BEFORE THE ENVIRONMENT COURT

Decision No. [2016] NZEnvC 81

IN THE MATTER	of the Resource Management Act 1991
AND	of an appeal under section 120 of the Act
BETWEEN	R J DAVIDSON FAMILY TRUST
	(ENV-2014-CHC-34)
	Appellant
AND	MARLBOROUGH DISTRICT COUNCIL
	Respondent

Court:	Environment Judge J R Jackson Environment Commissioner J R Mills Environment Commissioner I Buchanan Dr A J Sutherland as special advisor under section 259 of the Act
Hearing:	at Blenheim on 4 to 8 and 11, 12 May 2015 and 17 July 2015
Appearances:	J D K Gardner-Hopkins, A M Cameron and E J Hudspith for Davidson Family Trust J W Maassen for Marlborough District Council J C Ironside for Kenepuru and Central Sounds Residents Assn Inc. and Friends of Nelson Haven and Tasman Bay Inc. – section 274 parties
Date of Decision:	9 May 2016
Date of Issue:	9 May 2016

DECISION

A: Under section 290 of the Resource Management Act 1991 the Environment Court:

(1) confirms the decision of the Marlborough District Council on application U130797;

(2) refuses resource consent application (MDC ref) U13097 to establish and operate a 7.34 hectare marine farm at Beatrix Bay, Pelorus Sound.

B: Reserve costs; any application is to be made within 15 working days and any reply within a further 15 working days.

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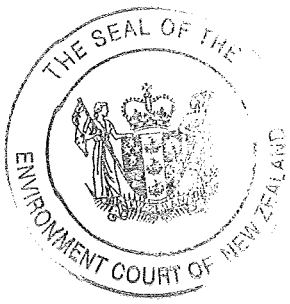

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Reasons of Environment Judge Jackson and Environment Commissioner Mills

0. Introduction

0.1 The issue: another marine farm in Beatrix Bay?

[1] On 24 December 2014 the R J Davidson Family Trust applied (Marlborough District Council Application No U130797) for consent to establish and operate a 8.982 hectare marine farm in Beatrix Bay, Central Pelorus Sounds, to enable the cultivation of green shell mussels[1] and other crops. The application also seeks consent to disturb the seabed with anchoring devices, to take and discharge coastal seawater, to harvest the produce from the marine farm and to discharge biodegradable and organic waste during harvest.

[2] The ultimate issue for the court is whether the proposal achieves the objectives and policies of the combined district and regional plan and of the New Zealand Coastal Policy Statement. The first important subordinate issue is to obtain an accurate description of the environment — there is disagreement between the parties over the accurate description of the current and reasonably foreseeable future environment. A further important issue for the court is whether, assessed under the relevant objectives and policies, the clear financial and social benefits of the proposal outweigh the direct and accumulative environmental costs. Finally, there is disagreement about the scale,

[1] *Perna canaliculus.*

character and intensity (inter alia) of the accumulative adverse effects of the proposal on:

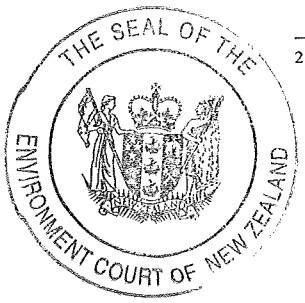
- the natural character of Beatrix Bay;
- the landscape values of a promontory at the northern end of the Bay;
- amenities for visitors to and (the few) residents of Beatrix Bay;
- safety through reducing navigational options;
- the marine ecology of Beatrix Bay; and
- the habitat of New Zealand King Shag.

[3] More specific issues are identified as we identify and analyse the matters to be considered.

0.2 The application, the appeal, the other parties and the service of evidence

[4] The applicant for the proposed marine farm is a family trust. The beneficiaries of which are the children of Mr R J Davidson. Mr Davidson is part-owner of a number of other consented marine farm areas in the Marlborough Sounds and is a well-known marine scientist.

[5] The application is for a site adjacent to and surrounding the southern end of an un-named promontory ("the northern promontory") which juts out into the northern end of Beatrix Bay. The amended proposal is to split the farm into two separate blocks (a south-east section of 5.166 hectares and a south-west section of 2.206 hectares) either side of the point of the promontory, with a reduced total area of 7.372 hectares. The farm is otherwise of standard design: it is to consist of a number of lines with an anchor at each end and a single warp rising to the surface. At the surface is a backbone with dropper lines extending to approximately 12m depth (not to the sea floor). Each structure set is spaced 12 to 20 m apart. Despite the array of potential crops[2], we will call the proposed farm a "mussel farm" to distinguish it from other types of marine farm like salmon farms which usually have much greater adverse environmental impacts.



[2] In addition to green shell mussels, the application seeks to cultivate scallops (*Pecten novaezelandiae*), blue shell mussels (*Mytilus galloprovincialis*), dredge oysters (*Tiostrea chilensis*), pacific oysters (*Crassostrea gigas*) and algae (*Macrocystis pyrifera, Gracilaria sp., Pterocladia lucida, Undaria pinnatifida*).

[6] The application was heard by an independent commissioner Mrs S E Kenderdine[3] on 21 May 2014 and a decision to decline was issued by the Marlborough District Council on 2 July 2014. The decision was appealed by the Appellant, which has put forward to the court an amended proposal to reduce impacts on the environment.

[7] Two incorporated societies, Kenepuru and Central Sounds Resident's Association Inc and Friends of Nelson Haven and Tasman Bay Inc, (together "the Societies"), which had lodged submissions on the Davidson Family Trust's application, then joined the appeal as section 274 RMA parties in support of the Council's decision.

[8] The service of evidence in this proceeding was rather drawn out for two reasons. First, after the initial service of evidence which largely replicated the evidence given to the hearing Commissioner, the Council decided it wished to put forward evidence on ecological matters. That was challenged, and after submissions, (a procedural[4] decision) allowed a further exchange of evidence.

[9] The Council then lodged evidence by Dr B G Stewart — an ecologist, and Dr P R Fisher — an avian ecologist. The Appellant responded with evidence from its various experts and with a statement from Mr Davidson which was nearly[5] as long as his evidence-in-chief. The Council challenged the admissibility of that evidence on the grounds it was new evidence, rather than rebuttal. Subsequently the Council lodged "supplementary" evidence from Mr R Schuckard, Dr Fisher, and Dr T Cook (an ornithologist) in response to Mr Davidson's long rebuttal statement. The Appellant objected to the admissibility of this evidence on the grounds that the Council had no right to lodge it. Finally, the Appellant applied for consent to call rebuttal evidence on methodology from Dr D M Clement a marine ecologist. The admissibility of this was in turn challenged by the Council.

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3 A retired Environment Judge with very extensive experience in and knowledge of the Marlborough Sounds.

4 Procedural Decision [2014] NZEnvC 257.

5 26 pp evidence-in-chief [Environment Court document 6]; 22 pp further evidence [Environment Court document 6A].

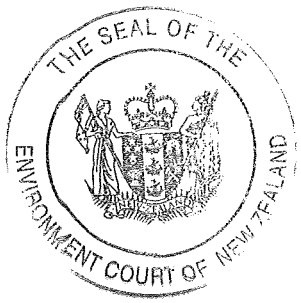
[10] The questions of admissibility raised subsequent to the procedural decision were adjourned to be resolved at the hearing. We considered it appropriate to receive all[6] the information lodged for these reasons. First, the evidence received is relevant which is the main test. Second, Mr Davidson is, in effect, the Appellant and so if he wishes to raise matters he should be allowed to so that he can be reasonably satisfied the Trust has been given a full and fair hearing. Third, to the considerable extent that Mr Davidson raised new matters in his rebuttal, the Council and the Societies should, in fairness, be allowed to reply.

0.3 The mussel farm site[7]

[11] The site is an area of shallow coastal water — between 22m and 42m deep — adjacent to the northern promontory. Dr D I Taylor, an ecologist called by the Appellant, described the benthic environment below the farm's two blocks as primarily soft mud sediments with a small area of mud/shell hash and coarser sand/shell hash sediments at the inshore margin. A bedrock/boulder reef habitat extends to the southwest of the promontory to around 35m from the closest proposed mussel lines. It was to avoid interfering with this reef that the Appellant divided its proposed farm into the two blocks described.

[12] On the site current speeds are generally below 4cm per second which is considered to be in the low to moderate range. Higher flushing events of up to 10cm per second occur periodically throughout the water column and strong currents up to 20cm per second have been recorded in the lower section of the water column. Flow direction is generally balanced east/west around the end of the promontory.

[13] The northern promontory adjacent to the site extends around 700m into the bay, dividing the northern coastline of Beatrix Bay into two relatively sheltered embayments. The western slopes of the promontory are dominated by rough pasture mixed with tauhinu scrub[8], gorse, pig fern, and occasional wilding pines. Further regeneration is inhibited by dry conditions combined with grazing stock (e.g. cattle), feral pig rooting



6 Except the evidence of Dr T Cook who was unable to attend at hearing to confirm his evidence and be cross-examined.

7 See the Assessment Matters in rule 35.4.2.9 of the Sounds Plan [p 35-21].

8 *Olearia leptophyllus*.

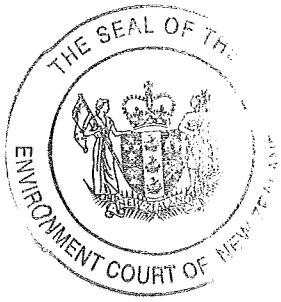
and goat and hare grazing. Vegetation cover on the eastern side of the promontory is more advanced but is also inhibited by feral animals and stock.

0.4 The landscape and seascape setting

[14] Beatrix Bay, containing approximately 2,000 ha, is one of the largest bays in Pelorus Sound (total 38,477 ha). It is roughly circular with a coastline of about 22 km. Some sense of the scale of the Bay can be gleaned from the fact that the northern promontory, where the site is, cannot be identified when entering from the south, but looms quite large from close to. The western side of Beatrix Bay is a long near-island running from Kaitira, the East Entry point to Pelorus Sound (from Cook Strait), to Whakamawahi Point. It is connected by a low isthmus along the northern side of Beatrix Bay to the Mount Stoke massif. The slopes of that hill form the higher (1,000 m above sea level) east and south-east margin of the bay. The southern end of the bay descends to Te Puaraka Point. The wide south-western end of Beatrix Bay opens to the rest of Pelorus Sound: south to Clova and Crail Bays, south-west to inner Pelorus Sound and west to Tawhitinui Reach.

[15] The relatively sheltered water of the "Mid Pelorus Marine Character Area"[9] is described in the plan as "... turbid and warm and the seafloor as mostly mud with conspicuous sparse marine life fringed by narrow cobble reef"[10]. Most of Beatrix Bay is 30 to 36 m deep with a seabed of soft sediment[11] (the most common type of habitat in the Marlborough Sounds).

[16] Much of the land surrounding the northern end of Beatrix Bay is in the single ownership of Mr W Scholefield. It has been farmed for many years, but is in varying stages of regeneration (i.e. pasture to kanuka/broad-leaf scrubland). Some of the upper hillsides are administered by the Department of Conservation and support mature forest. Three small reserves reach the coast (two on the western coast of the Bay and one on the eastern coast). None of the reserves are close to the application site.



9 Map 106 Sounds Plan Vol. 3.
10 Appendix Two of Sounds Plan [p Appendix Two – 67].
11 B G Stewart evidence-in-chief para 3.1[Environment Court document 26].

[17] There are[12] 37 existing marine farms (approximately 304.4 ha in total[13]) located around the edge of Beatrix Bay. Backbones (surface structures) on the 37 marine farms span approximately 8.5 km (33%) of total shoreline length[14] at sea level (but more under water). Approximately 85% of the surface area (2,000 ha) of Beatrix Bay is not occupied[15] by mussel farms.

0.5 The matters to be considered when making the decision

[18] The site is located within Coastal Marine Zone 2 ("CMZ2") in the Marlborough Sounds Resource Management Plan (the "Sounds Plan"). That is a zone in which "appropriate"[16] marine farms are provided for, at least close to the shore, as discretionary activities[17]. In fact, because the proposed farm extends beyond 200 m from the shore, the status of the activity under Rule 35.5 of the Sounds Plan is non-complying. One of the gateways of section 104D RMA must therefore be passed before we can grant consent. Those gateways require either:

- that the adverse effects will be minor; or
- that the activity is not contrary to the objectives and policies of the Sounds Plan.

[19] If one of these tests is met, section 104(1) identifies the matters we are to have regard to in coming to a decision. In this case the relevant matters include:

- the actual and potential effects of the activity on the environment (section 104(1)(a));
- the provisions of the New Zealand Coastal Policy Statement ("the NZCPS"), the Marlborough Regional Policy Statement ("the RPS") and the Sounds Plan (section 104(1)(b));

12 R J Davidson evidence-in-chief Table 1 [Environment Court document 6].
13 R J Davidson evidence-in-chief Table 1 [Environment Court document 6].
14 R J Davidson rebuttal evidence-in-chief para 8.1 [Environment Court document 6A].
15 R J Davidson evidence-in-chief Table 1 [Environment Court document 6].
16 Explanation to Issue 9.2 [Sounds Plan p 9-4]; Objective (9.2.1) 1 and Policy (9.2.1) 1.14 [Sounds Plan p 9-6].
17 Rule 35.4.2.9 of the Sounds Plan where "close" means between 50m and 200m of the shore within CMZ2.

- any other relevant matters, if that is reasonably necessary (section 104(1)(c)).

Consideration of matters under section 104(1)(a)-(c) is "subject to Part 2 of the RMA". We must also have regard to[18] the Commissioner's Decision.

[20] The "environment" in section 104(1)(a) is not only the current description of its components (as identified in the section 2 RMA definition) but also the past environment as described in the relevant district plan and the reasonably foreseeable environment. Thus the environment includes the accumulated and reasonably foreseeable accumulative effects of all stressors (other than the application) on the past and current environment.

[21] The future component of the "environment" is well established. In *Queenstown Lakes District Council v Hawthorn Estate Limited*[19] ("*Hawthorn*") the Court of Appeal identified the central question in section 104 (rather than section 104D) of the Act as[20]:

> … whether the consent authority ought to take into account the receiving environment as it might be in the future and, in particular, if existing resource consents that had been granted but not yet implemented, were implemented in the future …

The court examined numerous provisions in the Act in which the "environment" was referred to, then analysed[21] the scheme and purpose of the RMA and concluded:

> In summary, all of the provisions of the Act to which we have referred lead to the conclusion that when considering the actual and potential effects on the environment of allowing an activity, it is permissible, and will often be desirable or even necessary, for the consent authority to consider the future state of the environment, on which such effects will occur.

18 Section 290A RMA.
19 *Queenstown Lakes District Council v Hawthorn Estate Limited* [2006] NZRMA 424; (2006) 12 ELRNZ 299 (CA) at [57].
20 *Hawthorn* at [11].
21 *Hawthorn* at [57].

[22] More recently, in *Far North District Council v Te Runanga-A-Iwi O Ngati Kahu*[22], the Court of Appeal confirmed that:

> In its plain meaning and in its context, we are satisfied that "the environment" necessarily imports a degree of futurity. [Emphasis added].

0.6 The obligation to supply adequate information (section 104(6) RMA)

Introduction

[23] There is one other, procedural, aspect of section 104 which we need to consider in the light of the evidence given to us. It is the question how to apply section 104(6) of the RMA (as added[23] in 2009). That states:

> (6) A consent authority may decline an application for a resource consent on the grounds that it has inadequate information to determine the application.

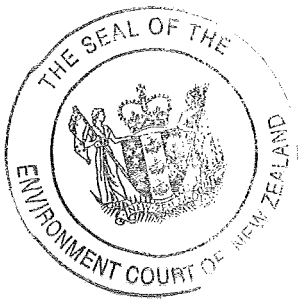
[24] For the Council Mr Maassen relied on this as the basis for his submission[24]:

> … that even though a submitter or the Council does not call evidence on a particular effect, it is open for the consent authority to determine that the information is inadequate and decline the application accordingly. The only way, for example, one can faithfully fulfil the Parliamentary direction to "recognise and provide for" [the] matters of national importance [is] to have adequate information. This supports the evidential onus that the applicant bears.

Mr Maassen carefully did not call this burden an onus of proof. For the Appellant, Mr Gardner-Hopkins did not respond directly to Mr Maassen's submission about section 104(6).

The obligation to supply adequate information

[25] Section 104(6) appears to place an onus on the Appellant for a resource consent to supply enough relevant information to the consent authority to enable it to determine



22 *Far North District Council v Te Runanga-A-Iwi O Ngati Kahu* [2013] NZCA 221 at [80].
23 By section 83(6) Resource Management (Simplifying and Streamlining) Amendment Act 2009.
24 Submissions for Marlborough District Council dated 29 June 2015 at [113].

the application. In particular, the decision-maker must be able to reasonably assess a credible region[25] of probabilities of the relevant adverse effect even if only qualitatively.

[26] However, in some situations there may be inadequate information to even assess the likelihood of the effects of a stressor, and it is then that section 104(6) RMA may come into play. Clearly the power to decline on the basis of inadequate information should be exercised reasonably and proportionately in all the circumstances of the case. The power is also discretionary — that is shown by the use of the word "may" — so the consent authority may grant consent even if it lacks sufficient information. An example may be if there is a proposal for adaptive management to respond to uncertainties.

[27] Some assistance as to the purpose of section 104(6) RMA may be gained from Part 2 of the Act. The purpose of Part 2 is, as described in *Environmental Defence Society Inc v The New Zealand King Salmon Company Ltd*[26] ("*King Salmon*"), principally to guide local authorities, for example when considering a resource consent. However, as Mr Maassen observed, it is difficult for a consent authority to provide for the matters of national importance in section 6 unless it recognises them first. This suggests an applicant should put forward adequate information for the consent authority to be able to identify the relevant stressors and their effects.

[28] Another particular provision of Part 2 of the RMA that may assist application of section 104(6) is section 7(b) of the RMA, which requires decision makers to have particular regard to the efficient use and development of the relevant resources. While section 7(b) is only ever one, of many, matters to be considered (and it is silent about the protection of resources) it does imply that in many cases it is the more[27] valuable use and development of the resources which should be preferred. How often could a consent authority deliberately and rationally choose a wasteful use of resources? It appears to us that section 7(b) reinforces or creates a burden on an appellant to show that its proposed consent would use the resources better than the status quo or some other possible use if that is put forward in the evidence.

25 I.e. between 34% and 66%.

26 *Environmental Defence Society Inc v The New Zealand King Salmon Company Ltd* [2014] NZSC 38; [2014] 1 NZLR 593; [2014] NZRMA 195 at [24] and [25] per Arnold J.

27 Or most valuable if there are three or more options.

[29] Several aspects of the scheme of part 6 (Resource Consents) of the RMA are relevant as to how section 104(6) should be applied. First, section 88 prescribes[28] that an application for resource consent must include an Assessment of Environmental Effects ("AEE") as required by Schedule 4 of the Act. The information required by the Schedule (principally as to the effects of the proposal) "... must be specified in sufficient detail to satisfy the purpose for which it is required[29]". One purpose[30] is — as stated in the previous paragraph — found in the particularised objectives and policies of the relevant plan. This appears to impose an obligation to supply information of adequate quality (as well as sufficient detail) to enable grant of consent if no other information is put forward.

[30] An application may now[31] be determined to be incomplete if it does not include the information required by Schedule 4, and returned[32] to the Appellant. Then the Council has the power to request[33] that the Appellant provide further information or to commission a report[34] (in addition[35] to any standard report under section 42A RMA) before the hearing, although the Appellant has the right to refuse[36] to provide the information or even to ignore[37] the request. A similar provision[38] applies in respect of refusing to agree to the commissioning of a report.

[31] So the procedural scheme of Part 6 of the RMA emphasises the provision of information to the consent authority even before the hearing. That is to ensure the consent authority is adequately informed before making a decision. Because the appellant may refuse or ignore the request, section 104(6) still confers a power enabling the consent authority to decline if it has inadequate information.

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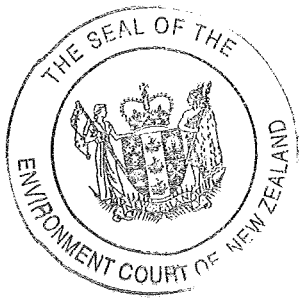
28 Section 88(2)(b) RMA.
29 Clause 1, Schedule 4 RMA.
30 Another purpose is to fully and fairly inform the public of the potential effects.
31 Since the Resource Management Amendment Act 2013.
32 Section 88(3A) RMA (added by section 92(2) Resource Management Amendment Act 2013).
33 Section 92(1) RMA.
34 Section 92(2) RMA.
35 Section 92(4) RMA.
36 Section 92A(1)(c) RMA.
37 Section 92A(3) RMA.
38 Section 92B RMA.



[32] The Environment Court has the same[39] powers, duties and discretions as the consent authority in relation to section 104(6) under this appeal, so it appears the court may also decline the application if it has inadequate information to satisfy it that the purpose of the Act will be achieved. Further, when making an assessment under section 104(6) on the adequacy of the information, the consent authority (or, on appeal, the Environment Court) must have regard to[40] whether any request for further information or reports resulted in further information being available. Presumably if further information (or a report) has not been requested that is a factor against declining the application on the grounds of inadequate information.

[33] In *Saddle Views Estate Limited v Dunedin City Council*[41] Whata J, a Judge of the High Court with extensive experience of the RMA, stated:

> Burden of proof is a complex issue in RMA proceedings. Very often RMA proceedings involve proof of existing fact, assessment of future effects and an evaluative judgment in light of prescribed statutory thresholds. Allocation of evidential and persuasive burden is problematic and sometimes inapposite in this context, as several leading cases demonstrate[42].

We respectfully agree subject to two minor qualifications: first we consider it may be more accurate to move (or repeat) the phrase "in light of prescribed statutory thresholds"[43] to follow the words "assessment of future effects"; second, the statement needs to be read in the light of section 104(6) RMA.

[34] In one of the cases referred to by Whata J, *Shirley Primary School v Telecom Mobile Communications Ltd*[44], the Environment Court held that "in a basic way there is always a persuasive burden" on an Appellant for resource consent reflecting the principle that "the person who desires the Court to take action must prove the case".

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39 Section 290(1) RMA.

40 Section 104(7) RMA.

41 *Saddle Views Estate Limited v Dunedin City Council* (2014) 18 ELRNZ 97 (HC) at [90].

42 Referring to *McIntyre v Christchurch City Council* (1996) 2 ELRNZ 84 (PT); *Shirley Primary School v Christchurch City Council* [1999] NZRMA 66 (EnvC); *Ngati Maru Iwi Authority v Auckland City Council* HC Auckland AP 18/02 June 2002; *Director-General of Conservation v Marlborough District Council* [2004] 3 NZLR 127 (2005) 11 ELRNZ 15 (HC); *Royal Forest and Bird Protection Society of New Zealand Inc v Buller District Council* [2006] NZRMA 193 (HC).

43 "Thresholds" is rather idealistic: few plans are so forthright, and the Sounds Plan is a classic plan that always qualifies its objective and policies.

44 *Shirley Primary School v Telecom Mobile Communications Ltd* [1999] NZRMA 66 at [121]-[122].

That approach was endorsed (obiter) by the majority of the Court of Appeal in *Ngati Rangi Trust v Genesis Power Ltd*[45].

[35] We conclude that since 2009 section 104(6) now imposes a type of legal burden on an Appellant to supply adequate information, although it may in certain circumstances be able to sidestep that if it can satisfy a consent authority that an adaptive management or similar condition is appropriate (i.e. the *Sustain Our Sounds v New Zealand King Salmon Company Ltd*[46] criteria are met — we discuss these later).

[36] The method of applying section 104(6) discussed above seems generally consistent with Principle 15 of the *Rio Declaration*[47]. That includes the statement that "[W]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation". However, we give that no weight since we did not receive full submissions on the principle. In any event, a precautionary approach is (as we shall see) included in the New Zealand Coastal Policy Statement which we will consider later.

[37] Does that mean that an Appellant must either in its AEE[48] or in its evidence "... pre-empt all possible arguments made by opponents, in order to disprove alleged effects"?[49] The answer is "no" for two reasons. First, the relevant effects should usually have been identified in the relevant plan, as should what the plan expects to be done about them. That is why the particularisation in subordinate policy statements or plans of the purpose and principles of Part 2 of the Act, as identified in the majority decision in *King Salmon*[50], is so important. Second, it is impossible to prove (or disprove) a future event, simply because it has not happened yet. The most that can be established is a probability or likelihood that an effect may (or may not) occur. Third, on the facts of this case it is quite clear that the Appellant knew from the beginning that lost feeding habitat for King Shags is an issue because its AEE records that[51].

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45 *Ngati Rangi Trust v Genesis Power Ltd* [2009] NZRMA 312 (CA) at [23].

46 *Sustain Our Sounds v New Zealand King Salmon Company Ltd* [2014] NZSC 40; [2014] 1 NZLR 673; (2014) 17 ELRNZ 520 at [124] and [125].

47 *The Rio Declaration on Environment and Development* UNESCO, 1992.

48 Required under section 88(2)(b) and Schedule 4 of the RMA.

49 Making a question of a proposition by Mr G Severinsen in his recent paper *Bearing the Weight of the World: Precaution and the Burden of Proof* (2014) 26 NZULR 375 at 384.

50 *King Salmon* above n 26.

51 Assessment of Environmental Effects para 5.7 (Seabirds) [Exhibit 6.5].

0.7 The standard of proof and prediction under the RMA

[38] As to the standard of proof, Mr Gardiner-Hopkins submitted[52] that the High Court in *"Buller Coal"*[53] stated that the appropriate standard of proof to be applied is "... the balance of probabilities". He made no distinction between the standard of proof of facts and any assessment of likelihood for predictions. We consider the differences are important.

[39] We accept that we must decide all questions of fact on the preponderance of the evidence. Of course not all disputes about the environmental setting of a proposal are factual. To the extent that the "environment"[54] includes the reasonably foreseeable future, questions about what that may look like are also predictive. However, a standard of proof for predictions that is "on the balance of probabilities" is problematic for several reasons.

[40] First the concept of a "probability of a probability" is at least awkward if not inchoate. Second, the definition of "effects" in section 3 of the Act includes "... effects of low probability but high potential impact". As the court has stated before, it is difficult to understand what is meant by determining an effect of low probability on the "balance" of probabilities.

