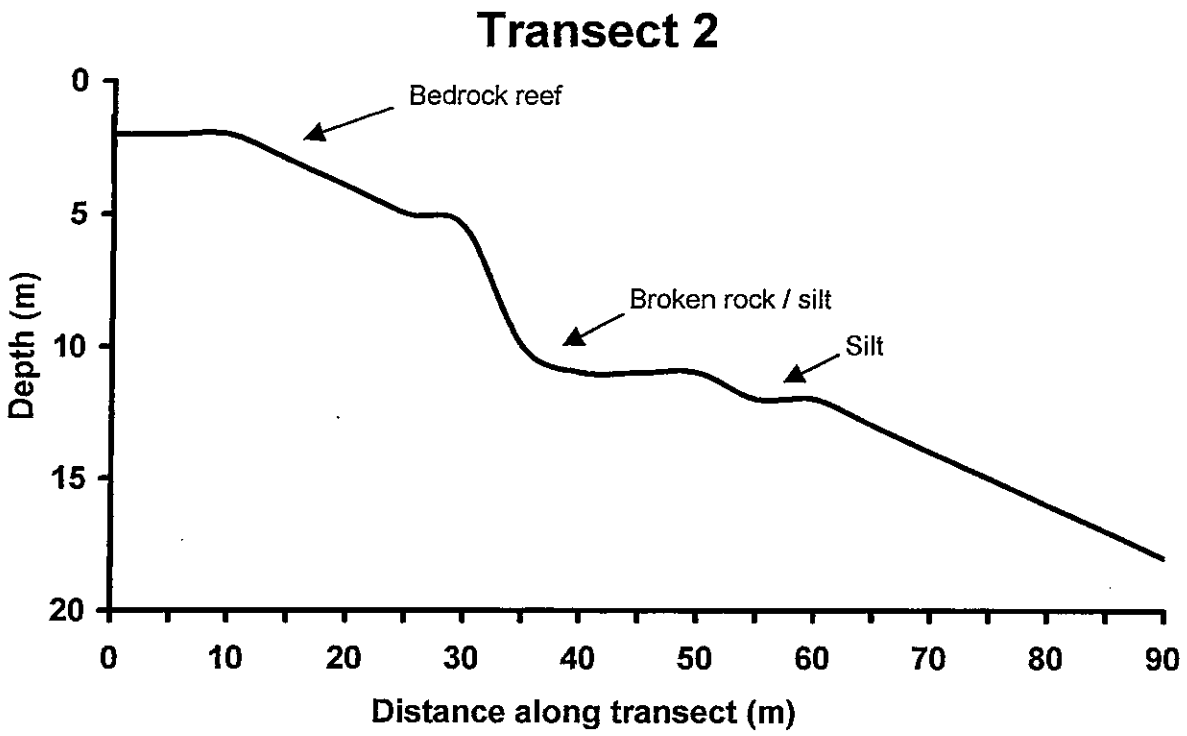

Figure 3. Subtidal shore profile with substrates along the second transect within the area proposed as a marine farm in East Bay (Otonga Point).

Table 2 Species and substrates observed along transect 2 (90m) in an area in East bay.

Depth (m)	Distance (m)	Habitat	Species	Common name	Abundance (1<2<3)
0 - 12	0-30	Solid reef	*Cellana spp.*	limpets	1
			Turbo smaragdus	cats eye	1
			Corallina spp.	paint	1
			Fosterygion lapillum	triplefins	3
12 - 14	30- 50	Broken rock	*Cellana spp.*	limpets	1
			Coscinasterias calamaris	11 arm star	3
			Evechinus chloroticus	kina	1
			Pateriella regularis	cushion star	2
			Brachiomma sp.	fan worm	2
			Galeolaria hystrix	tube worms	1
14 - 18	50 - 90	Silt / shell	*Trochus viridus*	topshell	3
			Coscinasterias calamaris	11 arm star	2
			Stichopus mollis	sea cucumber	1