[41] Third, in *Clifford Bay Marine Farms Ltd v Director General of Conservation*[55], the Environment Court suggested that applying "the balance of probability test to predictions of risk or any other prediction of future effects on every occasion is unhelpful". The court subsequently considered the issue further in *Long Bay-Okura Great Park Society Incorporated v North Shore City Council*[56] ("*Long Bay*") and considered it was bound[57] by the advice of the Privy Council in *Fernandez v*

52 Closing submissions dated 13 July 2013 at para 2.3(a).

53 Citing *"Royal Forest and Bird Protection Society of New Zealand Inc v Buller District Council* [2005] NZRMA 193 (HC) at [73]". The correct reference is [2006] NZRMA 193 (HC).

54 As defined in section 2 RMA.

55 *Clifford Bay Marine Farms Ltd v Director General of Conservation* Decision C131/03 at [63].

56 *Long Bay-Okura Great Park Society Incorporated v North Shore City Council* Decision A78/2008.

57 *Long Bay* at [321].

Government of Singapore[58] where Lord Diplock referred to "the balance of probabilities" as[59]:

> … a convenient and trite phrase to indicate the degree of certitude which the evidence must have induced in the mind of the court as to the existence of facts, so as to entitle the court to treat them as data capable of giving rise to legal consequences.

He continued:

> But the phrase ['the balance of probabilities'] is inappropriate when applied not to ascertaining what has already happened but to prophesying what, if it happens at all, can only happen in the future. There is no general rule of English law that when a Court is required, either by statute or at common law, to take account of what may happen in the future and to base legal consequences on the likelihood of its happening, it must ignore any possibility of something happening merely because the odds on its happening are fractionally less than evens.

As the court said in *Long Bay* that is a clear statement of the law, equally applicable in New Zealand. Predictions of the likelihood of an effect are decided upon the preponderance of the evidence.

[42] The Likelihood Scale[60] set out by the International Panel on Climate Change is useful in this context. It suggests the following "calibrated language for describing quantified uncertainty"[61] about the future:

Table 1. Likelihood Scale	
Term	**Likelihood of the Outcome**
Virtually certain	*99-100% probability*
Very Likely	*99-100% probability*
Likely	*66-100% probability*
About as likely as not	*33 to 66% probability*
Unlikely	*0-33% probability*

58 *Fernandez v Government of Singapore* [1971] 2 All ER 691 (PC).
59 *Fernandez v Government of Singapore* [1971] 2 All ER 691 (PC) at 696.
60 Table 1 Likelihood Scale in *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties* MD Mastrandrea et al (2010).
61 *Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties* MD Mastrandrea et al (2010).

Very unlikely	*0-10% probability*
Exceptionally unlikely	*0-1% probability*

We will endeavour to be consistent with that Table in our assessment of probabilities of future events.

[43] The court also invited[62] the parties to make submissions before the hearing on the application of the probabilistic principle known as Bayes Rule to evidence (and hypotheses about future effects) but neither counsel nor the witnesses took up the opportunity. The court raised this point because most expert evidence that attempts to quantify the effects of stressors on the environment does so in a frequentist manner with 95% confidence limits. Since much data does not justify frequentist conclusions (disproving — or not — a null hypothesis, when that hypothesis is usually the opposite of what a consent authority wants to know), that information is then discarded as useless. However, such information can still be useful to assess the probabilities of potential events. As the Minute suggests, the principal method known to the court enabling consideration of more uncertain probabilities is Bayes Rule, so we regret the opportunity was not taken. That is especially so since Dr Clement, called for the Appellant, after making standard (and largely justified) frequentist criticisms of the Council's evidence, then admitted to the court that "Bayesian frameworks come in"[63] when assessing probabilities in conditions of uncertainty.

1. The marine environment of Beatrix Bay

1.1 Overview of the environmental setting

[44] The marine environment of Beatrix Bay, like the rest of the Marlborough Sounds, has been the focus of considerable historic human activity. It has been modified by physical disturbance (e.g. dredging and trawling), by runoff after land clearance, and by contaminants from residential and farming use of the land. Little data exists describing the ecological attributes of the Sounds prior to these activities. Some early publications reported on resources such as commercially viable intertidal mussel beds and subtidal scallop and horse mussel beds in the Pelorus Sound although most of these

62 Minute dated 14 April 2015.
63 Transcript p 369.

have been lost as a result of dredging and/or smothering sedimentation from land use practices.

[45] Dredging still occurs in the area, however, the actual number of dredge and trawl tows is not publicly available. The consensus of the experts seemed to be that dredging only occurred once or twice a year, whereas in the past it had been more frequent. In any event the experts seemed to agree that repeated and ongoing trawling for flatfish in Beatrix Bay has resulted in significant changes to the seafloor with fine sediments remaining on the surface. This could potentially result in a turbid layer across the whole Bay, but whether that is so is unclear. Much of the soft bottom marine environment in central Pelorus Sound remains in a modified state with small remnant sites supporting biologically significant communities[64]. Close to the shore there is often domestic rubbish[65] on the seabed.

[46] The intertidal zone of Pelorus Sound is dominated by cobble and boulder substrata interspersed by areas of bedrock. Isolated areas with low gradient soft shores exist at the heads of bays where shellfish such as cockles and pipis exist. In many parts of the Sounds the intertidal biological communities have been modified by historical recreational and commercial fishing activities. For example, from 1960 to 1980, hand harvesting as well as subtidal dredging of natural green-lipped mussel beds was widespread in the Sounds.

[47] The inshore shallow subtidal edges of Pelorus Sound are dominated by relatively steeply sloping shores. These areas have not been dredged and the impact of sediment runoff is minimised due to wave action and water currents that keep these shores relatively free from the effects of sediment smothering. Inshore shallow subtidal habitats in Pelorus Sound and the wider Marlborough Sounds are therefore in a relatively natural[66] state. Where currents are strongest, a variety of filter feeding organisms such as hydroids, sponges, ascidians and tubeworms become abundant. These current-swept shallow subtidal areas have often been recognised as significant sites.

64 Davidson R, Duffy C, Gaze P, Baxter A, DuFresne S, Coutney S and Hamill P. (2011). Ecologically significant marine sites in Marlborough New Zealand (Davidson Environmental Limited) [Exhibit 6.3].

65 R J Davidson rebuttal evidence para 7.5 [Environment Court document 6A].

66 R J Davidson evidence-in-chief para 24 [Environment Court document 6].

[48] At the foot of the shore slope, the topography of the sea floor becomes relatively flat. Deep offshore flat areas are usually dominated by silt and clay (mud). Mud is the most common and widespread marine habitat in the Sounds and supports a characteristic invertebrate community in addition to benthic fish species such as flat fish. In general, the diversity of surface dwelling species in these offshore mud areas is considerably lower than on the sloping bay edges. Surface dwelling species in particular are often relatively uncommon on deep mud. These offshore areas have been dredged in the past and that still continues[67]. Dredged sites support a community dominated by opportunistic species able to cope with regular disturbance. In many instances the original community types found on these offshore soft bottoms do not recover (or recover very slowly) from activities such as dredging.

[49] In addition to dredging and trawling the stressors on coastal marine environments such as Beatrix Bay include anthropogenic effects such as accelerated climate change, sedimentation from run-off from land-based activities[68], fishing[69] and marine farming. We received minimal evidence as to how the effects of climate change might affect the habitats of Beatrix Bay or the species that live in them.

[50] Dr Taylor also observed that[70]:

> Confounding the issue of determining any cumulative ecological effects on sub-tidal and intertidal communities will be the Sound-wide impacts of stochastic (largely random but can be predicted on a probabilistic basis) environmental events. This includes a rapid succession of floods from the Pelorus River (catchment 880 km²) and the Kaituna River (catchment 155 km²), which discharge on average 43.0 m^3s^{-1} and 5.4 m^3s^{-1} respectively (Sutton & Hadfield 1997), and decadal oscillations in weather patterns like El Nino/La Nina[71]. Both of these drivers can cause

67 R J Davidson rebuttal evidence para 8.11 and Figures 5 and 6 [Environment Court document 6A].

68 D I Taylor evidence-in-chief para 36 [Environment Court document 8] referring to "deforestation, pastoral farming, clear-felling of exotic forestry".

69 D I Taylor evidence-in-chief para 36 [Environment Court document 8].

70 D I Taylor evidence-in-chief para 39 [Environment Court document 8].

71 Citing Zeldis JR, Hadfield MG, Booker DJ 2013. "Influence of climate on Pelorus Sound mussel aquaculture yields: predictive models and underlying mechanisms". *Aquaculture Environment Interactions* at 4:1-15.

large shifts in the abundance of intertidal and sub-tidal species[72], and are known to affect the distribution of species within the Marlborough Sounds[73].

1.2 The effects of the existing mussel farms

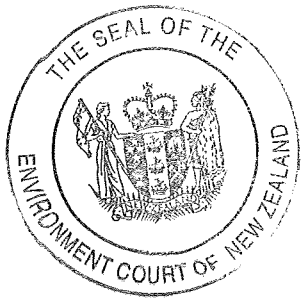
[51] We have referred to the 37 marine farms around the bay. Many of the earlier mussel farms in Beatrix Bay were — in accordance with the Sounds Plan — located close in to the shore and over rocky or reef substrates. As awareness of the ecological importance of those areas has risen, and as demand for farming space has increased, farms have extended seawards. That has had the effect of extending farms over the soft (flatter) substrate that characterises the seabed of most of Beatrix Bay.

[52] Cultured shellfish such as mussels feed on microscopic suspended particulate matter both living and non-living (collectively referred to as seston) by filtering it from the water column. Mussel diets are primarily composed of phytoplankton, but also include some zooplankton and other living and non-living material. Following digestion of food, the faeces produced by mussels are generally light and tend to break up and dissolve readily. That process releases dissolved nutrients, particularly nitrogen, into the water column. Mr B R Knight, another ecologist called for the Appellant, wrote that nitrogen is considered to be a limiting factor to the growth of phytoplankton in Beatrix Bay, so the effect of grazing by mussels — which reduces phytoplankton stocks — may be somewhat balanced by the recycling of nutrients that encourage replenishment of phytoplankton stocks[74]. However, that is somewhat academic because Mr Knight also described the current trophic status of Beatrix Bay as low-mesotrophic. Indeed basic nitrogen budgets developed for the Pelorus Sound indicate there is an excess of nitrogen inputs occurring.

72 Citing Schiel DR (2004). "The structure and replenishment of rocky shore intertidal communities and biogeographic comparisons". *Journal of Experimental Marine Biology and Ecology* at 300:309-342.

73 Citing Davidson R.J.; Duffy C.A.J.; Gaze P.; Baxter A.; DuFresne S.; Courtney S.; Hamill P. 2011. "Ecologically significant marine sites in Marlborough, New Zealand". Coordinated by Davidson Environmental Limited for Marlborough District Council and Department of Conservation.

74 B R Knight, evidence-in-chief para 19 [Environment Court document 9].



[53] Mr Knight relied on papers[75] which he said found no change in the base food web as a result of mussel production in Pelorus Sound. There was no indication from these studies that mussel production at a bay or Sounds-wide scale was nearing ecological carrying capacity or that mussel farming associated change in water column properties was occurring[76].

Water column effects

[54] More authoritative information on water column effects is contained in a report by Dr N Broekhuizen and others called "A biophysical model for the Marlborough Sounds Part 2: Pelorus Sound"[77]. A draft was produced by Dr Broekhuizen, under a witness summons, and the final version ("*the Broekhuizen Report*") was referred[78] to by Mr Maassen in his memorandum of June 2015 and produced to the court and parties in February 2016.

[55] *The Broekhuizen Report* presents the results from large scale biophysical modelling of Pelorus Sound designed to describe the effects of existing (at 2012) and proposed (consented since 2012) mussel and finfish farms on water quality[79]. Various marine farming and geochemical scenarios were modelled. A finding of particular relevance in this case was that bay scale effects of increased ammonium concentrations and decreased seston concentrations are predicted by the model as a result of mussel farming.

[56] Counsel submitted that *the Broekhuizen Report* shows that the Existing Mussel farms in Pelorus Sound as at January 2012 have changed the environment compared with a "No Mussel farms" scenario. The report states, as Mr Maassen for the Council quoted[80], that:

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75 Zeldis JR, Howard-Williams C, Carter CM, Schiel DR 2008. *ENSO and riverine control of nutrient loading, phytoplankton biomass and mussel aquaculture in Pelorus Sound, New Zealand.* Marine Ecology Progress Series 371; 131-142; Zeldis JR, Hadfield M, Booker D 2013. *Influence of climate on Pelorus Sound mussel aquaculture yield; predictive models and underlying mechanisms.* Aquaculture Environment Interactions 3(4); 1-15.

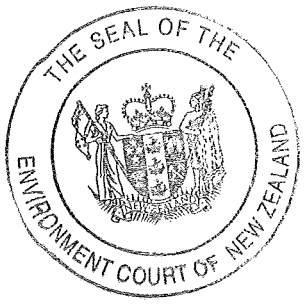
76 B R Knight, rebuttal evidence at 4.9-4.10 [Environment Court document 9A].

77 Broekhuizen, N; Hadfield M; Plew D "A biophysical model for the Marlborough Sounds Part 2: Pelorus Sound" (2015) NIWA Report CHC 2014-130.

78 Environment Court document 10A.

79 Broekhuizen N, Hadfield M and Plew D 2015 *A biophysical model for the Marlborough Sounds. Part 2: Pelorus Sound.* NIWA Client Report CH2014-130.

80 Memorandum from Marlborough District Council dated 22 July 2015.



> Relative to the nominated baseline scenario (EM-EF-WD[81]), a no mussel, existing fish with denitrification simulation (NM-EF-WD[82]) yields:
>
> **Winter-time:** lower concentrations of ammonium and nitrate but higher concentrations of particulate organic detritus (dead plankton etc.,) phytoplankton and zooplankton. The largest changes in relative concentration are seen in Kenepuru Sound and the largest relative concentration changes are within the zooplankton. There, time-averaged near-surface winter-time seston3 concentrations in the NM-EF-WD simulation are more than double those of the EM-EF-WD scenario (for zooplankton in Kenepuru, substantially more than double). The Beatrix/Crail/Clova system also exhibits similar (but smaller) changes.
>
> **Summertime:** lower concentrations of ammonium, nitrate, higher concentrations of detritus and zooplankton, but phytoplankton concentrations which are similar to (or lower than) those of the EM-EF-WD scenario. During summer, mussels convert particulate organic nitrogen (not directly exploitable by phytoplankton) to ammonium (directly exploitable by phytoplankton). Phytoplankton growth is normally nutrient limited during this time, but in the immediate vicinity of the mussel farms, phytoplankton (which survive passage through the farms) find a plentiful ammonium supply. This enables them to grow quickly – more than offsetting the losses that the population suffered to mussel grazing (the 'excess' accrued phytoplankton biomass being fuelled out of the detritus that was consumed). …

[57] In summary the *Broekhuizen Report* suggests that there have been "material" changes in water column properties as a result of the development of mussel farms. However, the report does not assist with determining any threshold regarding the ecological carrying capacity of Pelorus Sound for mussel farms. Nor does it substantiate a trajectory of insidious decline (in Mr Maassen's phrase) in relation to the water column.

The benthic zone: physical effects

[58] Shell, mussels, faeces and pseudofaeces are released from mussel farms. The latter comprise inorganic and organic material filtered from the water column, but not digested. The rejected particles are aggregated into a mucus-bound mass and

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81 The abbreviation stands for "existing mussel-farms, existing fish-farms, with benthic dentrificantion": (EM-EF-WD). This "corresponds to present-day conditions in Pelorus Sound" Broekhuizen et al para 4.9.

82 The abbreviation stands for "no mussel-farms, existing fish-farms, with benthic dentrification": (NM-EF-WD).

periodically ejected back into the water column. Pseudofaeces are heavier than faeces and settle out rapidly to the seafloor as sediment.

[59] Between 250 and 400 tonnes of shell, mussels and sediment is released under each hectare of farm each year[83]. For the 304 hectares (approximately) of current farms in Beatrix Bay, that is a minimum of 76,000 tonnes of sediment. The nutrients and fine particulate matter which are part of that sediment are dispersed at a rate which is a function of the current flow at the individual sites and the flushing characteristics of the bay as a whole. The shell hash and live mussels settle on the sea floor.

[60] The obvious visual effect of a mussel farm on the sea floor is the accumulation of live and dead mussels, increased sediment, and the increase in invertebrate predators such as the 11-armed sea star. Chapter 3 (Benthic Effects) of the *Literature Review of Ecological Effects of Aquaculture*[84] ("the *Literature Review*") published by the Ministry of Primary Industries states generally:[85]

> Visual observations suggest that shell deposition within a farm can be patchy, ranging from rows of clumps of live mussels and shell litter directly beneath long lines to widespread coverage across the farm site[86].

Further "Mussel clumps and shell litter beneath a mussel farm have been observed as acting as a substrate for the formation of reef-type communities"[87].

[61] Specifically in the Marlborough Sounds a more recent study we were referred to shows that at two sheltered farm sites[88]:

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83 B G Stewart evidence-in-chief para 6.4 [Environment Court document 26] referring to Hartstein, N.D. and Rowden, A.A. (2004). "Effect of biodeposits from mussel culture on macroinvertebrate assemblages at sites of different hydrodynamic regime". *Marine Environmental Research* 57:339-357 and Hartstein, N.D. and Stevens C.L. (2005). "Deposition beneath long-line mussel farms". *Aquaculture Engineering* 33:192-213.

84 *Literature Review of Ecological Effects of Aquaculture* (2013) Ministry of Primary Industries ("MPI") at section 2.2.2 (Exhibit 11.2). This publication does not contain a consensus view but is a series of individual chapters by different experts on the subject of their expertise.

85 *Literature Review* at p 3-20.

86 *Literature Review* citations omitted.

87 *Literature Review* citations omitted.

88 N D Hartstein "Acoustical and Sedimentological Characterization of Substrates in and Around Sheltered and Open-Ocean Mussel Aquaculture Sites and Its Bearing on the Dispersal of Mussel Debris" (2005) *IEE Journal of Oceanic Engineering* Volume 30 No 1 p 85 at 85.

> Photography and sediment samples reveal farms are underlain by mounds of shells with biodeposits infilling intershell voids and forming a veneer over entire mounds. In contrast, the surrounding seabed is naturally sedimented soft mud. Sediment from beneath the farms had total organic contents of 8%-19% decreasing sharply to natural levels of 4%-7%, 30 m from the farm's boundaries.

The author adds[89] "Given that [the farms] have low current flows and little potential wave energy … there is likely little lateral transportation and redistribution of the shell and organic material, thus causing it to deposit directly beneath the culture site." That might suggest the mussel shells and mussels only fall directly underneath the lines so that there is soft substrate between them. However, that possible interpretation is belied by the description of the "surficial sediments" in Hartstein's Figure 8. That shows the whole footprint of both low-energy farms was "silt and clay with mussel shells" or (smaller areas of) "predominately mussel shells"[90].

[62] We find on the balance of probabilities that the whole area underneath an average mussel farm in Pelorus Sound has a changed substrate. It is no longer reef or soft mud but is usually a patchy mix of clumps of mussels and shells, and larger areas of mud and mussel shells. It is unlikely there is consistent soft mud and an absence of shells. We also find that on average the penumbra of sediment extends no further than 30 metres from the farms, and shell hash extends far less, depending on wind drifting long lines.

[63] Dr Stewart calculated[91] the total amount of soft substrate habitat available within Beatrix Bay as approximately 1960 ha. He then compared that with "… the amount of habitat likely changed due to the presence of mussel farms (approximately 365 ha), based on 320 ha of consented farm space and 15-20% extra for movement of longlines and impacts beyond farm boundaries". He concluded that "…approximately 19% of the soft substrate habitat is potentially affected" by existing mussel farms. He considered that insufficient information was available to determine the effects of mussel farms on

89 N D Hartstein, above n 88, at p 92.
90 N D Hartstein above n 88, at p 91.
91 B G Stewart evidence-in-chief para 7.4 [Environment Court document 26].

benthic communities away from the immediate farm footprint[92] or on the accumulated effects[93] from the scale of farming in Beatrix Bay on these communities.

[64] We are uneasy about Dr Stewart's calculations. The Appellant was generally critical of them, but did not attempt to put up on alternative figure. It seems to us (for example from Figure 1 attached to Dr Fisher's evidence[94]) that about 60% of the existing farms in Beatrix Bay are over water that is at least 20m deep and is thus likely to be both over soft mud seafloor and within King Shag foraging depths (which start at about 10m). Of the 320 hectares of consented space perhaps only 200 hectares is over soft substrate. In addition there is a 30 metre wide strip along the outside edge of all the total farm's length (8.5km) which adds a further 25 hectares of substrate substantially affected, albeit more by sediment than by shell hash and live mussels. Thus the total 225 hectares of affected benthic environment is very approximately 11% of the total area of Beatrix Bay (but more than 11% of the total soft substrate).

The benthic zone: biochemical and infaunal effects

[65] Dr Taylor wrote that[95]:

> … mild enrichment effects are common under mussel farms in the Marlborough Sounds, and are relatively minor and are a natural feature of mussel beds on the seabed. These effects are often result in enriched infauna (animals living in the sediments) and epifauna (animals living on the sediments) communities with greater taxa diversity and abundances[96].
>
> …
>
> In general, mussel farm-related seabed effects reduce to no near undetectable levels within 20 m–30m of farm boundaries[97].

[66] In relation to the deposition of finer sediments, Dr Taylor described how in his opinion deposition in the form of faeces and pseudofaeces from the mussel farm will

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92 B G Stewart evidence-in-chief para 4.2 [Environment Court document 26].

93 B G Stewart evidence-in-chief paras 5.13 and 6.40 [Environment Court document 26].

94 P R Fisher evidence-in-chief p 7 [Environment Court document 28].

95 D I Taylor evidence-in-chief paras 32 and 33 [Environment Court document 8].

96 Citing Kaspar, H.F., Gillespie, P.A., Boyer, I.C. and MacKenzie, A.L. (1985). "Effects of mussel aquaculture on the nitrogen cycle and benthic communities in Kenepuru Sound, Marlborough Sounds, New Zealand". *Marine Biology* at 85: 127–136.

97 Citing Keeley, N., B. Forrest, G. Hopkins, P. Gillespie, D. Clement, S. Webb, B. Knight and J. Gardner (2009). "Review of the Ecological Effects of Farming Shellfish and Other Non-finfish Species in New Zealand". Prepared for the Ministry of Fisheries: *Cawthron Report No. 1476*. Nelson, New Zealand, Cawthron Institute: at p 144.

result in "mild" enrichment of the soft sediment directly below and immediately adjacent to the farm. This enrichment reduces to near undetectable levels within 20-30m of the farm boundary in low to moderate water flow sites.

[67] Dr Mead asserted that based on his own observations and modelling evidence on currents, he expected anoxic conditions (highly enriched) to be widespread under the majority of the mussel farms in Beatrix Bay[98]. He extrapolated from research by Christensen and others[99] in Pelorus Sound.

[68] Responding to Dr Mead's assertion[100] that enrichment of the benthic environment under existing mussel farms had not been investigated, Dr Taylor referred us to two qualitative assessment studies he had been involved with in Pelorus Sound, one of these in Beatrix Bay. Mr Ironside, in a lengthy cross-examination, took Dr Taylor through a detailed examination of all of the elements contributing to benthic changes under mussel farms reported in Christensen[101]. Dr Taylor responded that all have been taken into account in this case.

[69] In response to cross-examination by Mr Ironside on the Christensen research[102] on the "cumulative" effects of suppression of the natural denitrification process under mussel farms, Dr Taylor suggested that it was difficult to extrapolate to a bay-wide scale or even a farm-wide scale the results from three 5cm cores as reported by Christensen. He maintained his position that a gradient of effects under and moving out from mussel farms resulted in largely benign effects at a Beatrix Bay scale. In his opinion, "cumulative" effects were not distinct, marked or adverse[103]. When asked by the court

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98 Transcript, p 412, line 20.

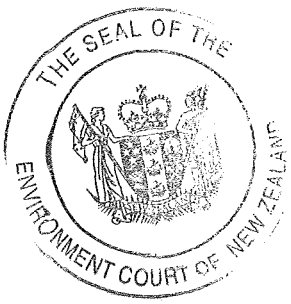
99 Christensen P B, Glud R N, Dalsgaard T and Gillespie P 2003. "Impacts of longline mussel farming on oxygen and nitrogen dynamics and biological communities of coastal sediments". *Aquaculture* 218, 567-588 [Exhibit 8.4].

100 S T Mead evidence-in-chief at para 41 [Environment Court document 20].

101 Christensen P B, Glud R N, Dalsgaard T and Gillespie P 2003. "Impacts of longline mussel farming on oxygen and nitrogen dynamics and biological communities of coastal sediments". *Aquaculture* 218, 567-588 [Exhibit 8.4].

102 Christensen P B, Glud R N, Dalsgaard T and Gillespie P 2003. "Impacts of longline mussel farming on oxygen and nitrogen dynamics and biological communities of coastal sediments". *Aquaculture* 218, 567-588 [Exhibit 8.4].

103 Transcript, p 186, line 17.



if the sediment sampling reported in the Christensen study was adequate to establish bay-wide conclusions, Dr Mead agreed that "this wouldn't be a normal process"[104].

[70] Dr Stewart presented findings from his own dive surveys of "inshore habitats" at the proposed site, under and adjacent to an existing mussel farm, and at a control site in Miro Bay. These surveys revealed a range of differences in epifaunal community structure (diversity) and abundance between sites. Hard substrate communities showed larger differences than those on soft substrate. Dr Stewart observed[105] that without more comprehensive survey work, linking differences in diversity to any specific cause would be difficult. He did however go on to make such a linkage[106] to the presence or close proximity or absence of mussel farms. He concluded that as the benthic community "will almost certainly differ" following development of a mussel farm, the effect on that community was likely to be significant within 100m of the farm.

[71] Dr Taylor and Dr Grange were critical of the design of Dr Stewart's study in that it examined a single site beneath the mussel farm and one control site some 14 km further into Pelorus Sound from Beatrix Bay in an area influenced by freshwater and sediment-laden plumes from the Pelorus River. Dr Taylor considered[107] the lack of site replication meant that analysis of the results had a very high risk of making a type 1 error (a false positive) suggesting there is an effect when none is actually present. In Dr Taylor's opinion the limitations of the study ruled out any conclusions on mussel farm effects on inshore communities as any differences can equally be explained by natural site to site variability as evidenced by the Davidson/Grange study referred to earlier.

[72] Of particular concern in this case are the effects of the mussel farms on specialist (rather than generalist[108]) taxa and particularly on (the habitat of) the specialist King Shag. It is apparent that the 37 mussel farms in Beatrix Bay each have some effect in altering the benthic environment below and adjacent to (within 30 metres of) the direct footprint of the farm. The evidence does not, however, support the claim that bay-wide effects on benthic communities are <u>generally</u> significant. The same conclusion was

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104 Transcript, p 416, line 14.

105 B G Stewart evidence-in-chief at 4.19 [Environment Court document 26].

106 B G Stewart evidence-in-chief at 4.24 [Environment Court document 26].

107 D I Taylor, rebuttal evidence-in-chief [Environment Court document 8A].

108 A simple everyday example is to compare nearly ubiquitous house sparrows (relatively generalist) with rock wren (mountain specialists).

earlier reached by the author of Chapter 12 of the *Literary Overview*[109] with the statement:

> While benthic effects are one of the most commonly expected changes as a result of shellfish farming, they are typically of minor ecological consequence **beyond** the boundary of the farm. (Emphasis added).

The implication is that benthic effects are of more than minor ecological significance underneath mussel farms. That is consistent with the evidence of Dr Stewart.

The photic zone

[73] Dr Stewart carried out an analysis[110] in respect of the photic zone — the sunlit zone within which photosynthesizing algae play a significant role in primary production. Using a "conservative" figure of 30 metres to define the depth of the zone in Beatrix Bay, he calculated the percentage of the photic zone likely altered by mussel farms is about 85-90%.

[74] Upon first reading, this appears to be a significant change resulting from mussel farming. However Dr Taylor wrote that[111]:

> … the level of productivity of the microphyto-benthos (the micro algal mats that grow on muddy substrata throughout the Marlborough Sounds) is known to fluctuate greatly depending on the time of year and the time elapsed since significant flood events in the Pelorus River. This is because the river plume reduces water clarity and contributes significantly to sedimentation in the Pelorus Sound[112].

He continued:

> Not only is the productivity of the microphyto-benthos highly variable in space and time, but it is also capable of remaining highly productive beneath mussel farms.

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109 *Literature Review* above n 84: Chapter 12 (C Cornelisen) at section 2.3.2.

110 B G Stewart evidence-in-chief para 7.6 [Environment Court document 26].

111 D I Taylor rebuttal evidence para 4.1 [Environment Court document 8A].

112 Citing Handley S 2015. "The history of benthic change in Pelorus Sound (Te Hoiere), Marlborough". *NIWA Client Report No: NEL2015-001*. Prepared for Marlborough District Council.

[75] We have inadequate information to determine whether the effects of mussel farms have been adverse or beneficial generally on the photic zone of Beatrix Bay. However, since we were not given evidence of any direct link between this and any alleged adverse effect of relevance under the Sounds Plan or NZCPS we consider it no further.

Summary

[76] We find on the balance of probabilities that the effects of the existing mussel farms on:

(a) the water column is that they deplete seston supplies from the water column in winter and add to it in summer;
(b) the reef zone around the promontory are negligible;
(c) the photic zone are uncertain;
(d) the benthic zone are confined to changing the substrate to patches of shell, live mussels and sediments within an incomplete ring no wider than 30 metres from the farm boundaries;
(e) the soft seafloor of Beatrix Bay is that about 11% has been changed quite substantially.

[77] All those accumulated and accumulating effects are a key part of the environmental setting of the proposal.

1.3 Have mussel farms changed fish distribution?

[78] The soft mud floor of Beatrix Bay provides habitat for flatfish including Witch Flounder, other (right-eyed) flounder species and Lemon Sole. While fish species typically spend[113] some of their time feeding, "the remainder of the time [is spent] in other activities such as predator avoidance, where their location may be driven by benthic habitat". When not breeding or feeding, flatfish spend much of their time hidden in the soft substrate of the seafloor according to Dr Fisher. Beatrix Bay also provides habitat "for adult spawning and nursery areas for juvenile flat fish"[114].

113 P R Fisher evidence-in-chief para 4.26 [Environment Court document 28].
114 P R Fisher evidence-in-chief para 4.42 [Environment Court document 28].

[79] The *Literature Review* states[115] "Direct effects from the development of shellfish farms include alteration of essential fish habitats through the deposition of shell litter and biodeposition of particulate matter." It goes on to add "These effects can be avoided or minimised through proper site selection and effects assessments prior to development". Dr Fisher's evidence was consistent with that. In his view[116] the habitat under mussel farms is no longer soft muddy floor.

[80] The *Literature Review* continues[117]:

> The initial attraction of wild fish species to aquaculture structures (e.g., habitat creation) can lead to a variety of related effects including:
>
> - Changes in the distribution and productivity of wild fish populations due to the addition of artificial structures that create new habitats used by wild fish.
> - Changes in recreational fishing patterns and pressure, which in turn could affect wild fish populations differently than in the absence of the structures.
> - Larval fish depletion by shellfish and/or potential trophic interactions (e.g., alteration of plankton composition and food availability).

[81] Dr Stewart was also of the opinion that the "formation of reef-like communities immediately below mussel farms [both] create predator oases"[118] and cause "habitat loss and/or modification"[119] as well as "increased competition for bottom feeders …"[120]

[82] In Mr Shuckard's experience[121] "[f]ish abundance around mussel lines is small[122] and dominated by small, demersal species characteristic of rocky reefs in the area, notably triplefins (*Forsterygion lapillum* and *Grahamina gymnota*) and Spotty (*Notolabrus celidotus*)." He has also observed[123] common species of fish around mussel

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115 *Literature Review* above n 84, at p 5-6.
116 B G Stewart evidence-in-chief para 3.15 [Environment Court document 26] (see P R Fisher evidence-in-chief para 6.2).
117 *Literature Review* above n 84, at p 5-6.
118 B G Stewart evidence-in-chief para 6.15 [Environment Court document 26].
119 B G Stewart evidence-in-chief para 6.17 [Environment Court document 26].
120 B G Stewart evidence-in-chief para 6.17 [Environment Court document 26].
121 R Schuckard evidence-in-chief para 59 [Environment Court document 25].
122 Citing Morrisey, D.J., Cole, R.G., Davey, N.K., Handley, S.J., Bradley, A., Brown, S.N. and Madarasz, A.L. (2006). "Abundance and diversity of fish on mussel farms in New Zealand". *Aquaculture* 252:277-288.
123 R Schuckard evidence-in-chief para 59 [Environment Court document 25].

farms such as Smooth Leatherjacket (*Parika scaber*) and Yellow-eyed Mullet (*Aldrichetta forsteri*).

[83] Mr Davidson wrote[124]:

> ... Dr Fisher suggests[125] the "smothering of benthos" under mussel farms excludes "naturally occurring benthic species" ... There are no published data on the abundance or distribution of witch flounder (or, for that matter, flat fish) under mussel farms compared to adjacent areas. His statement is therefore unsupported speculation. As mussel farms exclude trawling it is entirely possible that flatfish abundance may be higher under and between farms. Apart from studies investigating fish species inhabiting farm structures, I am not aware of comprehensive data investigating benthic species. (Underlining added).

This is one of the points where the burden on the Appellant (as applicant) of putting forward adequate information becomes critical.

[84] We accept that it is possible that some flatfish may be found underneath mussel farms: some of the prey (e.g. polychaetes) of Witch Flounder may increase in abundance. However, we find that the overall assemblage of fish and other fauna changes quite markedly underneath and in the proximity of most mussel farms. In relation to benthic fish species, Mr Schuckard[126] referred to overseas research which shows that:

> Declining environmental conditions under and in the vicinity of farms as a result of faeces and pseudo-faeces deposition in small discrete areas in and around the farms, have a generally negative impact on oxygen-related processes for the different life stages of fish; settlement probability of juveniles; habitat utilisation of spawning fish; age structure of successful spawners; and food consumption rates of adult fish.

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124 R J Davidson rebuttal evidence para 8.16 [Environment Court document 6A].

125 P R Fisher evidence-in-chief para 6.6 [Environment Court document 28].

126 R Schuckard evidence-in-chief para 57 [Environment Court document 25] citing Folke, C., Kautsky, N., Berg, H., Jansson, A., Troell, M.. (1998). "The ecological footprint concept for sustainable seafood production: A review". *Ecological Applications*, 8(1) Supplement, pp S63-S71; Hinrichsen, H.H., Huwer, B., Makarchouck, A., Petereit, C., Schaber, M. And Voss, R. (2011) "Climate-driven long term trends in Baltic Sea oxygen concentrations and the potential consequences for eastern Baltic cod (*Gadus morhua*)". *ICES Journal of Marine Science*, 68: 2019-2028; Diaz, R., Rabalais, N.N. and Brietburg, D.L "Agriculture's Impact on Aquaculture: Hypoxia and Eutrofication in Marine Waters". *OECD Publishing* (2012)..

That supports the third bullet point in the *Literature Review* quoted above. Further, there appears to be effects on the substrate which may decrease the quality of habitat even for feeding flatfish: increased predator numbers and potentially a poorer hiding environment.

[85] We find that the habitats of flatfish and other benthic fish species have been reduced by the introduction of mussel farms in that:

(a) it is likely that the changes in substrate underneath mussel farms are physically (a change from soft mud to mud and shell, or shell and mussels), chemically (increases in organic matter) and ecologically (a change of in-fauna and increases in predators) different from the original seafloor;
(b) it is very likely that the fish assemblages have changed;
(c) flatfish in all stages of their life-cycle and in most of their activities are largely excluded from underneath most mussel farms;
(d) it is likely that flatfish have been at least partly displaced within about 30 metres of the outside boundary of mussel farms in the Sounds.

[86] The reduction in that habitat within Beatrix Bay is an accumulated effect or stressor which is part of the environment. However, we have found it quite difficult to assess the extent of change to that part of the benthic environment which is soft mud, because by no means all of the existing mussel farms are anchored over that type of seafloor exclusively.

[87] The Appellant (through Dr Taylor) did not address the question whether the nutrients under mussel farms — whether in or on the benthos (seafloor) or in the photic zone — change the food web in a way that assists species higher up the chain, for example by providing them with more prey, or inhibits them. We now turn to that and related issues in respect of one particular species — the New Zealand King Shag.

2. New Zealand King Shags and their habitat

2.1 Description, population and conservation status

[88] One aspect of the environment in which the site is located is of particular importance in this case. It stems from the fact that Beatrix Bay is within the extent of

occurrence ("EOO")[127] of the endemic New Zealand King Shag[128]. The New Zealand King Shag[129] ("King Shag") is one of 16 taxa[130] of blue-eyed shags. Like almost all *Leucocarbo* shags, it is dimorphic: males are larger and heavier than females and they tend to feed in deeper water[131].

[89] The King Shag is a large black and white bird with pink feet and white bars on its black wings. It has yellowish-orange patches of bare skin at the base of the bill. It is smaller than the Black Shag[132] and larger than the Pied Shag[133] (with which it can be confused).

[90] We received evidence about King Shags from three witnesses. Mr R Schuckard who holds a MSc in Biology gave evidence for the Societies. Since 1991 he has conducted long term[134] studies and monitoring of New Zealand King Shag. He is a committee member of the Friends of Nelson Haven and Tasman Bay Inc[135] and is thus not completely disinterested in the outcome of this proceeding. We treat his evidence with caution as we do that of Mr Davidson for the Appellant. In fact Mr Davidson expressly renounced[136] being an expert witness in these proceedings. On the whole those two witnesses both attempted to be as objective as possible and our caution is more about subconscious biases than obvious partisanship by these two witnesses. The largest exceptions are parts of Mr Davidson's rebuttal evidence where he alternates between critical statements on the evidence of other parties' witnesses and rather broad or simplistic assertions of his own. The Council called Dr P R Fisher, a completely independent avian ecologist who has studied the King Shag.

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127 "Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy … This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g. large areas of obviously unsuitable habitat) … Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence)". IUCN (2012) *IUCN Red List Categories and Criteria*: [*Version 3.1, Second Edition*] Gland, Switzerland and Cambridge, UK: IUCN. iv + 34 pp11-12.

128 *Leucocarbo carunculatus.*

129 Te Kawau-a-Toru *Leucocarbo carunculatus.*

130 Seven blue-eyed species occur in New Zealand (including the Sub-Antarctic species).

131 P R Fisher evidence-in-chief para 4.5 [Environment Court document 28].

132 Better called Great Cormorant *Phalacrocorax carbo.*

133 *Phalacrocarax varius.*

134 R Schuckard evidence-in-chief para 3 [Environment Court document 25].

135 R Schuckard evidence-in-chief para 7 [Environment Court document 25].

136 R J Davidson evidence-in-chief para 10 [Environment Court document 6].

Population

[91] Mr Schuckard estimated the average population between 1992 and 2002 as 645 birds[137] with breeding colonies restricted to four areas: Duffers Reef, Trio Islands, Sentinel Rock and White Rocks[138]. Relying on his earlier research Mr Schuckard informed[139] us that "... the numbers of shags appear to have been stable for at least the past 50 years — and possibly over 100 years[140]". Mr Davidson saw this as providing "some comfort"[141] that marine farms have not effected the population of King Shags. In Dr Fisher's opinion[142] the methodology used by Mr Schuckard was "... appropriate for the task ..." and provided accurate counts.

[92] Dr Fisher initially wrote that[143] "the most recent *estimate* for the total King Shag population was of 687 birds". That is based on a survey of the marine avifauna of the Marlborough Sounds undertaken between September and December 2006. He sounded a precautionary note that the estimate is based on "... counts at colonies when significant numbers of birds were absent feeding"[144], and that caution was justified by subsequent events.

[93] New, more thorough (and expensive) techniques for surveying the King Shag population have recently (2015) been set up. On 11 February 2015 an aerial survey by Mr Schuckard and two other experts counted more (839)[145] King Shags than ever before. The increase in numbers of birds compared to the results of his earlier surveys is attributed by Mr Schuckard[146] to a better accuracy in the count than before, to the count being done in one morning rather than over tens of days and to more colonies being counted.

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137 R Schuckard "Population Status of the New Zealand King Shag ..." *Notornis* (2006) 53(3): 297-307.

138 All are protected as wildlife sanctuaries under the Reserves Act.

139 R Schuckard evidence-in-chief para 23 [Environment Court document 25].

140 Citing W L Buller "Notes and Observations on New Zealand Birds" (1891) *Trans. NZ Inst.* 24: 65-91.

141 R J Davidson rebuttal evidence para 8.10 [Environment Court document 6A].

142 P R Fisher evidence-in-reply para 3.4 [Environment Court document 28A].

143 P R Fisher evidence-in-chief para 3.2 [Environment Court document 28] citing M Bell "Numbers and distribution of New Zealand King Shag ... colonies in the Marlborough Sounds, September-December 2006" (2010) *Notornis* 57:33-36.

144 P R Fisher evidence-in-chief para 3.2 [Environment Court document 28].

145 R Schuckard Supplementary evidence para 30 [Environment Court document 25A].

146 R Schuckard Supplementary evidence para 30 [Environment Court document 25A].

[94] The highest number of birds counted by Schuckard at the four main colonies during his 1991-2002 surveys was 626 in 1994. The count for these four sites by the 2015 aerial survey was[147] 637. This suggests, given Dr Fisher's comment on the accuracy of Schuckard's 1991-2002 counts, that the numbers of birds at the four colonies has not changed significantly and thus the increase in the total number of birds is likely to be a result of a more wide ranging count.

[95] Mr Gardner-Hopkins in his closing submissions said:

> In 1992, the closest colony to Beatrix Bay, Duffers Reef, posted 168 (of 524) King Shag individuals. In contrast, the latest population count (early in 2015) has nearly 300 King Shags at Duffers Reef (out of 839 overall).[148]

It was unclear what inference he intended us to draw from that. One thing we cannot do is assume[149] there has been an increase in the total population[150].

[96] We conclude that King Shag numbers in the four main colonies have been approximately the same since 1991 and there is no declining trend in total numbers, but that finding is subject to the qualifications stated by Dr Fisher[151] who elaborated on this in his rebuttal evidence[152]: "the colony counts cannot be used to determine the long term '*stability*' of the population because the count[s] do … not reflect the number of breeding pairs, successful breeding attempts or age and sex ratio of birds, the latter determining the number of potential breeding pairs".

Status

[97] The King Shag is a Nationally Endangered[153] species in the *New Zealand Threat Classification System* published by the Department of Conservation. As at 2012 the criteria for King Shag's inclusion as a "Nationally Endangered Species" were that it had

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147 R Schuckard evidence-in-chief para 30 [Environment Court document 25].
148 As summarised in the Council's submissions at para 277.
149 Transcript, p 525, line 17.
150 R Schuckard supplementary evidence para 30 [Environment Court document 25A].
151 P R Fisher evidence-in-chief para 3.4 [Environment Court document 28].
152 P R Fisher rebuttal evidence para 6.6 [Environment Court document 28A].
153 "Nationally endangered" is the second in three categories of "Threatened Species": Nationally Critical, Nationally Endangered, and Nationally Vulnerable in the Department of Conservation's Threat Classification System.

a small (250-1,000 mature individuals), stable population[154]. It was also described as "Range Restricted"[155].

[98] The *IUCN Red List Categories and Criteria* ("the *Red List*") categorises taxa by assessing them under five sets of criteria[156]:

A: Reduction in population;

B: Geographic range (EOO or AOO — see next paragraph — or both);

C: Small population size and declining population;

D: Very small or restricted population size;

E: Quantitative analysis showing the probability of extinction in the wild meets a threshold[157].

[99] Obviously the "AOO" needs explanation. The *Red List* states[158]:

> Area of occupancy is defined as the area within its 'extent of occurrence' which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data …

[100] King Shag is identified as *vulnerable* by the International Union for the Conservation of Nature and Natural Resources ("IUCN") in the *Red List*. *Vulnerable* is one of the three 'threatened' species in the *Red List*. Dr Fisher explained that the King Shag is so categorised because[159]:

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154 H A Robertson, J E Dowding, G P Elliot et al p 10 Conservation Status of New Zealand Birds (2012) Department of Conservation.

155 H A Robertson, J E Dowding, G P Elliott et al Conservation Status of New Zealand Birds (2012) Department of Conservation p 10.

156 IUCN (2012) *IUCN Red List Categories and Criteria*: [*Version 3.1, Second Edition*] Gland, Switzerland and Cambridge, UK: IUCN. IV + 34.

157 50% probability means taxon is critically endangered, 20% endangered, 10% vulnerable.

158 The *Red List* above n 156, at p 12. The definition of "EOO" is given above n 127.

159 P R Fisher evidence-in-chief para 3.5 [Environment Court document 28].

> … this **species is facing a high risk of extinction in the wild in the medium-term future** based on the criterion (D1) **population less than 1000 individuals,** *and* is restricted to four core breeding colonies (criterion D2: **five or less locations***),* rendering the species susceptible to stochastic effects (e.g. infrequent, significant events) and human impacts.

The criteria he was referring to are contained in the *Red List*. Either of the two criteria referred to (D1 and D2) are sufficient[160] to place King Shag in the *vulnerable* category.

2.2 What is the geographic range of the King Shag?

[101] Neither the extent of occurrence nor the area of occupancy of King Shags is known with much accuracy. In answer to the Appellant's sustained attack on the accuracy of the Sounds Plan's inclusion of King Shag habitat as an area of ecological value (we discuss this later), Dr Fisher suggested that the extent of occupancy is the entire area of the Marlborough Sounds because individuals have occasionally been seen in remote corners. The species is known to breed at less than 10 locations.

Proximity of King Shag colonies to the site

[102] Relatively small numbers of birds breed[161] in any year across the four main colonies (Duffers Reef, Trio Islands, Sentinel Rock and White Rocks) ranging from a minimum of 70 to a maximum of 166 pairs based on census counts between the years 1992-2002.

[103] The closest main colony to Beatrix Bay is the Duffers Reef colony, with approximately[162] 240 birds. That may represent about 30-40% of the world population. There is also a small colony of up to 20 King Shags located 2 kilometres due west of the Beatrix Bay entrance at Tawhitinui Bay point[163].

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160 The *Red List* above n 156, at p 15.

161 P R Fisher evidence-in-chief para 3.7 [Environment Court document 28] citing Schuckard, R "New Zealand King Shag (*Leucocarbo carunculatus*) on Duffer's Reef, Marlborough Sounds." (1994) *Notornis 41*: 93–108 and Schuckard, R. "Population status of the New Zealand King Shag (*Leucocarbo carunculatus*)" (2006) *Notornis* 53: 297-307.

162 P R Fisher evidence-in-chief para 3.8 citing Ornithological Society of New Zealand 2013 [Environment Court document 28].

163 P R Fisher evidence-in-chief para 3.8 [Environment Court document 28].

Foraging areas

[104] Research from the Trios and (Northern) Stewart Island[164] in Admiralty Bay shows that King Shags forage mostly within 10 kilometres of the colonies. That was an approximation from Mr Schuckard's research which found that the mean distance of foraging birds from the Duffers Reef colony was 8.2km for a total count of 219 birds[165]. The maximum distance recorded was 24 kilometres although Dr Fisher acknowledged there had been no systematic studies at greater distances.

[105] In Mr Schuckard's opinion King Shags "... feed predominately southwest from the colonies in the outer Marlborough Sounds where their distribution in the feeding areas appear[s] to be constrained by distance and direction from the colony, and water-depth"[166]. To illustrate that he referred to his Figure 3 identified as "Figure 3 Distribution of feeding King Shags in the Marlborough Sounds". Certainly to our eyes that appears to illustrate his point about distance and direction. However, it was criticised by a witness for the Appellant, Dr D Clement who when asked in cross-examination whether it was an attempt to show area of occupancy agreed but qualified that by answering "... it is an attempt but not necessarily correct"[167]. We understand Dr Clement to be implying that there may be other squares beyond that distance which are within the area of occupancy, and we accept that. However, we also accept Dr Fisher's evidence that[168]:

> The potential marine foraging areas available to King Shags are constrained by energetic and food delivery requirements during the chick rearing period and body-morphometric related physiological constraints on maximal flight distances from the colony and water depth.

[106] Mr Schuckard's first surveys of the Duffers Reef breeding colony and feeding King Shags from this colony were 12 trips in 1990-1991. The foraging surveys were repeated along the same route, but in Beatrix Bay and Forsyth Bay only, in 1997 and 2014. Fewer trips (5) were made for these than for the 1990/91 survey. Finally, a single survey was undertaken by Mr Schuckard in 2015. He considered that he has established

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164 Davidson et al (Ex 6.3) at p 25.

165 P R Fisher evidence-in-chief para 4.8 [Environment Court document 8] citing R Schuckard "New Zealand King Shag ... on Duffer's Reef Marlborough Sounds" (1994) *Notornis* 41: 93-108.

166 R Schuckard evidence-in-chief para 7 [Environment Court document 25].

167 Transcript, p 361, line 33 dated 7 May 2015 1418.

168 P R Fisher evidence-in-chief para 4.4 [Environment Court document 28].

that the majority of feeding occurs within 15 km of the colony (although individual birds were observed beyond that distance).

[107] Usually, King Shags fly low to the sea and do not fly overland on foraging trips. There is one interesting and relevant exception. Beatrix Bay is unique in terms of foraging habitat for King Shags because they access[169] it from Forsyth Bay by flying over the narrow Piripaua Neck. In a nearly direct line the application site in Beatrix Bay is between 8 and 9 km from the Duffers Reef colony. We note that Mr Schuckard also recorded[170]:

> Some differences in foraging range between colonies does occur; about 34% of the feeding birds from the White Rock population fly between 20km and 26km from the colony into the Queen Charlotte Sound whereas most King Shags from Duffers Reef, Trio Island and Sentinel Rock feed up to 16km from their colonies.

[108] We find that Beatrix Bay is part of the area of occupancy of King Shag and that the area outside the ring of mussel farms is used for foraging and feeding.

2.3 <u>King Shag prey and the shag's foraging depths</u>

King Shag prey

[109] Dr Fisher stated that the "small colony sizes and solitary foraging strategy"[171] of King Shags indicate a "patchy" prey resource which is confirmed by their diet of flatfish and other benthic[172] (seafloor) species, including:

> Witch [Flounder] (*Arnoglossus scapha*), Lemon Sole (*Pelotretis flavilatus*), New Zealand or Common Sole (*Peltorhampus novaezeelandiae*), Sole (*Peltorhamphus* sp.), Flounder (*Rhombosolea* sp.), Opalfish (*Hemerocoetes* sp.), Sea Perch (*Helicolenus percoides*), Triplefins Tripterigydea, Leatherjacket (*Parika scaber*), Blue Cod (*Parapercis colias*), Red Cod (*Pseudophycis bachus*), Red Scorpionfish (*Scorpaena papillosus*), Spotty (*Notolabrus celidotus*) and Octopus (*Octipodidae* sp).

169 P R Fisher evidence-in-chief para 3.9 [Environment Court document 28].
170 R Schuckard evidence-in-chief para 16 [Environment Court document 25].
171 P R Fisher evidence-in-chief para 4.2 [Environment Court document 28].
172 P R Fisher evidence-in-chief para 4.27 [Environment Court document 28].

Not all those prey species are equally important: flatfish are the most frequently taken[173] prey, and spotties are a very small part of King Shags' diet. Lemon Sole (which are known[174] to breed in Beatrix Bay) are an unusually large component of the diet of King Shag from Duffers Reef. That is consistent with the evidence[175] of Mr Schuckard which was uncontested on this issue.

[110] Because, like many predators, King Shags have to search for their prey, the distribution and density of flatfish and other benthic species is important. Dr Fisher wrote[176] "... the foraging efficiency of shags is ... strongly influenced by the availability of prey. Even a small reduction in prey density will prevent birds meeting their energy requirements".

Foraging depth

[111] Reports by Mr Schuckard on some limited observations of foraging King Shags suggests that within Beatrix Bay they "predominantly" feed between 30 and 40 metres depth[177]. However the same survey gave 25% of foraging in Forsyth Bay[178] was in water from 10-30 metres deep. Those figures should not be regarded as conclusive because of the low sample size and differences in survey effort[179] (amongst other reasons[180]).

[112] Because female King Shags are smaller than males it is likely they forage in shallower water[181].

[113] Counsel for the Appellant summarised the evidence in respect of King Shags' use of Beatrix Bay as:

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173 R Schuckard evidence-in-chief paras 51 et ff [Environment Court document 25].
174 B G Stewart evidence-in-chief para 3.3 [Environment Court document 26].
175 R Schuckard evidence-in-chief para 59 [Environment Court document 25].
176 P R Fisher evidence-in-chief para 4.35 [Environment Court document 28] citing D Grémillet and R P Wilson "A life in the fast lane: energetics and foraging strategies of the Great Cormorant" (1999) *Behavioural Ecology* 10: 516-524.
177 P R Fisher evidence-in-chief para 4.11 [Environment Court document 28].
178 P R Fisher evidence-in-chief para 4.12 [Environment Court document 28].
179 P R Fisher evidence-in-chief para 4.14 [Environment Court document 28].
180 P R Fisher evidence-in-chief para 4.14 [Environment Court document 28].
181 P R Fisher evidence-in-chief para 4.21 [Environment Court document 28].

(a) In 1991 and 1992, when Mr Schuckard undertook his survey (upon which the 1/11 notations are based), there were approximately 33 marine farms in Beatrix Bay. However, these were smaller, not having been extended by subsequent applications[182] ...

(b) Across all 12 of Mr Schuckard's surveys in 1991 and 1992, he only recorded 24 sightings of King Shags in Beatrix Bay.

Mr Gardner-Hopkins continued that later surveys showed:[183]

(i) Between 1997 and 2003, 13 King Shags were observed feeding in Beatrix Bay during "two to five" survey events (compared to 12 in 1992).[184] During that period a further eight farms and 23 extensions to existing farms were consented.

(ii) Between 2010 and 2015, nine King Shags were observed feeding in Beatrix Bay during "two to five" survey events (compared to 12 in 1992). [185] During that period it appears as if a further two farms and four extensions were consented.[186]

...

[114] Mr Gardner-Hopkins then submitted:

> ... it was Mr Schuckard's evidence that King Shags in Beatrix Bay tend to feed at depths between 20-40m[187]. In fact, in Mr Schuckard's studies from 1991 to present day, very few King Shags (2) were recorded feeding between 20-30m, and 94% of all King Shags were recorded feeding at depths of greater than 30m.[188]

He put a map called "Special Map: King Shag Foraging/Water Depth/Beatrix Bay" to Dr Fisher. It showed that only one King Shag was recorded in Beatrix Bay as foraging in water less than 20 metres deep, and two between 20 to 30m (where total n = 46). We consider that the evidence does not bear out Mr Gardner-Hopkins' contention that those figures are "significant because most of the mussel farms in Beatrix Bay are situated over seabed that is shallower than 30m deep."

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182 Referring to Exhibit 33.1.
183 Referring to Exhibit 28.1.
184 Citing Schuckard Transcript at 502, lines 25-28.
185 Citing Schuckard Transcript at 503.
186 For accounting purposes, some of the new consented farms have now been counted alongside others to reach the 39 farms currently consented within Beatrix Bay.
187 Schuckard evidence-in-rebuttal at para 11.
188 See Exhibit 28.1 and P R Fisher, transcript at 576-577.

[115] Our reason for that finding is based on Mr Schuckard's description[189] of his survey method. This involved travelling on a reasonably consistent track at around 46 kph for approximately five hours, observing for King Shags 250m either side of the boat. A total of 115 km^2 out of an estimated 240 km^2 area was covered. Survey coverage did not include much of the close inshore areas, or the centre of Beatrix Bay, as shown on the survey track[190]. Indeed his "stylistic depiction" of his survey trips shows that for most of his trips he would have been beyond range to identify any inshore or shallow (20 to 30m) water foraging. We conclude that a more plausible explanation of the data is that fewer shags were observed in the shallower (less than 30m deep) water because there was less survey effort there. To that extent Mr Schuckard's results are biased (in the scientific sense).

[116] Indeed the Appellant called some evidence directed solely to that issue. Dr D Clement challenged the statistical validity of Mr Shuckard's survey methodology in supporting the conclusions reached. In her opinion, the study was not designed to allow for relative and statistical comparisons of King Shag use between areas. Dr Clement's evidence concluded with her opinion that[191]

> In summary, the 1994 Schuckard paper ... was not designed to systematically survey the stated study area for observations of feeding king shags from Duffers Reef. Based on the opportunistic distribution and feeding observations collected, this study cannot statistically presume that any survey sector may be more important as a feeding area relative to any other sector nor assess where feeding may or may not be occurring. Additionally, the stated mean foraging distance appears to represent a minimum range due to sampling design biases. As a result, it would not be appropriate to use the 1994 findings to statistically assess any potential changes in king shag distribution within the Sounds or through time.

[117] She continued[192]:

> Some readers may over- or misinterpret the study's findings based on wording and the lack of discussion around the limits of the study's methods. I attribute some of this confusion to the author's use of the collected data to drive the research questions (rather than the reverse), and the general lack of written detail in the paper. Additionally, the lack of any recent, more systematic

189 R Schuckard evidence-in-chief para 10 [Environment Court document 25].
190 Exhibit 25.5.
191 D Clement evidence-in-chief para 3.26 [Environment Court document 12].
192 D Clement evidence-in-chief para 3.28 [Environment Court document 12].

> studies focused on the distribution and / or foraging ranges of the Duffers Reef colony (unlike Admiralty Bay colonies; Fisher & Boren 2012) also precipitates the data from Schuckard (1994) being applied beyond what is considered statistically defensible.

[118] Dr Clement also states[193] with regard to the identification of King Shag feeding areas:

> … it does not appear that the 1994 study has considered or corrected for any … biases. As a result, the presence of foraging King Shags in the sector most relevant to Beatrix Bay (south) will be an under- or over-estimation in relation to the other sectors due to uncorrected biases. … Given these factors, the study's original Figure 8 map and its caption, *"Main feeding area of king shags from Duffers Reef"* is simply a conclusion that cannot be drawn based on the data collected. It would be more appropriate to say that the map simply represents *observed* feeding locations of king shags from Duffers Reef.

We accept Dr Clement's criticisms.

[119] The Appellant also relied on a report by Mr Davidson and others called *Ecologically Significant Marine Sites in Marlborough, New Zealand*[194] ("the *Davidson 2011 Report*"). This includes a statement[195] that:

> King Shags regularly feed in the middle of the main channel and side arms in the outer Pelorus, particularly Beatrix Bay.

Mr Schuckard considered that is wrong. In his opinion[196]:

> Beatrix Bay has a rather flat bottom without any channels and feeding King Shags are widespread throughout Beatrix Bay at depths ranging predominantly from 20-40m.

We prefer the latter evidence which is consistent with that of Dr Fisher.

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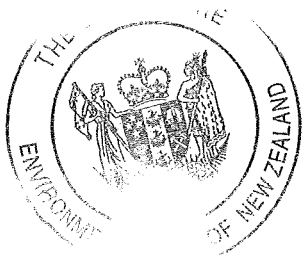
193 D Clement evidence-in-chief para 3.24 [Environment Court document 12].

194 R J Davidson et al *Ecologically Significant Marine Sites in Marlborough, New Zealand* Marlborough District Council and Department of Conservation 2011 [Exhibit 6.3].

195 The *Davidson 2011 Report*, above n 194, at p 83 [Exhibit 6.3].

196 R Schuckard evidence-in-chief para 19 [Environment Court document 25].



2.4 Use by King Shags of habitat within mussel farms

[120] Mussel farms provide one obvious advantageous change to King Shag's habitat: they supply buoys on which shags roost/rest/preen/loaf between flights or foraging. But do they forage within them?

[121] Dr Fisher wrote[197] that the existing and proposed mussel farms in Beatrix Bay "... exclude King Shag foraging from ... much of the soft substrate habitat ..." that is, or was, underneath them. Dr Fisher relied on the evidence of Dr Stewart to establish that about 19% of Beatrix Bay was affected. We have found that figure is an over-estimate, but we do not consider that invalidates Dr Fisher's evidence.

[122] A figure in Dr Fisher's evidence[198] appears to show that a high proportion of King Shags have been observed feeding in offshore areas both with and without mussel farms. Mr Davidson wrote[199] about this:

> Assuming these observations are representative, there are two possible reasons for this:
>
> (a) King Shags avoid mussel farms; or
>
> (b) they prefer to feed in deeper offshore areas of Bays and Reaches.

He continued[200]

> In order to determine which is the case, it is necessary to investigate shag preference in bays without mussel farms. These data have not been produced by Dr Fisher, however, in a paper by Schuckard (1994) the author delineated areas in Pelorus Sound where birds were observed feeding (Figure 4). Most feeding areas are in bays with mussel farms, however, in areas north and west of Maud Island free of mussel farms most feeding areas were located on offshore areas of these reaches. This suggests that birds select these deep offshore areas rather than avoiding mussel farms.

197 P R Fisher evidence-in-chief at para 6.2 [Environment Court document 28].

198 P R Fisher evidence-in-chief Figure 1 [Environment Court document 28] based on unpublished data from Mr Schuckard.

199 R J Davidson rebuttal evidence-in-chief para 8.4 [Environment Court document 6A].

200 R J Davidson rebuttal evidence-in-chief para 8.5 [Environment Court document 6A].

[123] Dr Fisher has conducted and published[201] research directly on this point within inner Admiralty Bay and Current Basin (also in the outer sounds, near French Pass). The most pertinent parts of the paper state[202]:

> Whilst mussel farms are sited away from breeding colonies and appear to have no appreciable direct impact, cumulative effects from habitat modification, alteration of habitat suitability for fish below the farm and wider area, and potential changes in marine species assemblages need to be considered.
>
> ...
>
> King Shags were recorded on 36% of the farms (n = 44) from 13 surveys within inner Admiralty Bay. No individuals were recorded foraging between farm lines from any of the survey methods. The low number of sightings within mussel farms suggests that farms are not important foraging areas for king shags, at least in Admiralty Bay. However, this may vary by site, prey availability and distance from colony/roost. Sightings of king shags foraging within mussel farms [reported in evidence in other proceedings before the Environment Court] show that mussel farms do not preclude king shags However, the low number of reported sightings and lack of published data would suggest that king shags do not exclusively use the areas occupied by mussel farms.

[124] After Mr Davidson relied on that passage to support the Appellant's position, Dr Fisher responded[203]:

> Less than 1% of all foraging King Shag records have been recorded within farms; of these most sightings are of birds diving between lines or on the edge of farms. Whether these individuals successfully captured fish associated with the farm structure, shell debris on the seabed or open water between the mussel lines remains to be substantiated.
>
> The comprehensive coastal strip surveys through all the mussel farms within inner Admiralty Bay between November 2006 to March 2007 (Fisher & Boren 2012) confirmed that King Shags do not feed (rarely; based on observations from Lalas and Brown) within mussel farms and have low attendance rates resting on buoys. ...

[125] Dr Fisher then hypothesised why King Shags do not use mussel farms[204]:

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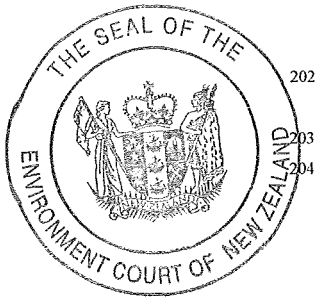
201 P R Fisher and L J Boren (2012) "New Zealand King Shag (Leucocarbo caruneulatus) foraging distribution and use of mussel farms in Admiralty Bay, Marlborough Sounds". *Notornis*, 59:105-115.

202 P R Fisher and Boren (2012) cited by R J Davidson rebuttal evidence-in-chief at paras 8.6 to 8.8 [Environment Court document 6A].

203 P R Fisher rebuttal evidence-in-chief paras 5.9 and 5.10 [Environment Court document 28A].

204 P R Fisher evidence-in-chief para 5.7 [Environment Court document 28].



> King Shags are typically not pelagic feeders or opportunistic taking prey near the surface ... Whether mussel farms exclude King Shags through the physical structure of the submerged lines reducing the open marine space and ability of birds to access the sea bed and benthic prey, or through unsuitable modification to the benthos habitat where benthic fish prey hide, and changes in benthic assemblages has yet to be determined.

[126] Mr Davidson, while he did not agree that mussel farms exclude King Shag, agreed that there is inadequate information on this. He disputed[205] the first theory on the basis that the water is so opaque near the seafloor anyway that the obstacles in a mussel farm would cause King Shags no difficulties. We have insufficient information to determine this issue.

[127] In any event, Dr Fisher's answer was[206]:

> The modification of the seabed under mussel farms is well documented; whilst it is recognised that the changes in seabed infauna and epifauna are dominated by mussel shell debris that forms artificial reefs and is habitat for a range of marine invertebrates and assemblage of fish. The modified seabed environment is less than suitable for flatfish to hide from predators such as the King Shag. The adverse effects to the King Shag foraging habitat within the footprint of the farm are more than minor.

[128] Mr Schuckard added a further reason why King Shags may not forage on the seafloor under and around mussel farms is their prey may be largely absent because of the increased organic matter underneath them.

[129] There was some suggestion by the Council's witnesses[207] that there is a wider zone of influence outside the boundaries of mussel farms. Dr Fisher referred to a 50 metre exclusion zone around a mussel farm based on the *Literature Review*. This habitat exclusion describes an alleged effect of the physical presence of farm structures in reducing the habitat available for "surface feeding seabirds"[208]. This last point seems to have been overlooked by Mr Gardner-Hopkins when he cross-examined Dr Fisher[209]. King Shags are benthic feeders not surface or even mid-column feeders.

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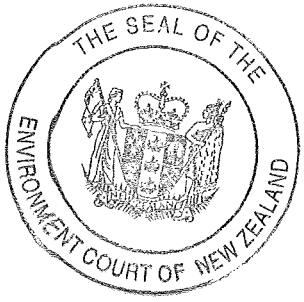
205 R J Davidson rebuttal evidence para 8.12 to 8.15 [Environment Court document 6A].
206 P R Fisher rebuttal evidence-in-chief para 7.3 [Environment Court document 28A].
207 We have summarised the relevant parts of Dr Stewart's evidence above in part 1 of this decision.
208 Table 6.10 *Literature Review* above n 84, at p 6-9.
209 Transcript, p 587.



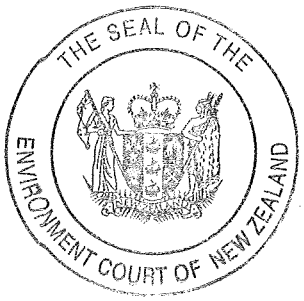
[130] The more relevant table in the *Literature Review* is Table 6.11 which describes[210] the effect of reduced habitat available for "benthic feeding seabirds, such as shags and penguins … because of changed benthic fauna due to the settlement of shell and debris from ropes used to grow filter feeders". This effect is described as taking place immediately underneath and within 200 metres of a farm. We are inclined to consider the shadow effect is largely confined to within about 30 metres of the seaward boundary of most mussel farms in Beatrix Bay, and is much narrower around the other three boundaries.

[131] The "Summary" in Chapter 6 (Seabird Interactions) of the *Literature Review* commences[211]:

> The potential effects of smothering of the seabed by debris from ropes leading to changes in the fauna are considered to be insignificant given the small area occupied by filter feeder aquaculture in New Zealand in relation to the large total area of suitable habitat available for foraging seabirds.

Mr Gardner-Hopkins said to Dr Fisher[212] "… again, you haven't given consideration to how the area of mussel farms compares with the foraging area that you define for King Shags?" and the answer was "That's correct". We have two problems with this whole cross-examination. First it appears to suggest that it was Dr Fisher's problem that he had not compared the foraging areas with the area of the mussel farms, when it is, we have held, the Applicant who has the obligation to supply adequate information for us to determine the application.

[132] Second, Dr Fisher's answer might, by itself and if the apparently superfluous word "again" is ignored, convey the wrong impression to a reader of the transcript. To obtain Dr Fisher's fuller answer one needs to read the previous page of the Notes of Evidence. There, Mr Gardner-Hopkins had asked essentially the same question in



210 Table 6.11 *Literature Review* above n 84, at p 6-9.
211 Table 6.11: *Literature Review* above n 84, at p 6-9.
212 Transcript, p 588.

respect of (the barely relevant) Table 6-10 in the *Literature Review*. That contains a summary with a similar first sentence. In answer to the same question Dr Fisher said[213]:

> No. if I can just add to that, I did comment on this, this report and prior reports in my evidence and I noted that they didn't include the DOC survey that I was involved with, which was the most comprehensive survey looking at effects of King Shags on mussel farms …

[133] Mr Gardner-Hopkins submitted that:

> Of the 9 King Shags recorded to be feeding between 2010 and 2015, over half (5) were recorded feeding within the 50m and 200m zones relied upon by Dr Fisher as "excluding" King Shags.[214] The empirical data proves there is no exclusion around the marine farms.

That submission overstates both what Dr Fisher said and any (tentative) conclusion which can be drawn from the information, which is that King Shag may still forage "close" to the outside edge of marine farms. Whether that is with the same success rate, or higher — or lower — than in the absence of marine farms is not known. Changing environmental conditions such as the introduction of mussel farms may lead to an adaptive response that maintains or even increases the productive nature of the benthic ecosystem below the farm. That may even benefit King Shags. For example, it may be that there is an 'edge' effect in which King Shags are drawn to the outer edge of the 30m shadow (of sediment and some shell) because their prey such as Witch Flounder are finding more food e.g. polychaetes in the richer sediments there. That is however, our speculation and we have no evidence for it.

[134] We find on the basis of Dr Fisher's and Mr Schuckard's evidence that King Shags forage <u>within mussel farms</u> only very infrequently and that likely contributors to that is the reduced presence of flatfish on or in the changed seafloor underneath the farms. King Shags' use of mussel farms is likely to be largely confined to resting on them.

213 Transcript, pp 587-588.
214 Exhibit 28.2 and P R Fisher, transcript at 579-580.

[135] While Dr Fisher considered that the whole of the Marlborough Sounds was a "significant habitat" for King Shags[215] — in reliance we suspect on the IUCN Red List and on a policy in the NZCPS[216] — he was also of the opinion[217] that Pelorus Sound (or at least the parts shown on the 1991/1992 map by Mr Schuckard) are the core feeding areas for the birds from the Duffers Reef colony.

3. The statutory instruments

3.1 The relevance of the statutory instruments

[136] The statutory instruments are of course relevant because the consent authority must have regard to[218] them. However, they are of even more importance now than previously in the light of *King Salmon*[219] because the effects on the environment to be considered are not (except in unusual circumstances) necessarily or usually the relevant effects inferred from Part 2 or alleged by opponents of an application but the potential effects particularised in the statutory instruments.

3.2 The Marlborough Sounds Resource Management Plan

[137] The Sounds Plan, made operative on 28 February 2008, is a combined[220] district, regional and regional coastal plan. It is contained in three volumes — Volume 1 sets out the objectives and policies and methods, Volume 2, the rules and Volume 3 the maps. In Volume 1 five (of 23) chapters are particularly relevant. We summarise the relevant provisions below.

Natural Character (Chapter 2.0)

[138] Chapter 2 (Natural Character) of the Sounds Plan attempts to integrate[221] the values and interests identified in other chapters which promote activities while avoiding, remedying and mitigating adverse effects on the identified values.

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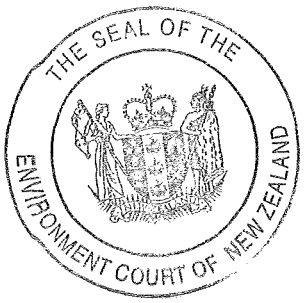
215 P R Fisher evidence-in-chief para 7.4 [Environment Court document 28].
216 Policy 11(a)(iv) [NZCPS p 16].
217 P R Fisher rebuttal evidence-in-chief para 3.29 [Environment Court document 28A].
218 Section 104(1)(b) RMA.
219 *King Salmon* above n 26.
220 Sounds Plan para 1.0 [page 1-1].
221 Chapter 2.0 para 2.1 [Sounds Plan p 2-1]. This is repeated in the explanation to policy (2) 1.4 [Sounds Plan p 2.2].



[139] The single objective simply repeats section 6(a) of the RMA. The implementing policies are[222] first to avoid the adverse effects of use or development within those areas of the coastal environment which are predominantly in their natural state and have natural character which has not been compromised[223]; to encourage appropriate use and development in areas where the natural character of the coastal environment has already been compromised, and where the adverse effects of such activities can be avoided, remedied or mitigated[224]; and to consider the effects on those qualities, elements and features which contribute to natural character[225], including (relevantly):

(a) coastal and freshwater landforms;
(b) indigenous flora and fauna, and their habitats;
(c) water and water quality;
(d) scenic or landscape values;
...

[140] Other non-repetitive[226] policies require regard to be had to the ability to restore or rehabilitate natural character in the areas subject to the proposal when considering "appropriateness"[227]; adopt a precautionary approach in making decisions where the effects on the natural character of the coastal environment are unknown[228]; recognise that preservation of the intactness of the individual land and marine natural character management areas and the overall natural character of the freshwater, marine and terrestrial environments identified in Appendix Two is necessary to preserve the natural character of the Marlborough Sounds as a whole[229].

[141] Since this chapter attempts to integrate all the others in the Sounds Plan we will state the questions it raises at the end of this subpart, after ascertaining the other questions those chapters raise.

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222 Chapter 2.0, para 2.2 [Sounds Plan pp 2-3 and 2-4].
223 Policy (2) 1.1 [Sounds Plan p 2-3].
224 Policy (2) 1.2 [Sounds Plan p 2-3].
225 Policy (2) 1.3 [Sounds Plan p 2-4].
226 Policy (2) 1.5 largely repeats policy (2) 1.1 and the start of the chapter.
227 Policy 1.6.
228 Policy 1.7.
229 Policy 1.8.

Indigenous Vegetation and Habitats of Indigenous Fauna (Chapter 4.0)

[142] Objective (4.3) 1 and its two relevant supporting implementation policies[230]are important. The objective provides for "The protection of significant ... fauna ... and their habitats from the adverse effects of use and development". The first two policies are relevant:

> Policy 1.1 Identify areas of significant ecological value which incorporate areas of indigenous vegetation and habitats of indigenous fauna.
>
> Policy 1.2 Avoid, remedy or mitigate the adverse effects of land and water use on areas of significant ecological value.

[143] Those policies are important because feeding habitat of King Shag is identified in Volume 2 of the Sounds Plan (Appendix B, notation 1/11) of the Sounds Plan as an "Area of Ecological Value" ("AOEV"[231]) with national significance. The relevant ecological overlay for King Shag habitat is shown in Map 69 of the Sounds Plan. The site is within an area subject to that notation. Ironically, since this classification was based on recommendations in a report by Mr Davidson and others[232] (and that in turn drew on the foraging range information reported in Schuckard 1994[233]), the Appellant challenged the science behind this notation and asked us to place less weight on it as a result. We will consider that issue later.

[144] Modification of values associated with the ecological overlay for King Shag habitat are to be assessed as discretionary activities[234] with the anticipated environmental result[235] of maintaining population numbers and distribution of the species. The questions that arise under policies (4.3)1.2 are therefore:

- What are the likely adverse effects on the feeding habitat?
- What is the probability of adverse effects occurring?

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230 Policy (4.3) 1.1 and 1.2 [Sounds Plan p 4-2].

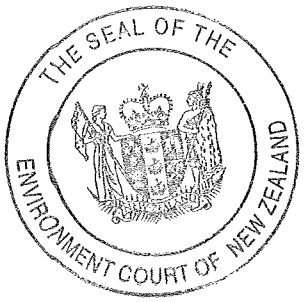
231 Not to be confused with an "AOLV" or "Area of Outstanding Landscape Value" which is the term used in the Sounds Plan for outstanding natural features or parts of outstanding natural landscapes.

232 The *Davidson 2011 Report*, above n 194.

233 Schuckard R, 1994 "New Zealand Shag (Leucocarbo Carunculatus) on Duffers Reef, Marlborough Sounds". *Notornis* 41, Collin 93 to 108.

234 Section 4.4 Methods of Implementation [Sounds Plan p 4-4].

235 Section 4.5 Anticipated Environmental Results [Sounds Plan p 4-5].



- What is the probability of adverse effects being avoided, remedied or mitigated?
- What is the probability of a decrease in the number of King Shags? (Noting this last question derives from the methods not the policies).

Landscape (Chapter 5.0)

[145] Chapter 5 (Landscape) of the Sounds Plan recognises that the Marlborough Sounds as a whole has "outstanding visual values"[236]. Areas of "outstanding landscape value" are shown on the Landscape Maps in Volume 3. The promontory in Beatrix Bay, which the site is at the tip of, is not identified as an "Area of Outstanding Landscape Value".

[146] There are no relevant policies. However, Chapter 5 recognises as a relevant issue[237] that when deciding whether development is appropriate or not:

> ... the siting, bulk and design of structures ... on the surface of water can interrupt the consistency of seascape values and detract from the natural seascape character of a bay or wider area.

That is an evaluation matter raised directly in Appendix 1 of the Sounds Plan which we will refer to in due course.

Public access (Chapter 8)

[147] There is a single objective to maintain and enhance public access[238]. The relevant implementing policy expressly states[239] that adverse effects of marine farms on public access should as far as practicable be avoided and otherwise mitigated or remedied. The questions under this policy are first whether there would be any adverse effects on access? Second, can they practically be avoided, or at least mitigated or remedied?

236 Para 5.1.1 [Sounds Plan p 5-1].
237 Para 5.2.2, Landscape [Sounds Plan p 5-3].
238 Objective 8.3.1 [Sounds Plan p 8-2].
239 Policy 8.3.1/1.2 [Sounds Plan p 8-2].

The Coastal Marine Area (Chapter 9)

[148] The first objective (of three) for Chapter 9 is[240] to accommodate appropriate activities in the coastal marine area while avoiding, remedying or mitigating the adverse effects of those activities. The relevant implementing policy (9.2.1) 1.1 identifies as values to be maintained[241]: conservation and ecological values, cultural and iwi values, heritage and amenity values, landscape, seascape and aesthetic values, marine habitats and sustainability, natural character of the coastal environment, navigational safety, public access to and along the coast, public health and safety, recreation values, and water quality. Most of these are at issue to some extent in these proceedings. The policy also requires any adverse effects to be avoided, remedied or mitigated. Policy (9.2.1) 1.2 is at first sight rather repetitive but actually requires adverse effects of development to be avoided as far as practicable and otherwise mitigated or remedied.

[149] The other relevant policy is (9.2.1) 1.14 which is to enable a range of activities in appropriate places in the Sounds. Marine farming is expressly included and is zoned in the Coastal Marine Zone 2 in which marine farms are controlled or discretionary in the inshore area and non-complying beyond 200 metres from the shore. The Sounds Plan explains[242] that "the extent of occupation and development needs to be controlled to enable all users to obtain benefit from the coast and its waters".

[150] The second coastal marine area objective[243] is to manage water quality at a level that enables shellfish gathering and cultivation for human consumption. Implementing policies seek to avoid the discharge of contaminants that adversely affect significant ecological value, cultural areas, outstanding landscapes and seafood consumption. The only possibly relevant policy is that which seeks to avoid discharges affecting "significant ecological value" which seems to echo the policies relating to "areas of ecological value" already referred to, and we will consider the effects under that heading.

240 Objective 9.2.1 [Sounds Plan p 9-4].
241 Policy (9.2.1)1.1 [Sounds Plan pp 9-4 and 9-5].
242 Explanation of objective 9.2.1/1 [Sounds Plan p 9-6].
243 Objective 9.3.2 [Sounds Plan p 9-10].

[151] The third coastal marine objective[244] relates to alteration of the foreshore and seabed. It seeks to protect the coastal environment by avoiding, remedying or mitigating any adverse effects of activities that alter the foreshore or seabed. Policy (9.4.1) 1.1 identifies the same list of values as did policy (9.2.1) 1.1 already listed and so does not raise independent predictive questions. Policy (9.4.1) 1.9 suggests that certain adverse effects can only be addressed when the relevant rules say so, which emphasizes the wording of the rules.

Summary: stating the questions about the natural character of the area

[152] Returning to the policies in Chapter 2 of the Sounds Plan, the summarising questions these raise are:

(1) is the natural character of the area around the site compromised? And if so, to what extent?

(2) can any adverse effects of the mussel farm on coastal landforms, flatfish, King Shag and their habitats, water quality and scenic/landscape values be appropriately avoided, remedied or mitigated?

The rules

[153] Volume 2 of the Sounds Plan contains the rules implementing the objectives and policies. Chapter 35 covers Coastal Marine Zones One, Two and Three. General Assessment Criteria for discretionary activities are set out in Rule 35.4.1 and the specific criteria for marine farms are detailed in Rule 35.4.2.9. The former rule requires consideration of the "likely" effects of the proposal on the locality and wider community, the amenities values of the area, any significant environmental features including the habitat of indigenous species, and generally on the natural and physical resources of the area. The latter rule[245] requires specific assessments for marine farms of (relevantly):

- an assessment of the present nature of the site, both physical and biological including the nature of the sea floor and species found in the area;

...

244 Objective 9.4.1 [Sounds Plan p 9-16].
245 Rule 35.4.2.9 [Sounds Plan p 35-24].

- consideration of navigational matters …
- consideration of aesthetic and cultural matters;

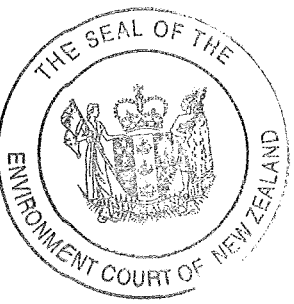
  …
- other matters including
  - (a) likely effect on areas used for commercial and recreational fishing;
  - (b) the visual effect of the farm and its operation;
  - (c) likely effects on water quality and ecology;
  - (d) the alienation of public space.

    …

The Council only requires assessment of "likely" effects on some resources. "Likely" may mean "as likely as not" or "fractionally above the balance of probabilities" or it may, following international conventions[246], mean effects with a 66% or higher probability of occurring. Either way, we doubt whether these policies and rules can be said to fully implement part 2 of the RMA in conjunction with that part of the definition of "effects" in section 3 RMA which includes[247] "any potential effect of low probability which has a high potential impact". The Sounds Plan is incomplete on those issues especially on the risk of extinction of King Shag: that may be an event of low probability but high potential impact.

3.3 <u>The Marlborough Regional Policy Statement</u>

[154] We are obliged to have regard to[248] the Marlborough Regional Policy Statement ("MRPS"). However, because it became operative (1995) over a decade before the Sounds Plan (2008) its provisions are deemed to be given effect to and particularised in the Sounds Plan (unless the latter is incomplete, unclear or *ultra vires*) — see *King Salmon*[249]. On the whole it is so broad it gives us little assistance, except that there is an objective[250] to ensure that "… natural species diversity and integrity of marine habitats be maintained and enhanced".



246 See the IPCC's *Guidance Note* (2010) quoted in part 0.7 of this Decision
247 Section 3(f) RMA.
248 Section 104(1)(b)(v) RMA.
249 *King Salmon* above n 26.
250 Objective 5.3.10 [MRPS p 44].

3.4 The New Zealand Coastal Policy Statement

[155] The New Zealand Coastal Policy Statement 2010 ("the NZCPS")[251] was described in *King Salmon*[252] by the Supreme Court as "an instrument at the top of the hierarchy". We respectfully adopt the Supreme Court's description of the objectives in that document. The NZCPS is important in this case because it has not yet been implemented in the Sounds Plan. One procedural policy of potential importance in this case is Policy 3 which requires us to adopt a precautionary approach. We will consider the implications of that later.

[156] The NZCPS identifies the following issues[253] relevant to this proceeding:

- the ability to manage activities in the coastal environment is hindered by a lack of understanding about some coastal processes and the effects of activities on them;
- loss of natural character, landscape values … along extensive areas of the coast …;
- continuing decline in … habitats and ecosystems in the coastal environment under pressures from subdivision and use, vegetation clearance, … plant and animal pests, poor water quality, and sedimentation in estuaries and the coastal marine area;
- demand for coastal sites … for aquaculture …;

…

These issues recognise that in their current state some areas in the coastal environment are not necessarily being managed sustainably.

[157] The NZCPS provides for integrated management of the resources of the coastal environment by requiring particular consideration of situations where "significant adverse cumulative[254] effects are occurring"[255]. A later policy[256] requires plans to set thresholds (including zones …) where practicable "… to assist in determining when activities causing adverse cumulative effects are to be avoided". The areas of ecological value in the Sounds Plan can be seen as an anticipation of this approach.

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251 This came into force on 3 December 2010.
252 *King Salmon* above n 26, at [152].
253 NZCPS 2010 p 5.
254 The word "cumulative" in these policies is being used in the normal (accumulative) sense not in the narrow *Dye* sense discussed below, in part 4.1 of this Decision.
255 Policy 4(c)(v) [NZCPS p 13].
256 Policy 7(2) [NZCPS p 15].

[158] We now turn to the substantive implementing policies.

Aquaculture

[159] Policy 6(2) of the NZCPS 2010 is important[257] because, in relation to the coastal marine area, it requires recognition of:

> a. ... potential contributions to the social, economic and cultural wellbeing of people and communities from use and development of the coastal marine area; ...
>
> b. ... the need to maintain and enhance the public open space and recreation qualities and values of the coastal marine area;
>
> c. ... a functional need [for some activities] to be located in the coastal marine area, and [to] provide for those activities in appropriate places;
>
> ...

[160] Those more general policies are then elaborated on with a specific Policy 8 (b) for aquaculture which is obviously relevant in this case. It is to[258] recognise the significant potential contribution of aquaculture to the well-being of people and communities by[259]:

> ...
>
> b. taking account of the social and economic benefits of aquaculture, including any available assessments of national and regional economic benefits; and
>
> c. ensuring that development in the coastal environment does not make water quality unfit for aquaculture activities in areas approved for that purpose.

These policies are clearly applicable. What is less clear is whether these are intended to refer to the net benefits of aquaculture. We assume that they are to be consistent with section 7(b) RMA, otherwise the NZCPS would be incomplete. In any event there was no disagreement over the brief evidence called for the Appellant on the social and financial benefits of the proposal.

Indigenous biodiversity

[161] Policy 11 is (relevantly):

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257 Policy 6(2) relates to the coastal environment generally and is much less relevant to these proceedings.

258 Policy 8: Aquaculture [NZCPS 2010 p 15].

259 Policy 8 (a) is not relevant, because we are not here concerned with the approval of a regional policy statement or plan [NZCPS 2010 p 15].

Policy 11: Indigenous biological diversity (biodiversity)

To protect indigenous biological diversity in the coastal environment:

(a) avoid adverse effects of activities on:

(i) indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;

(ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;

(iii) …

(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare[260];

(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

…

(iii) indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, **rocky reef systems**, eelgrass and saltmarsh;

… [emphasis added].

[162] The first important aspect of policy 11 is that certain adverse effects are simply to be avoided: the effects on certain threatened categories of animals and birds <u>and</u> on certain classes of habitat of indigenous fauna. We note that categories in (a)(i) and (ii) are not mutually exclusive. Adverse effects of activities on a taxon obviously include injury to or death of individuals and reduction in population, but they may also include reductions in EOO or AOO, and reduction in habitat area or quality. This results from the reasons (e.g. very small populations) why they have been classified as threatened or at risk in the first place.

[163] Policy 11(a)(i) and (ii) refer to the adverse effects of activities on taxa, whereas 11(a)(iv) refers to habitats of indigenous species. Subparagraph (i) and (ii) thus simply implement section 5(2) whereas subparagraph (iv) also implements section 6(c) RMA (significant habitats). We mention that because there is some potential for confusion about subparagraph (i) and (ii). They do not refer to 'habitats' or 'significant habitats' and thus do not implement section 6(c). However, to particularise and implement section 5(2)'s direction for the "… protection of natural … resources" the NZCPS adopts the

260 "Naturally rare" is defined in the Glossary as meaning "Originally rare: rare before the arrival of humans in New Zealand" [NZCPS 2010 p 27].

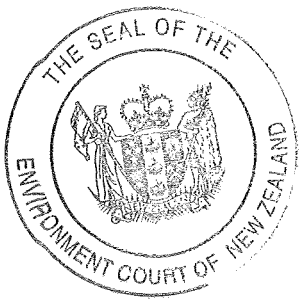
lists in the New Zealand Threat Classification System and in the IUCN Red List. These largely refer to population criteria. However, some of the criteria for small populations do refer to habitat (and they happen to be the relevant ones in this case). But that does not turn the criteria into section 6(c) RMA implementations.

[164] As recorded above, New Zealand King Shag is an indigenous taxon which is listed as threatened in both the New Zealand Threat Classification and in the IUCN Red List, so NZCPS policy 11(a)(i) and (ii) both apply. That means that the issue emphasised so strongly by the Appellant — whether the site's classification as a "significant habitat" for New Zealand King Shag is correct — is not really relevant at least to policies 11(a)(i) and (ii) of the NZCPS.

[165] Policy 11(a)(iv) recognises that habitats are particularly important at the edges of a species' range. This policy recognises that reduction in the quality or quantity of habitat may itself have consequences for a qualifying species, even if the consequences for individuals and/or populations are not yet known, and treats such reductions as effects to be automatically avoided.

[166] The King Shag is at the limit of its natural range primarily because its apparent area of occupation is so small. Anywhere within the AOO is close to its edges in the sense that birds from the principal Pelorus colonies are always within foraging range of the edges. The evidence is that the King Shag has a foraging range of about 25 km. Given the very small number of colonies we do not understand NZCPS policy 11(a)(iv) to apply in a way so that only the outermost ring (with an inner radius of say 20 km) is protected habitat. That would be an absurd consequence whereby potentially less important habitat is protected under the policy while more important habitat is not. Consequently we consider policy 11(a)(iv) applies in this proceeding.

[167] The court's knowledge of New Zealand King Shag suggests that neither its taxonomic status nor its (former) extent of occurrence are necessarily as black-and-white as Mr Schuckard portrayed them. It is possible, for example, that King Shag should be lumped as a northern outlier of a superspecies of "New Zealand Blue-eyed Shags" within the *Leucocarbo* genus. That would put King Shags at the limit of the (super-) species range so NZCPS policy 11(a)(iv) would still apply (i.e. a lumping of the species



with, for example, Stewart Island Shag, would make no difference to the analysis). The other matter is that the fossil record of King Shags apparently shows[261] a wider extent of occurrence (EOO) in the past. However, no evidence was given about these matters so we simply record them as potential complications in any future cases.

[168] The site is also close to the reef system wrapped around the promontory so policy 11(b)(iii) is relevant.

[169] The questions raised by these policies are: will the proposed mussel farm cause adverse effects on:

(a) the King Shag species?
(b) the habitat of King Shags?
(c) effects which are significant on the reef system around the promontory?

Natural character and natural landscapes in the coastal environment

[170] Policy 13 is (relevantly):

> **Policy 13: Preservation of natural character**
>
> 1. To preserve the natural character of the coastal environment and to protect it from inappropriate use, and development:
> a. avoid adverse effects of activities on natural character in areas of the coastal environment with outstanding natural character; and
> b. avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on natural character in all other areas of the coastal environment; including by:
> ...

The meaning of "natural character" in section 6(a) of the RMA — as it applies to the coastal environment — now needs to be read in the light of the particularisation of that phrase in policy 13(1) of the NZCPS.

[171] Policy 15 is (relevantly):

[261] P Schofield and B Stephenson Birds of New Zealand (2013) Auckland University Press p 229.

Policy 15: Natural features and natural landscapes

To protect the natural features and natural landscapes (including seascapes) of the coastal environment from inappropriate subdivision, use, and development:

a. Avoid adverse effects of activities on outstanding natural features and outstanding natural landscapes in the coastal environment;

b. Avoid significant adverse effects and avoid, remedy, or mitigate other adverse effects on other natural features and natural landscapes in the coastal environment;

...

[172] The important questions raised by these two policies are:

(1) Will the proposed mussel farm cause adverse effects:
   (i) to the natural character of Beatrix Bay?
   (ii) to the natural features in, or landscape of, Beatrix Bay?

(2) If the answer to question (1) is "yes" will any of those effects be significant?

(3) Will the proposed mussel farm, together with other mussel farms, cause cumulative adverse effects on the natural character/natural features/landscape of Beatrix Bay?

4. What are the predicted effects of the mussel farm?

4.1 Introduction: identifying the relevant effects

[173] Under section 104(1)(a) RMA the consent authority must have regard to the "actual and potential effects on the environment of allowing the activity".

[174] At first sight that requires a comprehensive inquiry because the word "effect" is defined very widely in section 3 of the Act as including:

3 Meaning of effect

In this Act, unless the context otherwise requires, the term **effect** includes—

(a) any positive or adverse effect; and

(b) any temporary or permanent effect; and

(c) any past, present, or future effect; and

(d) any cumulative effect which arises over time or in combination with other effects—

regardless of the scale, intensity, duration, or frequency of the effect, and also includes—

(e) any potential effect of high probability; and

(f) any potential effect of low probability which has a high potential impact.

The wording suggests that any cumulative effects of any stressor appear to be included. For example, the ecologist Dr Stewart referred to Chapter 12 of the *Literary Overview* which describes "cumulative" effects in relation to marine aquaculture as[262]:

> *... Ecological effects in the marine environment that result from the incremental, accumulating and interacting effects of an aquaculture development when added to other stressors from anthropogenic activities affecting the marine environment (past, present and future activities) and foreseeable changes in ocean conditions (i.e. in response to climate change).*

That description appears to fit within section 3(d) RMA.

[175] However, in 1999 the Court of Appeal issued a decision in *Dye v Auckland Regional Council*[263] ("*Dye*") which held that a "cumulative effect" is not a wide concept in the context of a resource consent application. Tipping J, giving the decision of the Court, wrote[264]:

> The definition of effect includes "any cumulative effect which arises over time or in combination with other effects". The first thing which should be noted is that a cumulative effect is not the same as a potential effect. This is self evident from the inclusion of potential effects separately within the <u>definition</u>. A cumulative effect is concerned with things that will occur rather than with something which may occur, that being the connotation of a potential effect. This meaning is reinforced by the use of the qualifying words "which arises over time or in combination with other effects". The concept of cumulative effect arising over time is one of a gradual build up of consequences. The concept of combination with other effects is one of effect A combining with effects B and C to create an overall composite effect D. <u>All of these are effects which are going to happen as a result of the activity which is under consideration</u>. [Underlining added].

The converse appears to be that effects of other stressors (which are not the activity under consideration) are not cumulative effects as a matter of law. That is problematic in

262 *Literature Review* above n 84, at p 12-13.

263 *Dye v Auckland Regional Council* [2002] 1 NZLR 337; [2001] NZRMA 513 (CA).

264 *Dye* at paras [38] and [39].

relation to the (extensive) parts of the environment which are[265] "ecosystems and their constituent parts" because they are all affected accumulatively by all effects from all stressors. Further, *Dye* does not recognise that 'cumulative' effects of multiple stressors are the main consideration in preparations of district plans and other statutory instruments.

[176] *Dye* was explained by Cooper J in *Rodney District Council v Gould*[266] as follows:

> … I consider that all that was said in *Dye* was that an effect that may never happen, and which, if it does, will be the result of some activity other than the activity for which consent is sought, cannot be regarded as a "cumulative effect".

[177] We record that other decisions show some disquiet over that restrictive application of the term "cumulative effects". First, *Dye* does not use the ordinary meaning of "cumulative" as pointed out by the Environment Court in *The Outstanding Landscape Protection Society Inc v Hastings District Council*[267]. Second, the learned Chief Justice, in her minority judgment in *West Coast ENT Inc v Buller Coal Ltd*[268], wrote:

> I … would have thought that contribution to the greenhouse effect is precisely the sort of cumulative effect that the definition in s 3 permits to be taken into account under s 104(1)(a) in requiring the consent authority to "have regard to any actual and potential effects on the environment of allowing the activity".

Third, *Harris v Central Otago District Council*[269] has recently pointed out that strictly *Dye* is only authority for the proposition that a potential effect on the environment which might be caused by some other activity <u>which requires a resource consent under the relevant plan</u> is not a cumulative effect of allowing the activity for which consent is sought. It seems that the restrictions of *Dye* are not necessary: the potential effects of

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265 Section 2 RMA.

266 *Rodney District Council v Gould* [2006] NZRMA 217 (HC) at [122].

267 *The Outstanding Landscape Protection Society Inc v Hastings District Council* [2008] NZRMA 8 at [50].

268 *West Coast ENT Inc v Buller Coal Ltd* [2013] NZSC 87; [2014] 1 NZLR 32; [2014] NZRMA 133; (2013) 17 ELRNZ 688 (SC) at [91].

269 *Harris v Central Otago District Council* [2016] NZEnvC52 at [48].

another independent application for resource consent would not usually be part of either the existing or the reasonably foreseeable future environment and so are irrelevant anyway.

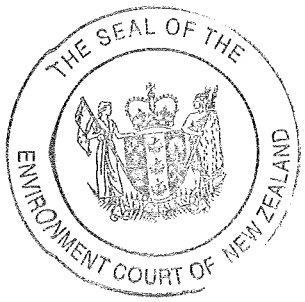
[178] We observe that the complexity of *Dye*'s discussion of 'actual and potential effects' in section 104(1)(a) RMA are also unnecessary. There is a simple reason why Parliament used that phrase rather than the defined word "effects". Obviously if a resource consent is applied for in the proper order — in advance of carrying out an activity — all its effects are potential, i.e. they have not occurred yet. However, the legislature anticipated the reality that in a small but significant percentage of cases, particularly after an abatement notice has been issued by a local authority, a resource consent is applied for retrospectively. In such a case most of the effects are "actual".

[179] To those points we can add:

(1) *Dye* does not take into account — because it did not need to — the reality that all stressors, regardless of who or what causes them, cause "cumulative" effects on ecosystems; and

(2) the *Dye* view of the world is rather static — in reality this second's effects are the next second's environment. The past effects of stressors — the accumulated[270] effects — have become and are continually becoming, part of the environment which is the setting of any proposal.

[180] It is important to realise that *Dye* does not mean that "cumulative" effects in a wider sense are irrelevant. If the potential effects of stressors, other than the activity for which consent is sought, are relevant then they may be taken into account under section 104(1)(c) RMA. Accordingly we will analyse such potential effects — which we will call "accumulative effects" — separately so as not to confuse the analysis imposed by *Dye*. The different treatment of such effects under *Dye* may have been intended to have this consequence: whereas cumulative (in the *Dye* sense) effects <u>must</u> be had regard to under section 104(1)(a), the consent authority has a discretion under section 104(1)(c) as to whether it takes accumulative effects into account at all. However that is probably an



270 We will use "accumulated" for the past effects of any stressors; "accumulative" for future effects of all stressors (other than the application).

over legalistic approach, because the potential (future) effects of other stressors are also part of the reasonably foreseeable future environment (under section 104(1)(a)) and that must be established in any event. In other words, there is no bright line distinguishing accumulative effects of other stressors from the future dimensions of the 'environment': to the contrary, they are the same thing.

4.2 Effects on the water column[271]

[181] As described earlier, the operation of the mussel farm will cause discharge of seawater and contaminants (mussel shells, mussel faeces and pseudofaeces) to the seawater of Beatrix Bay. The question under the Sounds Plan is whether discharges affecting significant ecological value are avoided.

[182] Mr Knight also assessed the effects of the proposed farm structures on currents, waves, shading and water column stratification, concluding that these effects would be small and localised[272]. In Mr Knight's opinion, an additional mussel farm is unlikely to contribute to oligotrophication (lowering of nutrient levels) of the region. He described his application of the *Aquaculture Stewardship Guidelines*[273] to estimate the effects of the proposed farm on phytoplankton depletion. He reported as follows[274]:

> Results of the carrying capacity analysis ... show that the estimated stocking density of the farm would filter the estimated area of influence of the farm every 13.5 days (the clearance time CT) and that the area of influence would be flushed approximately every 4.5 days (the retention time RT). Consequently, the analysis shows that the water currents at the site are sufficient to support the proposed culture at the site and that the proposal will meet with the ASC (2012) criteria, that the ratio of the clearance to retention time would be greater than one. (Footnote omitted).

This analysis of local scale effects of the proposed farm on phytoplankton productivity diversity and succession was not challenged by other expert evidence or in cross-examination. In fact, the conclusion appears to be supported by Dr S T Mead[275], ecologist for the Societies, because he stated that the farm in isolation is unlikely to exceed its localised carrying capacity or influence nutrient properties in the wider bay.

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271 See the Assessment Matters in rule 35.4.2.9 [Sounds Plan p 35-21].
272 B R Knight, evidence-in-chief at para 82 [Environment Court document 9].
273 Aquaculture Stewardship Council 2012: *ASGBivalve Standard Version 1* (January 2012).
274 B R Knight, evidence-in-chief para 56 [Environment Court document 9].
275 S T Mead, evidence-in-chief, paras 25 and 34 [Environment Court document 20].

[183] Dr Mead extrapolated the farm scale calculations by Mr Knight to show how quickly or slowly the seawater in the bay is replaced. He calculated a bay-wide CT/RT[276] score of 0.0675. In his opinion the capacity indicators[277] for clearance efficiency and regulation ratio indicated that cultured mussels control the ecosystem of Beatrix Bay (i.e. exceed carrying capacity)[278]. Based on his calculations, Dr Mead asserted that the accumulated ecological effects of mussel farms were already significant in Beatrix Bay and that no more farms should be added. Mr Knight responded to those calculations[279], noting that while they were useful tools "they do not account for the spatial complexity of an area and so will become increasingly less useful at larger scales." An equally cogent criticism of Dr Mead's opinion was that of Dr Stewart. He did not see the relevance in extrapolating the theoretical calculations because empirical observations at a base scale showed that carrying capacity was not being exceeded most of the time.

[184] We consider that the proposal is unlikely to add any adverse cumulative effects to the water column in Beatrix Bay that are more than minimal in the context of larger "natural"[280] variations. However, whether the regularity of winter/summer fluctuations changes the food web in a way that affects King Shag is unknown.

4.3 Effects on the seabed[281]

[185] Dr Taylor and Dr K Grange provided expert ecological evidence for the Appellant on the benthic effects of the proposal. Mr Davidson also gave us his expert opinions (although not claiming to be independent). Dr Stewart and Dr Mead provided expert evidence for the Council and the Societies respectively. A site-specific assessment[282] of the proposal was prepared by Mr R Forest for the original (now

276 CT=clearance time; RT=retention time.

277 Using methodology described in Gibbs M T 2007. "Sustainability performance indicators for suspended bivalve aquaculture activities". *Ecological indicators*, 7(1), 94-107.

278 S T Mead, evidence-in-chief, at para 28 [Environment Court document 20].

279 B R Knight, rebuttal evidence at para 4.11 [Environment Court document 9A].

280 "Natural" is in inverted commas to recognise the possibility that el Niño/ la Niña events may be influenced by anthropogenic global warming.

281 See the Assessment Matters in rule 35.4.2.9 [Sounds Plan p 35-21].

282 Forest R 2013, *Proposed Marine Farm Site Assessment for a new application located in Northern Beatrix Bay, Pelorus Sound*, (Cawthron Report No 2406) [Exhibit 6.5].

modified) application. While Mr Forest was not called by the Appellant, that report was relied on by Dr Taylor and others.

Will there be adverse effects on the rocky reef system at the promontory?

[186] We must assess the probability and degree of adverse effects on the rocky reef[283], which it will be recalled, is at least 35 metres from any part of the marine farm. There was no suggestion that there would be any shell drop on the reef. The only issue was whether finer suspended sediments would be moved on to and smother the reef.

[187] For the Appellant, Dr Taylor's evidence[284] was that the water flow regime at the site (typically less than 4cm per second), combined with the 35 metre buffer, would make farm-related deposition difficult to distinguish from background levels at the adjacent inshore reef area. Further, episodic high current flows recorded at the site (up to 20cm per second) would have the effect of re-suspending any fine organic material that might reach the reef. Dr Taylor also pointed out[285] research evidence establishing the inherent variability of rocky reef communities supporting his opinion that any "cumulative" effects from mussel farming on these communities are likely to be very difficult to detect when compared to large scale environmental processes. Finally Dr Taylor suggested that any residual concerns around potential effects on the reef habitat could be met by requiring an adaptive management approach based on benthic monitoring linked to a review of the farm's layout if significant issues were identified. Proposed conditions to this effect have been provided by Mr J C Kyle, planning witness for the Appellant[286].

[188] Dr Mead, after recalculating his figures related to flow rate and the deposition footprint, accepted that a deposition footprint limited to up to 35m from the farm was likely[287]. He also accepted[288] that the high currents experienced from time-to-time at the site may re-suspend any fine sediment that may travel further than the main footprint. Despite accepting these propositions, Dr Mead continued to assert that fine material

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283 NZCPS policy 11(b)(iii).
284 D I Taylor evidence-in-chief paras 33 and 34 [Environment Court document 8].
285 D Taylor evidence-in-chief paras 38 to 43 [Environment Court document 8].
286 J C Kyle, evidence-in-reply, Appendix A [Environment Court document 32].
287 Transcript, p 394, line 28.
288 Transcript, p 396, lines 10-15.

reaching the reef area from the proposed adjacent mussel farm would have a major effect on the ecological community at the reef.[289]

[189] We see a low probability of such an effect — it is unlikely to occur on the preponderance of the evidence given to us.

Will there be adverse effects on the intertidal zone?

[190] We are also required[290] to examine whether there will be adverse effects on another indigenous ecosystem found only in the coastal environment — the intertidal zone. Prompted by concerns expressed at the Council hearing on the possible impact of mussel farms on the wider biological community at Beatrix Bay, Mr Davidson undertook a sampling project on intertidal habitats[291] adjacent to and distant from mussel farms within Beatrix Bay in collaboration with Dr Grange. Mr Davidson selected the survey sites and collected the relevant data, which was analysed by Dr Grange. While acknowledging the snapshot nature of the survey, Dr Grange concluded from his analysis that there are differences in the biological communities between sites, but these differences are not consistent with the proximity to mussel farms. In his opinion, the differences can be explained by habitat differences and inherent patchiness in the shore communities (temporal and spatial variability)[292].

[191] Dr Grange's analysis was not disputed by Dr Stewart and he agreed[293] that it provided useful data. However, he went on to suggest that effects from mussel farms on intertidal communities are less easily determined than effects on subtidal communities. This was due to the influence of factors such as time submerged, wave action, aspect, substrate type, adjacent land use and exposure to the sun. These influences are moderated in the subtidal zone by the overlying water column.

[192] For his part Dr Mead dismissed[294] the analysis and conclusions of Dr Grange as providing no evidence one way or the other of the effects of mussel farms on intertidal communities. He asserted that the effects of mussel farms on intertidal habitats have not

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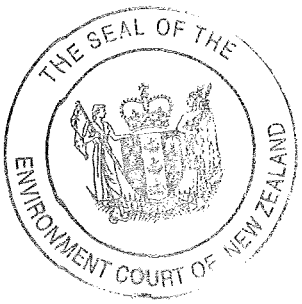
289 Transcript, p 397, line 2.
290 Under policy 11(b)(iii) of the NZCPS.
291 K Grange evidence-in-chief Appendix 1 [Environment Court document 11].
292 K Grange evidence-in-chief at para 8.1 [Environment Court document 11].
293 B G Stewart evidence-in-chief at para 8.23 [Environment Court document 26].
294 S T Mead evidence-in-chief 15 [Environment Court document 20].



been extensively researched. Responding to questions in cross-examination, Dr Grange disputed this, noting extensive research had been reported and that no effects had been observed.[295] On this issue we prefer the evidence for the Appellant and predict that it is likely there will be only very minor (if any) independent or cumulative effects on the intertidal zone.

What will be the effects of the marine farm on the seafloor and its macrofauna?

[193] There is no policy in the NZCPS which directly requires consideration of this ecosystem in itself. However, the Sounds Plan requires identification of likely effects on the sea floor and marine ecosystems generally. As it happens, the Appellant's experts all acknowledged that sedimentation and shell drop from mussel farms does alter infaunal and epifaunal biological communities (these include flat fish) within the direct footprint of the farm. Species diversity may diminish in some circumstances and the abundance of some species may increase. This can vary from site to site depending on current velocities and farm management practices.

[194] We have already described the shell drop from other mussel farms. No one disputed that the same will occur under the Appellant's farm. The proposal will change the 7.372 hectares of soft mud seafloor to a reef-like system of shells, live mussels and sediment to a distance of 30 metres from the seaward edge of each part of the farm.

[195] When questioned by the court on the relative impact of mussel farming alongside other anthropogenic influences and stochastic events, Dr Mead asserted that mussel farms were having by far the greatest impact[296], but without giving any detail to support this assertion other than to dismiss the impact of dredging and trawling as pulse events from which recovery was rapid. This was in contrast to the evidence of Dr Stewart, who considered the risk or threat from aquaculture to be lower than that from other influences. In his opinion, the probability of adverse effects occurring remained high, but the consequence of these effects would be orders of magnitude less than other stressors. Dr Stewart qualified this to some extent by saying that changes in dredging/trawling effort, reductions in exotic forest harvesting and native tree and shrub regeneration may mean that the gap between relative importances of major influences

295 Transcript, p 284, line 11.
296 Transcript, p 418, line 20.

may be diminishing. Mr Davidson considered anthropogenic effects from land generated sedimentation and trawling/dredging are the "biggies"[297] in driving benthic effects.

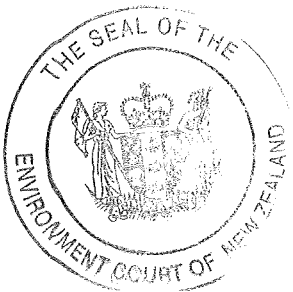
4.4 Effects on King Shag habitat and population

[196] The Council alleged that the Appellant's case was defective because its evidence-in-chief omitted to supply any information on the question whether the proposal would affect King Shags and their habitat. Mr Gardner-Hopkins, counsel for the Appellant, explained that it had not produced expert primary evidence on this issue as it was not significant in the Commissioner's decision and had not come to the fore until receipt of primary evidence from the respondent and section 274 parties. Counsel submitted that the Appellant was entitled to rely on aspects of evidence produced by other parties and to present rebuttal evidence on this. We agree with this submission and have considered all of the expert evidence, regardless of its source. However, that does not change the legal obligation on the Appellant to supply adequate information (from whatever source) to enable us to grant consent. We have already observed that some of the cross-examination by Mr Gardner-Hopkins seemed to proceed on the opposite basis.

[197] In Part 2 of this decision we found that the habitat of King Shags has been degraded (mainly by land use causing run-off of sediment and pollution, and by dredging) and reduced by installation of mussel farms. The impact of a further mussel farm will by itself generally have less than minor impacts on that habitat. On the other hand the accumulated and accumulating impacts of existing (and past) operations are adverse and more than minor, and the Trust's application can only add to those adverse effects on habitat.

[198] For convenience we summarise our findings[298] on the preponderance of evidence from parts 2 and 3 of this decision as follows:

(1) King Shags forage, feed and rest in Beatrix Bay.



297 Transcript p 85, line 20.
298 See the Assessment Matters in rule 35.4.2.9 [Sounds Plan p 35-21].

(2) Foraging occurs principally on or above the soft substrate of the Bay's floor at depths below 10m and mainly between 20m and 40m with female shags preferring shallower water in that range.

(3) The principal prey are flat fish including Witch Flounder and Lemon Sole.

(4) King Shags rarely forage within marine farms. There is anecdotal evidence of such foraging, but Dr Fisher's study showed none.

(5) Beatrix Bay is likely to be a better habitat for the Duffer's Reef colony than similar areas further away because King Shags require less energy to travel to (and return from) this area.

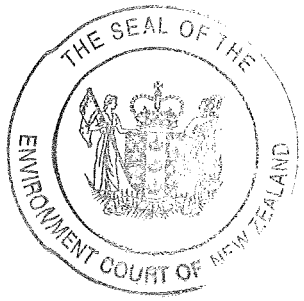
(6) A mussel farm over soft substrate modifies the habitat substantially by covering the area under it and an incomplete ring of variable width[299] (but up to 30m wide) around it under shell debris, mussel faeces and pseudofaeces.

(7) Mussel farms over soft substrate are potentially stressors of King Shag because they may reduce the presence King Shag's preferred prey or the ability of King Shag to catch them.

[199] We conclude that there are already adverse effects on King Shag in the current and reasonably foreseeable environment of the site.

[200] We have already found that the presence of mussel farms is having an adverse effect on the habitat of King Shags by excluding their benthic footprints from being foraged by King Shags. The telling figure is that less that 1% of the observations of swimming King Shags in the Marlborough Sounds have been of birds within mussel farms, and even then there is no evidence that they have been foraging, let alone successful. Further, there is a 30 metre wide (maximum) bulge outside each mussel farm in which the habitat is also likely to be modified adversely.

[201] The footprint of the 37 farms is 304.4 hectares and a 30 metre strip along the outside[300] of the farms would add (8.5 km x 0.03 km =) 25 hectares, which makes a total of 329.9 hectares subtracted from the potential optimum foraging area. That is (329.9 /



299 The "ring" is likely to be incomplete because there is unlikely to be shell drop and sediment inside the farm, and it will be asymmetric too: stretching in the direction of the predominant current.

300 We assume the inside edge of most farms is on or inside the boulder/reef zones.

2,000 =) 16% of the area of Beatrix Bay which is a more than minor reduction in foraging area[301] within the Bay. There is already an adverse accumulated effect, and the addition of the proposed farm will only exacerbate that.

[202] There is one other aspect of the application which may have a more than minor effect. It results from the fact that the site is nearly the last empty but potentially available mussel farm site around the circumference of Beatrix Bay. The site may be important as a control site for recording foraging by King Shags. If a mussel farm is installed and operated on the site, that opportunity is lost.

[203] Mr Maassen submitted[302] that a threshold of "cumulative effects" would be passed. However, we have no evidence of a threshold of effects on the habitat of King Shags. There are a number of reasons why reduction in habitat might affect the King Shag e.g. directly by killing displaced individuals by removing food (or decreasing hunting efficiency) and indirectly by fragmenting populations, increasing vulnerability to extinction from stochastic events (disease, el Niño and climate change effects and genetic problems). We have no information that any of those are causing problems at present or not.

[204] The Appellant argued that because there was no, or insufficient, evidence that any "tipping point" has been reached in respect of the cumulative (or accumulative) effects which are relevant under the Sounds Plan and the NZCPS, we can disregard these matters. We do not consider that is correct: the concept of a 'tipping point' is not found in the RMA. It is a tempting but misleading metaphor: it adds a connotation of a valued resource being at the top of a cliff, and one more push (in the form of the activity being applied for) will see the resource in pieces at the bottom. In reality it is often impossible to say where tipping points are in relation to habitats. Ecosystems and their components react to the myriad of stressors they are exposed to in a multitude of ways, very few of them known with accuracy. While dose-response relationships are often (but not necessarily) sigmoidal[303], identifying a "tipping point" on such a curve can be difficult. The point is that nobody has any idea whether a sigmoidal curve is correct, or

301 We note this is less than Dr Stewart's figure (19%) but consider our figure is more conservative.
302 Mr Maassen's submissions dated 29 July 2015, paras 216-218.
303 An elongated 'S' shape rather than the 'U' shaped or parabolic curve shown by Mr J Z Butler, the planner for the Marlborough District Council, at his para 9.4 [Environment Court document 33].

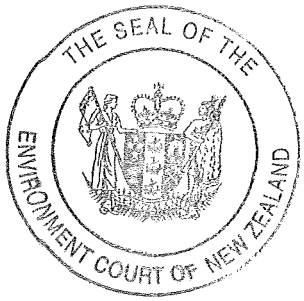
if Mr Butler's curve[304] or some other is correct. Further, nobody knows where on any of the curves the current population is, and what the effects of other stressors are.

[205] What the RMA actually requires is protection of significant habitats. Local authorities have worked at stating methods for evaluating areas of vegetation and habitats, see for example the criteria stated in *Minister of Conservation v Western Bay of Plenty District Council*[305]. In the statutory documents relevant to this proceeding (the Sounds Plan and the NZCPS) two other methods of responding to section 6(c) RMA have been used. Neither refers to tipping points. The NZCPS refers to the IUCN criteria which does use some thresholds, for example population decreases[306] or changes in extent of occurrence or area of occupancy[307] but they are tightly defined and are given as alternatives. Nobody attempted to apply them in this case. For the King Shag the IUCN small population criterion D[308] applies instead. As recorded earlier there are no applicable thresholds for criterion D in the IUCN Red List.

[206] In summary, we have adequate information to find/predict that:

(1) King Shag habitat will be changed by shell drop and sedimentation;
(2) the effects of the farm accumulate and are likely to be adverse; and
(3) it is as likely as not there will be adverse effects on the populations of New Zealand King Shags and their prey;
(4) there is a low probability (it is very unlikely but possible) that the King Shag will become extinct as a result of this application.

[207] On the other hand we have insufficient information to assess the effects in the previous paragraph (the combined effects of the Davidson Family Trust mussel farm together with the other mussel farms in the bay) against the effects of other major environmental stressors, both anthropogenic and stochastic. Pastoral farming, exotic forestry, deforestation, dredging and trawling fall into the first category, while flooding



304 J Z Butler evidence-in-chief para 9.4 [Environment Court document 33].
305 *Minister of Conservation v Western Bay of Plenty District Council* Decision EnvC A71/01 at [20].
306 See the *Red List* Vulnerable Criteria A above n 156.
307 See the *Red List* Vulnerable Criteria B above n 156.
308 The *Red List* Vulnerable Criteria D above n 156, at p 22.

in the Pelorus and Kaituna Rivers and oscillations in weather patterns fall into the latter (or both).

[208] The most direct likely effect on King Shag habitat is that an area of over 10 hectares (the 8.982 ha farm plus a 20 to 30 metre wide strip along its outside edge) is very likely to be covered in detritus from the farm at the rate of 250 tonnes/hectare (or more) each year. The studies of fish around mussel farms suggest that the new benthic habitats they form underneath them may not encourage flat fish. We hold that change is likely to be an adverse effect on King Shag habitat.

[209] In Dr Fisher's opinion benthic changes resulting from the scale of mussel farming reduce the availability of significant feeding habitat. Cross-examined by Mr Gardner-Hopkins he confirmed his view that the change in substrate under the farm meant that the "... benthic fish prey that the King Shags forage for are unable to use that habitat"[309]. This exchange occurred[310]:

> Q: The question that I think I asked was, on the basis of your paragraph 9.5 [of Dr Fisher's evidence-in-chief] and your earlier paragraph 7.4 you would consider any mussel farm in the Marlborough Sounds as having a more than minor effect because it removes foraging habitat for King Shags.
>
> A: That's correct. Yes I'd say that, yes.

Dr Fisher's approach is consistent with the approach in the NZCPS which is to avoid any adverse effect on threatened species and in particular to avoid adverse effects on the habitats of indigenous species (at the limit of their natural range).

[210] Given the scale of the proposal these will be minor (but not minimal) effects by themselves, but they are, with the accumulated and accumulative effects of existing farms, adverse to King Shag habitat (NZCPS Policy 11(a)(iv)) <u>and</u> to King Shags (NZCPS Policy 11(a)(i) and (ii)).

309 Transcript, p 585.
310 Transcript, p 585, lines 24 to 29.

4.5 Cultural effects[311]

[211] The local Iwi, Ngati Koata, supported the application as they apparently consider it complies with the Ngati Koata Iwi Management Plan. We have evaluated the evidence relating to effects on King Shag habitat and population above. We consider the application does not meet the protection focus for indigenous fauna and their habitats in the Iwi Management Plan. So we give the Ngati Koata support minimal weight.

4.6 The effects on the amenity and other values of the promontory

[212] On these and wider landscape/natural character issues the court read the evidence lodged by the following witnesses (and heard cross-examination on that evidence):

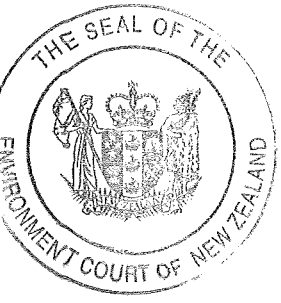
Landscape architects

- Mr C R Glasson for the Appellant;
- Mr A Bentley for the Marlborough District Council; and
- Dr M Steven for the section 274 parties.

Planners

- Mr Kyle for the Appellant;
- Mr J Z Butler for the Council; and
- Ms S J Allan for the section 274 parties.

[213] All of Beatrix Bay is considered by the landscape experts and planners and has been accepted by the court (in *Knight Somerville Partnership v Marlborough District Council*[312] and elsewhere) as having a high level of natural character even though 16% of its surface area is adversely affected by mussel farms. The promontory does not stand out from the rest of the bay in this regard in anyone's assessment except Dr Steven who considered that the southern third of the promontory is outstanding. While we do not accept Dr Steven's opinion, we do acknowledge the promontory's high values and sensitivity and we now consider the effects of the proposal on that.



311 See the Assessment Matters in rules 35.4.1 and 35.4.2.9 [Sounds Plan p 35-14 and 35-21 respectively].

312 *Knight Somerville Partnership v Marlborough District Council* [2014] NZEnvC 128.

How visible will the mussel farm be?

[214] For the Council Mr Bentley produced a table[313] as to the visibility of mussel farms at various distances. He explained that the table has been developed with his colleagues at the firm Boffa Miskell and contains an overall consensus from the Environment Court on different mussel farm appeals over the last 20 years. Mr Glasson, for the Appellant, produced his own table[314] of 'Visibility of Mussel Farms at Sea Level' (we think he means at about 1.5m above sea level). We have compiled this table:

Distance from farm	**Mr Glasson**	**Mr Bentley**
0-500m	Highly visible	Dominant
500-700m	Very visible	Prominent
700-1000m	Visible	Prominent
1000m-1.5km	Low visibleness	Prominent
1.5km-3km	Low visibleness	Visible as part of view
More than 3km	Low visibleness	Difficult to see

We find problems with both assessments. First, Mr Bentley's table seems to include two sets of value judgments — as to degree of visibility and as to its impact on the seascape — where the first might suffice. The use of the words "dominant" and "prominent" seems to make an aesthetic assessment which is arguably premature. In that regard Mr Glasson's vocabulary is preferable since it only attempts to assess the degree of visibility (albeit still in a subjective way).

[215] The difficulty with Mr Glasson's table is that it divides the units of distance so finely that we have doubts about its utility. A reasonable person on the water would struggle to identify whether they were 500 or 700 metres from a mussel farm in any conditions less than flat calm (and without other information).

[216] Mr Bentley's table describes the degree of visibility from 500 metres to 1.5km (from a farm) as *prominent*. We can accept this may be accurate (although we prefer

313 Visibility from water/Visibility from land (usually elevated) – J A Bentley evidence-in-chief, para 5.59 [Environment Court document 30].

314 Table 3.0, Visibility of Mussel Farms at Sea Level. Glasson evidence-in-chief, para 10.16 [Environment Court document 7].

"very visible") when viewing conditions are extremely favourable — flat sea with sun directly onto the farm. In other circumstances the table may not be correct, depending on both conditions and the eyesight of the observer.

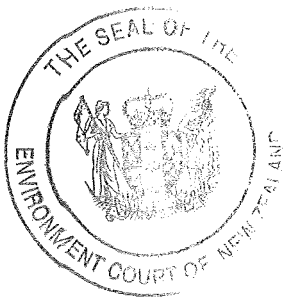
[217] In summary, on this site we predict that at a range of less than 400 metres (particularly where existing farms are not part of the foreground view) the farm would be highly visible in good conditions. In good but not millpond conditions from a range of 400m to 750m the farm may be visible depending on conditions and angle of approach. From about 750 metres to 1.5 kilometres the farm would, in many conditions, be visible. Beyond that it may be difficult to see even in good conditions.

[218] No ONL or ONF is identified for the site — it is not an Area of Outstanding Landscape Value ("AOLV") under the Sounds Plan. Thus the avoidance directives of Policy 15 NZCPS are not triggered. Given that finding, Policy 15(b) is applicable, even to an un-named promontory. That policy requires decision-makers to:

> Avoid significant adverse effects and avoid, remedy, or mitigate other adverse effects of activities on other natural features and natural landscapes in the coastal environment;

Any significant adverse effects need to be avoided and other adverse effects need to be remedied or mitigated.

[219] In Mr Glasson's opinion[315] the proposal in its modified form will still maintain the quality of the coastline and the landscape feature of the promontory. Now that the two mussel farm blocks are separated by an expanse of water *the integrity of the promontory can remain intact*. He also concluded that the proposal has avoided significant adverse effects on natural landscape, and the natural landscape values have been protected from other adverse effects due to the fact that the proposed mussel farm is integrated with a similar scale of existing farms in the area and is appropriately sited. Therefore he does not see the proposal, as amended, being contrary to Policy 15 of the NZCPS. Mr Glasson's overall conclusion was that[316]:



315 C R Glasson evidence-in-chief, para 7.28 [Environment Court document 7].
316 C R Glasson evidence-in-chief, para 11.8 [Environment Court document 7].

> The proposal is of a small scale, consistent with existing marine farm activity in Beatrix Bay, and would not compromise the landscape, natural character and visual amenity of the Bay. The presence of mussel farms in Beatrix Bay has already partly compromised the natural character at the head of the Bay, along with failed pastoral farming. One further mussel farm of this size will not affect the Bay's landscape, natural character and visual quality any further, or reach a threshold beyond which the effects are unacceptable.

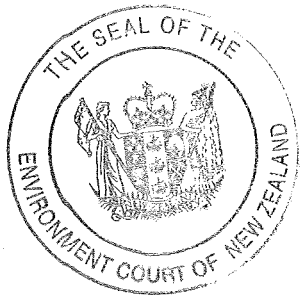
[220] Mr Bentley noted that due to the location of the proposed farm, it will appear from some locations to be not *wholly visually anchored to the landform* as is the case for the majority of farms around the Bay — this could in some conditions amplify the visual presence towards the unmodified waters offshore[317]. He concluded that the proposal will occupy an area of the coastal edge that is currently free from aquaculture development and the only remaining part of the promontory's naturalness that is unencumbered by mussel farms will be lost; therefore natural character will not be preserved.[318]

[221] We accept Mr Bentley's[319] answer when he described the headland which is the background landform of the proposal as:

> … it's sort of quite different in that regard from other landscape areas within the Bay … the fact that it's at the tip of that landform that in my view amplifies its prominence from a number of viewpoints and potential viewpoints, and leads to greater effects visually in that regard.

[222] We also agree with Mr Bentley when he describes some views of the proposed farm (and some existing farms) where there is a lack of (terrestrial) backdrop[320]. He cites the example of viewing the proposed mussel farms looking at the promontory and beyond towards the mouth of Beatrix Bay. In that situation:

> … existing mussel farm development from that viewpoint is not anchored towards a local backdrop, so that it appears that it's visually a part of the open water… and what I am saying about this proposal is due to its location at the tip of the promontory, and there are more locations where that would be the case.



317 J A Bentley evidence-in-chief, para 8.51 [Environment Court document 30].
318 J A Bentley evidence-in-chief, para 8.51 [Environment Court document 30].
319 Transcript, page 652.
320 Transcript, page 653.

His point is illustrated from the aerial photograph on the cover of the Council's Graphics[321] (Exhibit 30.1) with the proposed farms overlaid in red — there is a considerable area at the head of the bay where a viewer from a boat cruising inside, through or outside the existing mussel farms would observe the farm with only a sea backdrop. That experience would not align with the Appellant's slightly conflicting contentions that the proposed farm continues an existing pattern of development, and/or that the proposal will not interrupt[322] the natural sequence because the two parts of the farm are on either side of the head of the promontory.

[223] In terms of NZCPS 15(b) requiring the avoidance of significant adverse effects and the avoidance remedying or mitigation of other adverse effects, Mr Bentley's conclusion was:

> That close-up these structures would detract from the valued natural qualities of this part of the coast and reduce aesthetic coherence of the promontory.[323]

In Mr Bentley's opinion the proposal clearly failed the NZCPS 15(b) requirement. That is consistent with the evidence of Dr Steven[324]. In the latter's opinion[325]:

> The presence of the marine farm will detract from the wild state that currently exists, and that is largely responsible for the erosional forces that have shaped the southern end of the promontory. The marine farms … add a degree of industrialisation to an otherwise wild natural section of the coastal environment.

[224] As we have already noted, marine farms are traditionally located away from the most exposed parts of the headlands and promontories. While none of the witnesses could be definitive as to why this was the case it appears from their responses that adverse effects on navigation are likely to be one reason and another was the potential for adverse effects on landscape and natural character. Headlands/promontories by their very name suggest prominence and therefore potential sensitivity. NZCPS Policy 6(1)(h) requires us to:

321 Exhibit 30.1.
322 Transcript, pp 113 to 114.
323 J A Bentley evidence-in-chief, para 8.80 [Environment Court document 30].
324 M L Steven evidence-in-chief, para 117 [Environment Court document 23].
325 M L Steven evidence-in-chief, para 119 [Environment Court document 23].

(h) Consider how adverse visual impacts of development can be avoided in areas sensitive to such effects, such as headlands and prominent ridgelines, and as far as practicable and reasonable apply controls or conditions to avoid those effects.

Dr Steven[326] noted that visual impact on the promontory can arise from structures on the surrounding sea because of the way in which the sea/land interface is experienced. That aligns with Mr Bentley's evidence described above.

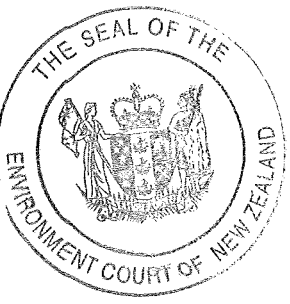
[225] We are unable to accept Mr Glasson's proposition[327] that the amended proposal (with the gap between the two farm blocks) will allow the integrity of the promontory to remain intact. We can accept from some view points (particularly from the south) that the promontory may appear unencumbered by marine farm structures. However, there are many views of the promontory that will have the proposed farm in the foreground. In such circumstances and at any distance less than 500 metres, the integrity of the promontory will, in our opinion, from a visual/aesthetic/natural character perspective be compromised. In our view that amounts to a significant adverse effect (which is clearly not avoided).

4.7 The effects on the natural character of Beatrix Bay

[226] The Sounds Plan through its CMZ2 zoning provides for the establishment of marine farms, particularly in inshore areas, as appropriate use of the coastal marine area, subject to individual farm assessment. One aspect of that is to determine the "natural character" of the relevant coastal marine area.

[227] Policy 13 in the NZCPS and the Sounds Plan together require us to answer these questions:

- Does the proposed mussel farm cause adverse effects on the natural character of Beatrix Bay?
- If so, are they significant adverse effects?
- Can any adverse effects be avoided, remedied or mitigated?



326 M L Steven evidence-in-chief, para 109 [Environment Court document 23].
327 C R Glasson evidence-in-chief, para 7.28 [Environment Court document 7].

Preservation of Natural Character (Policy 13)

[228] Dr Steven described how[328]:

> When viewed from the water, the farm will be viewed against a sensitive land/sea interface. ... The perception of the land/sea interface contributes significantly to the natural character and aesthetic appreciation of that part of Beatrix Bay.

[229] In Mr Glasson's opinion, as a result of its already compromised natural character, the proposed mussel farm will not adversely impact further on the natural character of the headland. He considered[329] that the proposal is not contrary to Policy 13(1)(b) of the NZCPS as it avoids significant adverse effects, and will avoid, remedy or mitigate other adverse effects on natural character in all other areas of the coastal environment by co-locating in an already modified environment. In his opinion the farm site is only a small area adjacent to the promontory, access to the coastline is available and the farm is *but a small addition to the already existing development in the Bay*[330].

[230] Mr Maassen referred[331] us to the Commissioner's decision[332] on the scale of direct visual effects. Notwithstanding the care taken by the Commissioner in her assessment, backed by decades of experience assessing the effects of marine farms in the Marlborough Sounds, we were not greatly assisted by this part of her decision because the amended application which is before us is quite different to the proposal considered by the Commissioner. In the paragraphs identified by Counsel, the Commissioner mentioned on three occasions how the farm *wrapped around the headlands* or words to that effect. This was her response to the staple-shaped farm in the original application which did indeed completely wrap around the headland without any separating gap. It gave rise to a completely different set of effects all of which were more adverse than those associated with the proposal before us.

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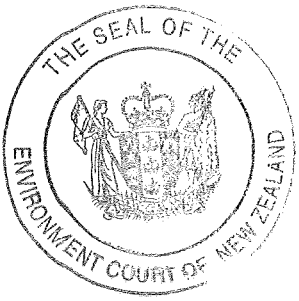
328 M L Steven evidence-in-chief, para109 [Environment Court document 23].
329 C R Glasson evidence-in-chief, para 7.17 [Environment Court document 7].
330 C R Glasson evidence-in-chief, para 7.18 [Environment Court document 7].
331 Mr Maassen's submissions dated 29 July 2015, para 13.
332 In particular paras [139] through to [151].



[231] Mr Glasson's evidence was criticised by Mr Ironside who submitted[333] that Mr Glasson's overall approach is that existing development justifies further development. This is certainly not what NZCPS Policy 13(1)(b) intends even if it is the Sounds Plan's policy. Further, Mr Ironside observed[334] that there is no pattern of developing marine farms off headlands as Mr Glasson seeks to suggest. There has been a recent exception — the mussel farm allowed by the Environment Court in the *Knight Somerville*[335] case. The Appellant may have been fortunate in that case: the evidence against the proposal was very limited especially on King Shags; a good part of the justification for the location in that case was to avoid a reef further in; and finally, the promontory in this case is a much more dominant feature than the headland in *Knight Somerville*.

[232] In Dr Steven's opinion marine farming within Beatrix Bay has reached a point of unacceptable "cumulative" adverse effects with respect to the natural character of the coastal environment, and to the appreciation of amenity and the aesthetic quality of the landscape[336]. He went on to say that:

> cumulative effects must be understood in terms of the total changes evident in the landscape, and not simply the cumulative effects arising from an additional marine farm. In this regard, the cumulative effects of marine farming generally must be considered, together with other modifications to the landscape.

He concluded with respect to NZCPS Policy 13:

> The effects will be significantly adverse, and as such should be avoided. If the effects would have been considered less than significantly adverse, I am of the opinion that the effects can neither be remedied nor mitigated, and as such should also be avoided.[337]

[233] Our overall finding is that the adverse visual effects of the Appellant's proposal on natural character might be minor by themselves if the other farms were not in the bay. It is their cumulative effect on top of the accumulated effects of the other mussel farms which makes us pause. We assess that the proposed farm does not satisfy Policy

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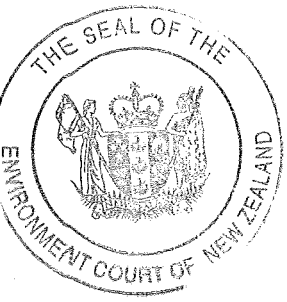
333 Mr Ironside's submissions dated 6 July 2015, para 19.
334 Mr Ironside's submissions dated 6 July 2015, para 19.
335 *Knight Somerville Partnership v Marlborough District Council* [2014] NZEnvC128.
336 M L Steven evidence-in-chief, para 104 [Environment Court document 23].
337 M L Steven evidence-in-chief, para 111 [Environment Court document 23].



13(b) because its cumulative effect — added to the accumulated and accumulative effect of all the existing farms — will be significant and thus should be avoided.

4.8 Effects on Navigation[338]

[234] The proposed site at the head of Beatrix Bay is primarily used by commercial boats servicing mussel farms in the area and by low numbers of recreational fishers and divers. Direct access from the open water of Beatrix Bay to the reef area at the southern end of the promontory is retained by the 190m separation of the eastern and western sections of the proposed farm.

[235] Access to inshore waters and the shoreline is maintained by the siting of the nearest mussel lines 100m from the shore. Mr Brian Tear, navigation witness for the Appellant, considered navigation by recreational boats in and around mussel farms either in transit or for fishing as commonplace in the Marlborough Sounds. In his opinion, the effects of the proposed new farm are minor. While some small inconvenience may occur, this would only be to mariners transiting between the embayments on either side of the point. This was likely to affect mussel service boats only, as very few recreational boats were likely to use this route. This view was supported by Mr C Godsiff, a long-term mussel farmer and tourism operator with extensive boating experience in Pelorus Sound.

[236] Mr L Grogan, Deputy Harbour Master for the Council, considered that as the proposal breached the Maritime New Zealand *Guidelines for Aquaculture Management Areas and Marine Farms* 2005 ("the Guidelines") there was an increased risk of vessels using the area to become entangled in farm structures. Of particular concern to Mr Grogan was the placement of the farm within 200m of the promontory (a headland) and 500m of a recognised navigational route.

[237] Mr Tear responded that the Guidelines in this regard should not be applied in a blanket manner based on geography as there are many differences between headlands that determine navigational safety. Also, in his opinion, the proposed site was not on a navigational route between popular destinations since it is at the end of the promontory

338 See Assessment Matter 35.4.2.9 [Sounds Plan p 35-21].

in an isolated bay with comparatively low recreational boating use. We consider this latter point is of some importance.

[238] The Guidelines are non-regulatory and as such applications for marine farms do not need to be compliant. They do, however, identify navigational safety matters to be taken into account when assessing marine farm applications. We prefer the evidence of Mr Tear that any concern over navigational safety has been appropriately mitigated in this application.

[239] On navigational safety, the court in *Knight Somerville Partnership v Marlborough District Council*[339] said:

> Any marine farm will present some risk to navigational safety simply by its shared common space in the sea. The Sounds, and Beatrix Bay in particular, have a long history of marine farming with its associated structures and hazards and mariners in the area are familiar with these. … Prudent seamanship is required in the vicinity of all farms and the lack of serious accidents associated with marine farms in the Sounds is a clear indicator that this is generally being exercised.

We agree and predict that there will likely be no more than minor adverse effects on navigational safety from the proposal.

4.9 Effects on fishing amenity and access

[240] Most effects on amenity have effectively been considered in parts 4.6 and 4.7 of this decision. However, one particular recreation — fishing — still needs to be considered. The reef area at the southern end of the promontory is used by locals and visitors for recreational fishing and diving[340]. Access to the reef area as a recreational destination is generally by boat, travelling directly across Beatrix Bay from the south. Although the area is relatively lightly used compared to less remote reef sites in Pelorus Sound, it is nevertheless highly valued by those who regularly use it, mostly in summer months.

339 *Knight Somerville Partnership v Marlborough District Council* [2014] NZEnvC 128 at para [67].
340 Transcript, p 601.

[241] We heard competing evidence from recreational witnesses on the likely accessibility of the reef after installation of the proposed farm. These ranged from perceiving it as a complete sealing off of access to the entire southeast embayment shoreline, to having no effect at all. Observations from our site visit tend to confirm the latter. Access to the reef and adjacent shore will remain unimpeded. Indeed, it was apparent that access to inshore areas between and through mussel farms is not significantly affected in good weather conditions when most fishing takes place. We accept that a little more care may be needed, but this is not a significant limitation to a moderately competent boat user in most conditions when recreational boat users would be out on the water. In this regard we do not accept the Societies' submission that recreational use of near shore areas in Beatrix Bay is severely limited by the presence of mussel farms, making this proposed currently unoccupied site even more important. However, we do accept the evidence[341] of Mr Offen for the Societies that drift fishing around the reef at the promontory's tip for blue cod will be difficult and that trolling across the reef for kingfish may be impossible.

[242] Mr Glasson stated that while water space has been infilled, the actual effects on the amenity values will be no more than minor because there will be so few boating recreationalists passing by the proposed farm or even accessing the northern beaches. He considers that Beatrix Bay is not an attraction for recreation due to the existing number of marine farms around the coastline. He came to this conclusion because Beatrix Bay is one that boaties, recreationalists and fishermen must make a special effort to enter — rather than a place where people pass-by. As there is no road access, all public access is by boat. The nearest (and only) dwelling in the Bay is 1.37 km from the proposed farm and the distance from the seaward end of the wharf (associated with the house) to the proposed farm is 1200m.

[243] We find that the layout of the proposed farm, which provides sufficient buffer distance between the mussel farm lines and the reef, is likely to reduce substantially any adverse effects on the recreational amenity provided by the reef and its adjacent shore or on access to it. We predict (with some reservations about the effects on trolling) that the adverse effects on fishing and access are as likely as not to be minor.

[341] T Offen evidence-in-chief paras 13 and 15 [Environment Court document 19].

4.10 Economic effects

[244] Despite the court's attempt to explain how to analyse these in *Port Gore Marine Farms v Marlborough District Council*[342] we received minimal evidence on this issue. We accept that there will be a producer surplus and consumer surplus which would give benefits to society. We also take into account the social benefits of employment identified by Mr M G Holland[343] even though strictly speaking that may be double counting benefits.

[245] Beyond that we are not able to make any quantitative comparison of the net benefits of the proposed marine farm with the net benefits of the status quo (i.e. no farm).

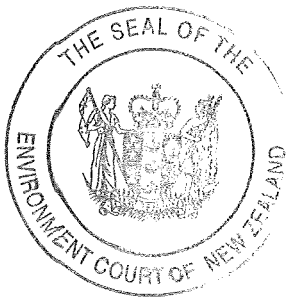
5. Evaluation

5.1 Preliminary issues: the gateway tests and the Commissioner's Decision

The gateway tests

[246] As noted earlier, this is an application for a non-complying marine farm under the Sounds Plan. As such we must be satisfied that it passes one of the gateways in section 104(D) RMA before consideration can be given to granting consent.

[247] We have found that some of the adverse effects are likely to be more than minor, so the first gateway is not passed. As for the second, Mr Maassen submitted that the test is a blunt one: "If a proposal is contrary to any material objective or policy, it fails the second gateway test". He relied on the judgment of Fogarty J in *Queenstown Central Limited v Queenstown Lakes District Council* where Fogarty described it as an error of law to "finess… out qualifiers of one objective by looking at another objective, to reach some overall conclusion that viewed as a whole the objectives allowed … the activity"[344].



342 *Port Gore Marine Farms v Marlborough District Council* [2012] NZEnvC 72 at [200] and [201].
343 M G Holland evidence-in-chief para 23 [Environment Court document 5].
344 See *Queenstown Central Limited v Queenstown Lakes District Council* [2013] NZHC 817 [2013] NZRMA 239 at [39].

[248] Strictly Forgarty J's statement may have been obiter because "errors of law" found by Fogarty were (he said) sufficient to dispose of the appeals[345]. In any event we respectfully prefer to follow the Court of Appeal in *Dye* where Tipping J wrote that the correct question was whether the application was consistent "on a fair appraisal of the objectives and policies as a whole"[346]. Otherwise we prefer not to lengthen this decision and simply refer to other decisions of the court: *Cookson Road Character Preservation Society Inc v Rotorua District Council*[347], *Calveley & Anor v Kaipara District Council*[348] and *Saddle Views Estate Ltd v Dunedin City Council*[349].

[249] As it happens, because the Sounds Plan tries to be "all things to all people", as another division of the Environment Court recorded a planner's view[350], it is difficult for an application to be contrary to the objectives and policies of the plan: "... nominally non-complying activities are effectively discretionary". We consider the second threshold test is met because the application cannot be said to be contrary to the objectives and policies of the Sounds Plan as a whole, although this is quite a close-run judgment in this case.

The Council's decision (section 290A)

[250] The court is required to have regard to the Council decision which refused the consents sought. In this case the decision of the Council's Commissioner cannot guide us because the application considered by Commissioner Kenderdine is markedly different from that put to us. In bringing the appeal the Appellant has radically altered the layout of the proposed marine farm so that we are being asked to determine a different and smaller proposal than that presented to the Commissioner. This is particularly important in relation to the key findings of the Commissioner on access, natural character, landscape and amenity on which the decision to decline the application was based.

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345 *Queenstown Central Limited v Queenstown Lakes District Council* [2013] NZHC 817 [2013] NZRMA 239 at [3] to [6].

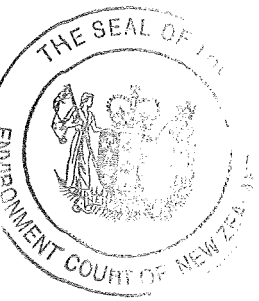
346 *Dye v Auckland Regional Council* [2002] 1 NZLR 337 (CA) at [25].

347 *Cookson Road Character Preservation Society Inc v Rotorua District Council* [2013] NZEnvC [194] at [46]-[51].

348 *Calveley & Anor v Kaipara District Council* [2014] NZEnvC 182 at [142].

349 *Saddle Views Estate Ltd v Dunedin City Council* [2014] NZEnvC 243, [2015] NZRMA 1 at [82].

350 *Kuku Mara Partnership (Admiralty Bay West) v Marlborough District Council* (2005) 11 ELRNZ 466 (EnvtC) at [86]. We understand the court was quoting Ms S Dawson the planner then advising the Council.



[251] On the effect of the proposal on King Shag, Commissioner Kenderdine wrote[351]:

> The protection of the King Shag habitat is a role not only for future decision makers, but for the applicant if this proposal goes ahead through monitoring and conditions. A large scale monitoring programme will assist in this regard. Meanwhile the King Shag population has been stable for 50 years and it appears to have adaptively managed its (new) aquaculture environment (s6(c)).

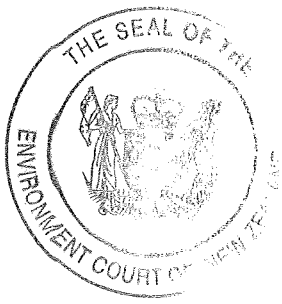
We note from the Commissioner's decision that the Council officers' section 42A report did not appear overly concerned with effects on King Shags or their habitat, and recommended that consent be granted. Mr Gardner-Hopkins submitted that the Council had (belatedly) taken a significantly different approach to this appeal than to previous applications where consents were supported. Mr Maassen's response was that this was the first application for some time that impinged on the King Shag habitat ecological overlay, which had resulted in the Council "taking a hard look" at this application to ensure the integrity of this component of the Sounds Plan. This was not a determinative factor for the Commissioner, but is for us.

[252] We now turn to consider the merits of the application as a whole under section 104 RMA, but before we do, there is a preliminary issue as to the relationship between the matters we must have regard to under section 104(1) RMA and Part 2 of the RMA.

5.2 "Subject to Part 2" in the light of the effect of *Environmental Defence Society Inc v The New Zealand King Salmon Company Ltd*

The correct application of 'subject to Part 2'

[253] As for the application of section 104 Mr Maassen submitted that in *KPF Investments v Marlborough District Council*[352] ("*KPF*") where the Environment Court concluded that the overall broad judgment under Part 2 whether a proposal would promote the sustainable management of natural and physical resources still applies.



351 Council Decision at para 279.

352 *KPF Investments Ltd v Marlborough District Council* [2014] NZEnvC 152 at [202].

[254] We now doubt whether that is quite accurate as a result of more recent decisions. In *Thumb Point Station Ltd v Auckland City Council*[353] ("*Thumb Point*") the implications of the majority decision in *King Salmon*[354] for the application of section 104 RMA were summarised by the High Court as being that:

> In most cases, the Environment Court is entitled to rely on a settled plan as giving effect to the purposes and principles of the Act. There is one exception, however, where there is a deficiency in the plan. In that event, the Environment Court must have regard to the purposes and principles of the Act and may only give effect to the plan to the degree that it is consistent with the Act.
> [Footnote omitted]

[255] In *Appealing Wanaka Inc v Queenstown Lakes District Council*[355] the Environment Court agreed with the *Thumb Point* summary, and explained[356] that the reference to any "deficiency" in *Thumb Point* was a reference to the "caveats" identified by Arnold J in *King Salmon* in the following passage[357]:

> … it is difficult to see that resort to Part 2 is either necessary or helpful in order to interpret the policies, or the NZCPS more generally, **absent any allegation of invalidity, incomplete coverage or uncertainty of meaning**. The notion that decision-makers are entitled to decline to implement aspects of the NZCPS if they consider that appropriate in the circumstances does not fit readily into the hierarchical scheme of the RMA.
> [Emphasis added]

[256] We note that a similar issue about the phrase 'subject to Part 2 …' came before the High Court in *New Zealand Transport Authority v Architectural Centre Inc & Ors* [358] ("*NZTA*"). While *NZTA* was concerned with section 171 RMA, the identical wording — "subject to Part 2 of the Act" — also occurs. The reasoning behind Brown J's decision is not completely obvious.

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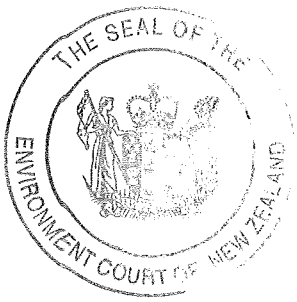
353 *Thumb Point Station Ltd v Auckland City Council* [2015] NZHC 1035 at [31].
354 *King Salmon* above n 26.
355 *Appealing Wanaka Inc v Queenstown Lakes District Council* [2015] NZEnvC 139.
356 *Appealing Wanaka Inc v Queenstown Lakes District Council* at [44]-[45].
357 *King Salmon* above n 26, at [90].
358 *New Zealand Transport Authority v Architectural Centre Inc & Ors* [2015] NZRMA 375 (HC) at [108].



[257] Brown J quoted, and seemed to accept a passage in *Auckland City Council v The John Woolley Trust*[359] ("*Woolley*") which was an appeal about a resource consent under the RMA. Randerson J wrote:

> [47] … Given the primacy of Part 2 in setting out the purpose and principles of the RMA, I do not accept the general proposition mentioned at para [94] of the decision in *Auckland City Council v Auckland Regional Council*[360], that the words "subject to Part 2" in s 104 mean that Part 2 matters only become engaged when there is a conflict between any of the matters in Part 2 and the matters in s 104. Part 2 is the engine room of the RMA and is intended to infuse the approach to its interpretation and implementation throughout, except where Part 2 is clearly excluded or limited in application by other specific provisions of the Act.

While we doubt if anything turns on the metaphor, we respectfully question its accuracy: Part 2 of the RMA appears to us — if a nautical image is to be used — to be more akin to the bridge or, nowadays the operations room, on a flagship.

[258] In contrast, in *King Salmon* Arnold J simply described section 5 as "… a guiding principle which is intended to be applied by those performing functions under the RMA rather than a specifically worded purpose intended more as an aid to interpretation;"[361]. Alternatively it is "… a carefully formulated statement of principle intended to guide those who make decisions under the RMA[362]". Later Arnold J also observed (presumably obiter) that the provisions in Part 2 are not operative provisions in the sense of being sections under which particular planning decisions are made[363], rather they "comprise a guide for the performance of the specific legislative functions". These passages suggest *Woolley* may need to be applied carefully in future.

[259] Brown J's other approach to the application of the phrase 'subject to Part 2 …' was simply to adopt[364] what the Board wrote[365]:

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359 *Auckland City Council v The John Woolley Trust* [2008] NZRMA 260 (HC) at [47].
360 *Auckland City Council v Auckland Regional Council* [1999] NZRMA 145.
361 *King Salmon* above n 26, at [24(a)].
362 *King Salmon* above n 26, at [25].
363 *King Salmon* above n 26, at [151].
364 *New Zealand Transport Authority v Architectural Centre Inc & Ors* [2015] NZRMA 375 (HC) at [118].
365 Decision of the Board of Inquiry into the Basin Bridge (29 August 2014) para [183].

> [183] Further and perhaps more importantly, as we have already noted, Section 171(1) and the considerations it prescribes are expressed as being *subject to Part 2*. We accordingly have a *specific statutory direction* to appropriately consider and apply that part of the Act in making our determination. The closest corresponding requirement with respect to statutory planning documents is that those must be prepared and changed *in accordance with ... the provisions of Part 2*.

The difficulty is that the phrase 'subject to Part 2' does not give a specific direction to apply Part 2 in all cases, but only in certain circumstances. As Cooke P explained for the Court of Appeal in *Environmental Defence Society Inc v Mangonui County Council*[366] (a case under the Town and Country Planning Act 1977): "The qualification "subject to" is a standard drafting method of making clear that the other provisions referred to are to prevail in the event of a conflict". We now know, in the light of *King Salmon*, that it is not merely a "conflict" which causes the need to apply Part 2. The Supreme Court has made it clear that, absent invalidity, incomplete coverage or uncertainty of meaning in the intervening statutory documents, there is no need to look at Part 2 of the RMA even in section 104 RMA.

[260] We accept that in this proceeding we are not obliged to give effect to the NZCPS, merely to "have regard to" it, and even that regard is "subject to Part 2" of the RMA. However, logically the *King Salmon* approach should apply when applying for resource consent under a district plan: absent invalidity, incomplete coverage or uncertainty of meaning in that plan or in any later statutory documents which have not been given effect to, there should be usually no need to look at most of Part 2 of the RMA. We note that the majority of the Supreme Court in *King Salmon* was clearly of the view that its reasoning would apply to applications for resource consents.[367]

[261] We consider that *Thumb Point* is, with respect, more accurate than *NZTA* on how to apply *King Salmon* in the context of section 104. Further, *Woolley* may now need to be applied with caution. None of those cases were cited to us by counsel but since no party relied strongly on Part 2 of the Act as over-riding considerations under section 104(1)(a) to (c), we consider it is unnecessary to seek further submissions. Rather this

366 *Environmental Defence Society Inc v Mangonui County Council* [1989] 3 NZLR 257; (1989) 13 NZTPA 197 (CA) at 202.

367 *King Salmon* above n 26, at [137]-[138].

exercise is simply the court trying to articulate the correct way of applying *King Salmon* in a section 104 context in the face of conflicting High Court decisions and the court's own erroneous decision in *KPF*[368].

Summary

[262] In summary we hold that the correct way of applying section 104(1)(b) RMA in the context of section 104 as a whole is to ask:

(1) "Does the proposed activity, after: assessing the relevant potential effects of the proposal in the light of the objectives, policies and rules of the relevant district plans[369];

(2) having regard to any other relevant statutory instruments[370] but placing different weight on their objectives and policies depending on whether:

  (a) the relevant instrument is dated earlier than the district (or regional) plan in which case there is a presumption that the district (or regional) plan particularises or has been made consistent with the superior instruments' objectives and policies;

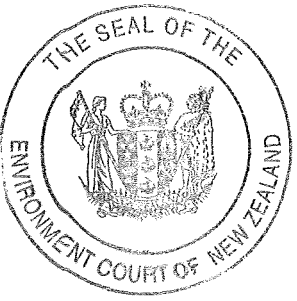
  (b) the other, usually superior, instrument is later, in which case more weight should be given to it and it may over-ride the district plan even if it does not need to be given effect to; and/or

  (c) there is any illegality, uncertainty or incompleteness in the district (or regional) plan, noting that assessing such a problem may in itself require reference to Part 2 of the Act, can be remedied by the intermediate document rather than by recourse to Part 2;

(3) applying the remainder of Part 2 of the RMA if there is still some other relevant deficiency in any of the relevant instruments; and

(4) weighing these conclusions with any other relevant considerations[371]

— achieve the purpose of the Act as particularised in the objectives and policies of the district/regional plan?"



368 *KPF* above n 352.
369 I.e. the operative district plan and any proposed plan (including a plan change).
370 Under section 104(1)(b) RMA.
371 E.g. under section 104(1)(c) and 290A RMA.

[263] Whether that process can still be called an "overall broad judgement" is open to some doubt. The breadth of the judgment depends on the following matters in the district or regional plan:

- the status of the activity for which consent is applied;
- the particularity (or lack of it) in the relevant objectives and policies about the effects of the activity; and
- the existence of any uncertainty, incompleteness or illegality (in those plans or in any higher order instruments).

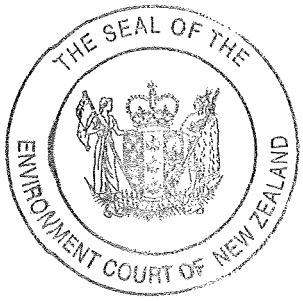
Consequently we consider that in *KPF*[372] the court may have overstated the width of the judgment under section 104 at least if the *KPF* approach is applied to other district plans which are more particular than the rather generalised Sounds Plan.

Incomplete tests for efficiency

[264] There is one other matter: it appears all district or regional plans are incomplete in the sense that they are not Stalinist Five-year Plans: they do not attempt to resolve the most efficient use of all resources: see *Meridian Energy Ltd v Central Otago District Council*[373]. While plans give guidance and/or directions (particularised implementations of Part 2 RMA) in policies, which are deemed to be appropriate (which includes efficient) — *King Salmon*[374] — some activities are stated by rules to be discretionary or non-complying so that more efficient uses can be ascertained on a case-by-case basis.

[265] That means that one aspect of Part 2 of the RMA may often need to be looked at as a result of *King Salmon*. That is section 7(b) which states:

> 7 **Other matters**
>
> In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—
>
> ...
>
> (b) the efficient use and development of natural and physical resources:



372 *KPF* above n 352, at [200].
373 *Meridian Energy Ltd v Central Otago District Council* [2010] NZRMA 477 (HC) at 118.
374 *King Salmon* above n 26, at [24] (d).

...

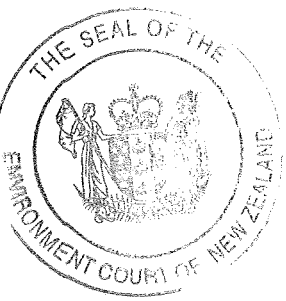
[266] Efficiency is, in our view, one of the least well understood concepts in the RMA. First it is important to understand that efficiency is a neutral concept: the efficient use of a resource cannot be ascertained until there are policies by which it can be assessed. Second, the standalone efficiency of a use of a resource can be ascertained by comparing the probability of environmental gains with the risk of adverse effects, or in 'economic' terms ascertaining whether the benefits exceed the costs. However, since those are rarely quantified, that assessment of efficiency (e.g. that refusing consent to a wind farm will "waste" the wind resource) adds little to the overall assessment. The third and potentially most useful point is that efficiency can be assessed in a practical and relative way. Efficiency asks "does the proposed use of the resource implement the relevant policies and achieve the objectives better[375] than the current (or permitted) use of the resource?" Consequently we consider there may be an extra step in the ultimate evaluation as follows:

> Having particular regard to section 7(b) RMA by assessing (at least) is the proposal more efficient in implementing the policies and achieving the objectives of the relevant plan than the status quo (or the permitted activities in the plan)?

[267] We have not needed to ask for further submissions on this issue because section 7(b) is largely irrelevant in this case. That is because the subsection is only concerned with two of the elements of sustainable management of resources — their use and development — not their third: protection. This case is essentially about the protection of the resources in the environment around the site and so we take this issue no further here.

5.3 Having regard to the potential effects of the mussel farm

[268] When considering the effects of the proposal and their consequences the consent authority should consider those effects as avoided, remedied or mitigated by any conditions of consent. We have done so in this case. However, there is one exception,



375 It is possible, especially in the absence of section 6 matters, to quantify and compare net benefits of a proposal with those of the status quo — see *Port Gore Marine Farms v Marlborough District Council* [2012] NZEnvC 72.

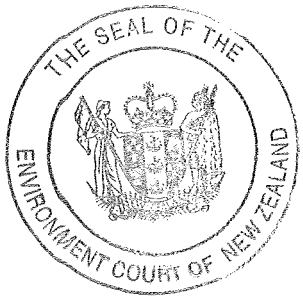
which is the proposed "adaptive management conditions". Since these neither avoid, remedy or mitigate effects but rather provide a recipe for future possible avoidance, remediation or mitigation of effects, we will consider adaptive management later.

[269] It will be recalled that in part 3 of this decision we asked a series of questions about the potential effects of concern under the Sounds Plan's objectives and policies. The answers to these questions were given in part 4. Pulling together and summarising the more important predicted non-neutral effects of the Davidson Family Trust application with the accumulative effects of the other identified stressors which we should consider under the Sounds Plan and the NZCPS, they are:

(1) likely net social (financial and employment) benefits;
(2) a likely significant adverse effect on the natural feature which is the promontory;
(3) likely significant cumulative adverse effects on the natural character of the margins of Beatrix Bay;
(4) likely adverse cumulative effects on the amenity of users of the Bay;
(5) very likely minor adverse impact on King Shag habitat by covering the muddy seafloor under shell and organic sediment, an effect which cannot be avoided (or remedied or mitigated);
(6) very likely a reduction in feeding habitat of New Zealand King Shags;
(7) very likely more than minor (11% plus this proposal) accumulated and accumulative reduction in King Shag habitat within Beatrix Bay and an unknown accumulative effect on the habitat of the Duffer's Reef colony generally; and
(8) as likely as not, no change in the population of King Shags, but with a small probability of extinction.

5.4 Consideration under the Sounds Plan

[270] The Sounds Plan in itself requires a fairly broad judgment. In the bigger picture, the proposal is generally consistent with Chapter 2 (natural character) and Chapter 5 (landscape) provisions of the Sounds Plan. The direct visual effects on the natural character and landscape of the promontory and associated inshore area are more than minor by themselves i.e. in the notional absence of existing marine farms on either side



of the promontory. Importantly, the proposal applies the natural character policy[376] to place development in areas "where the natural character of the coastal environment has already been compromised". We have wrestled with this and find the problem nearly intractable: in the absence of this policy we would find inappropriate the cumulative effects of the proposal on the amenity of the inshore area of Beatrix Bay and the feature which is the promontory. However, this policy seems to render cumulative effects on natural character irrelevant.

[271] Focussing on Chapter 9 (The Coastal Marine Area) the first objective is[377] to accommodate appropriate activities in the coastal marine area while avoiding, remedying or mitigating the adverse effects of those activities. The proposal achieves policies (9.2.1) 1.1 and 1.12 by (relevantly) enabling marine farming while maintaining, mitigating or remedying adverse effects on[378] cultural and iwi values, cultural and iwi amenity values, public health and safety, recreation values, and water quality. The question is whether it adequately mitigates effects on the remaining values in the policy (9.2.1)1.12 list, specifically conservation and ecological values, seascape and aesthetic values, the natural character of the coastal environment, navigational safety and public access to and along the coast — to make the site appropriate[379] in the landscape.

[272] The third coastal marine objective[380] seeks to protect the coastal environment by avoiding, remedying or mitigating any adverse effects of activities that alter the seabed. That raised the key question[381] whether the effects on the "value" of the marine habitat are sufficiently mitigated or remedied.

[273] It will be recalled that a key policy[382] in the Sounds Plan is to avoid, remedy or mitigate the adverse effects of (in this case) water use on areas of significant ecological value ("AOEV"). We have also recorded that the Appellant challenged the basis of the notation in the Sounds Plan describing the area around the site as an AOEV. We note that the challenge was not to the fact that the AOEV is habitat of King Shag. That is

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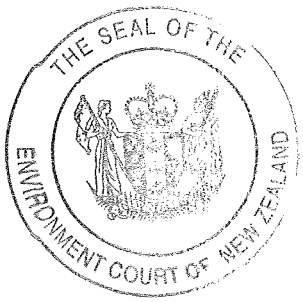
376 Policy (2.2)1.2 [Sounds Plan].
377 Objective 9.2.1 [Sounds Plan at 9-4].
378 Policy (9.2.1)1.1 [Sounds Plan at 9-4 and 9-5].
379 Policy (9.2.1) 1.14 [Sounds Plan].
380 Objective 9.4.1 [Sounds Plan at 9-16].
381 Policy (9.4.1)1.1 [Sounds Plan at 9-16].
382 Policy (4.3) 1.2 [Sounds Plan p 4-2].



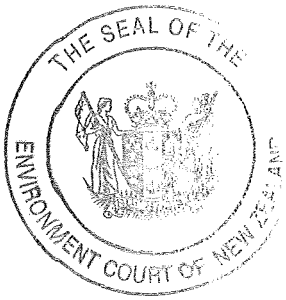
incontestable. The challenge by the Appellant was to whether the AOEV represented 'significant' habitat of King Shag. The Marlborough District Council was obliged to recognise and then to provide for the significant habitat of King Shag under section 6(c) RMA, and the AOEV was a response. It is far too late — more than a decade after the Sounds Plan came into force — to challenge the basis on which the Council made its decision to identify the area around the site as an AOEV. The proper approach on this issue would have been for the Appellant to call evidence showing that the site was not part of the habitat of King Shag, since it is likely that the whole AOO is significant for the species given its very small population. Consequently we consider policy (4.3)1.2 should be given full weight along with all the other relevant policies.

[274] Consequently, we consider that if we were to decide simply on the Sounds Plan itself and without yet considering the NZCPS we would on balance refuse resource consent on the basis that the proposal inappropriately reduces the habitat of King Shag.

5.5 Consideration under the NZCPS

[275] We recognise that mussel farms such as the application can only be located[383] in the coastal marine area. We also take into account the (social and) economic benefits[384] of the proposed farm. However, we consider the site is not an appropriate area for the reasons identified by the Council and the Societies: the change in benthic conditions within the direct footprint of the farm and nearby, particularly alterations to seabed morphology from shell drop, faeces and pseudofaeces represented an adverse effect on the foraging and feeding habitat of King Shag. Those adverse effects on King Shag habitat cannot be avoided as directed by the policy 11 of the NZCPS.

[276] We recognise that there are considerable uncertainties about the inter-relationships between stressors. The accumulative effect of marine farms on King Shag habitat may be less of an immediate threat than sediment run-off from land-based activities and bottom dredging. That does not mean it is not a threat. Further, potential effects of climate change (such as increase in water temperature) loom in the next few decades.



383 Policy 6(2)(c) [NZCPS p 14].
384 Policy 8(b) [NZCPS p 15].

[277] The point of policy 11(1) NZCPS is that if a species is at the limit of its range then it is automatically susceptible to stressors and any adverse effects on its habitat should be avoided. Applying that policy we consider that this is a strong factor against granting consent. More information and analysis is required beyond what we have been presented with here to address accumulative effects in a comprehensive manner. In the Appellant's view this is properly the province of a review of the Sounds Plan. We do not accept that an applicant can avoid the issue in this way when faced with the strong direction given in Policy 11 of the NZCPS. The applicant needs to put forward information that will satisfy the decision-maker that the risk of accumulative effects is acceptable. The onus is on the applicant because under section 104(6) RMA we may, as discussed, decline the application on the grounds that we have inadequate information.

[278] The cases for the Council and the Societies suggested the court take a precautionary approach in declining the application on the basis of uncertainty around the current knowledge of the effects of mussel farms on the environment. This was particularly the case in respect of adverse accumulative ecological effects and accumulative effects on King Shag where these effects are poorly understood. Policy 3 of the NZCPS[385] requires us to:

> Policy 3 Precautionary approach
>
> (1) Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown, or little understood, but potentially significantly adverse.
>
> (2) In particular, adopt a precautionary approach to use and management of coastal resources potentially vulnerable to effects from climate change, so that:
>
> (a) avoidable social and economic loss and harm to communities does not occur;
>
> (b) natural adjustments for coastal processes, natural defences, ecosystems, habitat and species are allowed to occur; and
>
> (c) the natural character, public access, amenity and other values of the coastal environment meet the needs of future generations.

[385] Policy 3 [NZCPS p 12].

[279] Policy 3 NZCPS applies where environmental effects are both "uncertain, unknown, or little understood" and "potentially significantly adverse". The Appellant submitted[386] that neither criterion is met.

[280] We have predicted that the adverse effect of the change to King Shag habitat under the site will be minor given the extent of potential habitat in the Sounds. On the other hand we have also predicted that the accumulative adverse effects could be serious. Counsel for the Appellant warned us[387] against the "real risk of loading a (new) potential effect upon multiple (existing) potential effects to arrive at an unrealistic potential cumulative effect scenario". Some *Dye*-induced confusion in that submission aside, we have heeded the warning. However, the prediction remains: potentially the King Shag could be driven to extinction by the accumulated and accumulative effects of mussel farms which are part of the environment in Beatrix Bay. That is a low probability event, but extinction is indubitably a significantly adverse effect which would be exacerbated, to a small extent, by the Davidson proposal.

[281] The precautionary approach suggests both that we should exercise our discretion under section 104(1)(c) to take accumulative effects into account, and — to the extent we have inadequate information about those — to consider declining the application under section 104(6) RMA (after taking into account in the Appellant's favour that the Council did not, it appears, ask for further information about this before the Commissioner's hearing).

5.6 Overall weighing under the Sounds Plan and the NZCPS

[282] Weighing the proposal under the Sounds Plan and the NZCPS, we judge that the undoubted benefits of the proposal are outweighed by the costs it imposes on the environment. In particular the proposal does not avoid or (where mitigation is possible) sufficiently mitigate:

(1) the direct minor effect of changing a small volume of the habitat of King Shag;

386 Opening submissions para 6.25.
387 Closing submissions for the Appellant dated 13 July 2015 at para 2.7(c).

(2) the accumulative effect — with other existing mussel farms in Beatrix Bay — of an approximate 11% reduction in the surface area of that soft bottom habitat on King Shag, even acknowledging that there are other suitable foraging areas within Pelorus Sounds which have not been quantified;

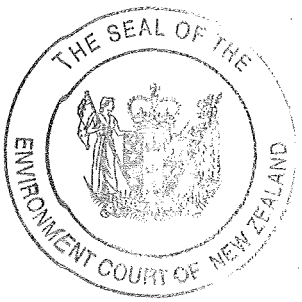
(3) the more than minor adverse effects on the landscape feature of the northern promontory; and

(4) the addition to the already significant adverse accumulated and accumulative effects on the natural character of Beatrix Bay.

[283] We have spent considerable time considering the implications of the apparently stable population of King Shag. If the population is stable despite all the existing mussel farms, how can one more have an adverse effect on the taxon?

[284] The first answer is that our finding that the current population of King Shag is apparently stable needs to be qualified by the lack of information about almost all other aspects of its population dynamics. The information given to us was completely inadequate to allow us to detect any trend in the population. At present data on the number of breeding pairs, breeding success rates, or even of the age and sex ratio of birds is almost completely lacking. In particular there is no data on the survival rates and population trends of mature female King Shags. These last are particularly important because it is the likely preferred foraging grounds of females which mussel farms have been extended into over the last 10 to 15 years.

[285] A second additive answer is that it is generally recognised that the precise effects of combinations of stressors on bird populations are not known. Thus the *Red List* works usually on the basis that if there is a percentage reduction in population of a taxon over time then that puts the species at risk. There are elaborate criteria depending on initial population; size of population reduction, declines in EOO or AOO or habitat quality, and so on[388]. However, when a taxon is reduced to less than 1,000 individuals on the planet, because of the risk of stochastic events, <u>waiting for a reduction in population is no longer regarded as an appropriate trigger for protecting the taxon</u>.



388 "V The Criteria for Critically Endangered, Endangered and Vulnerable" The *Red List* above n 156, at p 16 et ff.

[286] The NZCPS has also recognised[389] that continuing decline in habitats is a key issue in the coastal marine area. That is one of the reasons that policy 11(a)(iv) expressly avoids adverse effects (not only significant adverse effects) on habitats of indigenous species where the species is at the limit of its natural range.

[287] No party argued that the NZCPS was uncertain or incomplete so there is no need to apply the 'subject to Part 2' qualification in section 104 RMA.

5.7 Would the difficulties be met by adaptive management?

[288] The Appellant has proposed that any uncertainty over the effect of the proposed mussel farm on the environment can be met by adaptive management conditions. In *Sustain our Sounds Inc v Marlborough District Council* ("*SOSI*") the Supreme Court stated that there are two questions[390] to be answered:

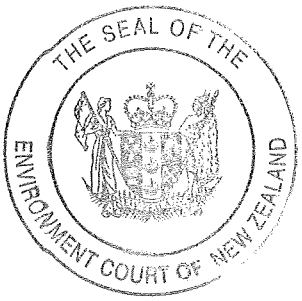
> … [First] what must be present before an adaptive management approach can even be considered and what an adaptive management regime must contain in any particular case before it is legitimate to use such an approach rather than prohibiting the development until further information becomes available.

The second question is whether any adaptive management regime is considered consistent with a precautionary approach[391] or whether consent should be refused.

[289] Giving the judgment of the Supreme Court, Glazebrook J elaborated[392]:

> As to the threshold question of whether an adaptive management regime can even be considered, there must be an adequate evidential foundation to have reasonable assurance that the adaptive management approach will achieve its goals of sufficiently reducing uncertainty and adequately managing any remaining risk. The threshold question is an important step and must always be considered. As Preston CJ said in *Newcastle*, adaptive management is not a "suck it and see"

389 Issues [NZCPS p 5].
390 *Sustain our Sounds Inc v Marlborough District Council* [2014] NZSC 40; (2015) 17 ELRNZ 520 at [124].
391 *SOSI* at [129].
392 *SOSI* at [125].



approach[393]. The Board did not explicitly consider this question but rather seemed to assume that an adaptive management approach was appropriate. This may be, however, because there was clearly an adequate foundation in this case.

[290] The proposed regime is claimed[394] by the Appellant to meet the requirements for adaptive management in respect of "proximate benthic effects" by[395]:

> (a) establish[ing] effective baseline monitoring to accurately assess the existing environment at the Application site and at least two control sites (in addition to the already existing data);
>
> (b) introduce[ing] clear and strong monitoring, reporting, and checking mechanisms; and
>
> (c) enable[ing] the removal or reduction in farming or other mitigation if monitoring results warrant such action.

[291] However that was qualified as counsel for the Davidson Family Trust explained in their opening submissions[396]:

> This adaptive management regime is offered by the Trust to assist in confirming the relationship between mussel farms and nearby reef habitats, and is offered notwithstanding the lack of any evidence that reef and rocky habitats inshore of mussel farms have been substantially altered by mussel farming.
>
> No other adaptive management conditions are required (or offered).

Thus the adaptive management regime is not proposed for the habitat (soft substrate) actually occupied by the farm.

[292] Given the apparent stability of the King Shag population, we have considered whether, despite the Appellant's disavowal of any other kind of adaptive management, we should impose an adaptive management condition involving research into (at least):

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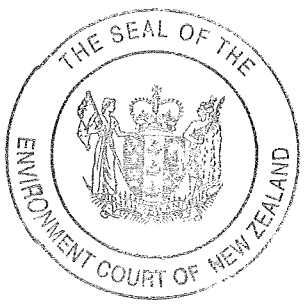
393 Referring to *SOSI* at [121] and adding: "See also the comments of Tremblay-Lamer J quoted at [123] above; the explicit consideration of the two options in *Clifford Bay Marine Farms Ltd v Marlborough District Council*, above n 199, at [113]; and the threshold question discussed in *Crest Energy Kaipara Ltd v Northland Regional Council*, ..., at [229]."

394 J C Kyle rebuttal evidence Appendix A [Environment Court document 32A].

395 See proposed conditions of consent in Appendix A to J C Kyle evidence-in-rebuttal [Environment Court document 32].

396 Opening submissions paras 6.31 and 6.32.

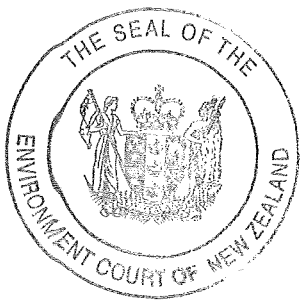


- Use of the areas covered by mussel farms and their shell shadow by preferred prey (flatfish) of King Shags.
- Whether there are seasonal or other periodic changes to use of Beatrix Bay by flatfish?
- Use of different substrates and depths by male King Shags and (separately) by females.
- Survival rates of male versus female King Shags.
- The other matters raised by Dr Fisher.

[293] If the Davidson Family Trust's proposal was for one of the first mussel farms in Beatrix Bay, that sort of condition might work. Unfortunately, its site is one of the few still available on the soft substrate immediately outside the rocky inshore substrate. If research is carried out, as it urgently needs to be, into the various questions posed in the previous paragraph, then this site will likely be needed as an unmodified or control site.

[294] A further, more important, difficulty in this case is that there is still considerable uncertainty over the probabilities as to whether marine farms are stressors of King Shags. Clearly what is needed are before and after controlled studies, but none have been conducted in Beatrix Bay or indeed elsewhere in the Sounds. Consequently we have little confidence that amendments of the proposed[397] adaptive management conditions would reduce uncertainty and manage any remaining risk.

[295] Finally, relying on an adaptive management condition triggered by a change in King Shag population is in our view precisely what the IUCN Red List criteria suggest is inappropriate for very small populations. The geographic range criteria B and the very small population criteria D are <u>independent</u> of the "change in population" criteria[398]. A population change condition is inappropriate because by the time a population change (at whatever relatively arbitrary level of change — 5%, 10% or 20% — is chosen) has been established to the appropriate degree of certainty, the species may be doomed to extinction.



397 J C Kyle rebuttal evidence Appendix A [Environment Court document 32A].
398 The *Red List* above n 156, at pp 21 and 22.

[296] We find that the adaptive management threshold test of *SOSI* is not met and therefore it would be inappropriate to rely on adaptive management of adverse effects in relation to these applications.

6. Result

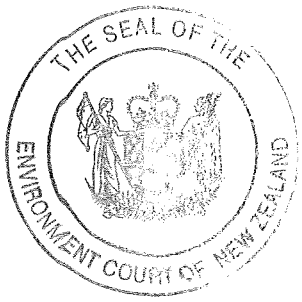
[297] After considering all the matters raised by the parties and after weighing all the relevant factors we judge that the objectives and policies of the Sounds Plan, reinforced by the more directive policies of the NZCPS, require that we should refuse the consents sought.

[298] We have attempted to assist the Appellant by assessing the information and making predictions where we can. For example we have attempted to assess the probable area of mud seafloor covered by mussel farms in Beatrix Bay. However, if that or any of our other assessments are too inaccurate, then the alternative outcome is clear: we were simply given inadequate information by the Appellant (and other parties) to determine that the application should be granted. Accordingly we would exercise our discretion under section 104(6) RMA to decline to grant consents.

Afterword

[299] We have also briefly considered the implications of refusing consent in this case for other applications in the area of occupancy of King Shags. In the short term this decision may cause difficulties. For the Appellant, Mr Gardner-Hopkins gained admissions[399] from a number of witnesses that the impetus for gathering information "should" occur at an industry level or higher (referring to local or even central government). The answer is that the Aquaculture Industry and the Council[400] may need to commission rather more sophisticated and detailed research into King Shags than appears to be carried out at present. In particular all the matters covered by the IUCN Red List criteria would be a minimum requirement of any research programme.

[300] The survival of a very rare species of bird is at risk here. With a population of less than 1,000 individuals it is at high risk of extinction. Much more robust research needs to be carried out both on New Zealand King Shag population structures and on the



399 For example — Transcript, p 485, line 24.
400 See the Methods of Implementation in the Sounds Plan at 9.3.3.

interrelationship between stressors on this species before the industry can expand (or even perhaps continue at the same level) in outer Pelorus Sound.

Reasons of Environment Commissioner Buchanan

Preliminary comment

[301] The application to establish a marine farm at the head of an unnamed promontory in Beatrix Bay by the RJ Davidson Family Trust was declined by the Marlborough District Council following a hearing before an independent Commissioner in July 2014. The decision to decline the application was based on the adverse effects of the proposal on navigation, natural character values, landscape values and recreational amenity being more than minor. As noted in the majority decision, the Court was presented with a modified marine farm layout at the site that sought to avoid many of the adverse effects noted in the Commissioner's decision.

[302] The majority conclude that there is an adverse effect on the habitat of King Shag and significant adverse effects on visual perceptions of natural character of the promontory and of Beatrix Bay. For this reason, the majority is of the view that the application should be refused. I disagree with the weight given to the effects on King Shag habitat and the evaluation of adverse visual effects of the proposed marine farm in an environment already containing 37 similar marine farms. The application should be granted.

King Shag

[303] I agree with the description of King Shag biology, population and status set out in Part 2 of the majority decision, including the findings:

(a) That King Shag numbers have remained constant since 1991 and that there is no declining trend in numbers.

(b) Beatrix Bay is part of the area of occupancy of King Shag.

(c) That King Shag forage very infrequently within mussel farms, likely due to reduced flatfish numbers under the farms.

[304] In relation to (a) Schuckard (2006)[401] established that the population of King Shag has on average been not less than around 650 birds over the past 50 years. Daytime counts reported from the four main colonies prior to 1992, taken when part of the population was away feeding, were adjusted by Mr Schuckard using a correction factor described in his 2006 paper. This correction factor was adopted by Bell (2010)[402] as an acceptable multiplier to estimate population and size from daytime counts at the colonies. Mr Schuckard was of the opinion that the population numbers of King Shag had remained stable for at least 50 years. The uncontested evidence he produced supports this. I therefore extend the finding of the majority decision to include the period from 1951 when full colony counts were first recorded.

Statutory instruments

[305] The questions that arise from Policy 4.3(1.2) of the Sounds Plan regarding the likely adverse effects on King Shag habitat relate only to those areas of the Sounds mapped as an area of ecological significance in Appendix B notation 1/11 of the Plan. Activities within the area of ecological value are to be assessed as discretionary and the anticipated environmental result is the maintenance of population numbers and distribution of the species, in this case King Shag.

[306] The New Zealand Coastal Policy Statement Policies 11(a)(i) and (ii) refer to threatened taxa. Taxa is a generic term used to refer to a taxonomic category at any level, such as phylum, order, family, genus or species. In this case we are dealing with a threatened seabird of the genus Leucocarbo and species carunculatus. The threatened taxon for the purpose of Policies 11(a)(i) and (ii) is the species *Leucocarbo carunculatus.* These policies direct the avoidance of adverse effects of the activity on a threatened species (King Shag).

[307] Policy 11(a)(iv) refers to the habitats of indigenous species where the species is at the limit of its natural range. Species range limits are the spatial boundaries beyond which individuals of the species do not occur. The natural range of King Shag is the Marlborough Sounds. Populations of species occupying habitats at the outer limits or

401 Schuckard, R. (2006). Population status of New Zealand King Shag (Leucocarbo carunculatus). Notornis, 53: 297-307.

402 Bell M. (2010). Numbers and distribution of New Zealand King Shag (Leucocarbo carunculatus) colonies in the Marlborough Sounds, September-December 2006. Notornis 57: 33-36.

periphery of the species' natural range are significant to ecology, evolution and conservation in that they provide opportunities to understand the conditions under which populations expand or contract or evolve new forms. Adverse effects of activities at these margin habitats may not affect the wider population of the species, so the maintenance of biological diversity in these areas of the marine environment is dependent on the avoidance of adverse effects on their habitats. This is the purpose of Policy 11(a)(iv).

[308] We are dealing here with a species that has a very limited range. The subject site is recognised as within the central feeding range of the population of King Shag centred on the Duffers Reef colony, which in turn is the largest colony of this species found within the natural range of the species.

[309] The majority decision finds that *Leucocarbo carunculatus* is at the limit of its natural range because its extent of occupancy (natural range) is small. Policy 11(a)(iv) NZCPS is not qualified by any size constraints large or small. The natural range is just that, the natural range, irrespective of its size. The majority decision also introduces the finding that *Leucocarbo carunculatus* is an outlier of a superspecies (collection of related species of largely sub-antarctic blue-eyed shags (genus Leucocarbo). This misinterprets Policy 11(a)(iv) which refers to indigenous species, not superspecies. The species *Leucocarbo carunculatus* is not found outside the Marlborough Sounds. The limit of its range is determined by the geography of the Sounds and physiology of the birds themselves that limit the foraging flight range to about 25 kilometres. King Shag are therefore not a qualifying species under Policy 11(a)(iv) NZCPS where any reduction in habitat at the limit of its range is to be avoided. King Shag cannot be considered as "naturally rare" under the NZCPS definition of that term for the purpose of the second qualifying requirement of Policy 11(a)(iv) as we have little knowledge of the status of the species in pre-human times.

Effects on King Shag

[310] The majority decision examines at length the likelihood and scale of adverse effects on the habitat of King Shag, both directly as a result of this proposal and cumulatively from all mussel farms in Beatrix Bay. The conclusion from this examination is that the altered environment under the proposed farm is likely to cause an

adverse effect on King Shag habitat. Given the scale of the proposal these effects will be minor (but not minimal) by themselves, but taken together with all the other existing farms will be adverse to King Shag habitat.

[311] The majority decision summarises that there was adequate information to find/predict that:

(1) King Shag habitat is changed by shell drop and sedimentation;
(2) The effects of each farm will accumulate and are likely to be adverse;
(3) That it is as likely as not there will be adverse effects on the population of King Shag and their prey;
(4) There is a low probability (it is very unlikely but possible) that the King Shag will become extinct as a result of this application.

[312] I did not dispute that (1) and (2) above are supported by the evidence and that regard should be given to these effects under section 104(1)(a) RMA. I disagree that there is adequate information to support (3) or (4). The accepted population information establishes that King Shag numbers are not declining and have not done so for the past 50 years at least. This cannot be dismissed. The likelihood of this farm resulting in the extinction of the species is so remote that it cannot be considered as a credible threat in the context of the definition of effect under Section 3 RMA.

[313] The majority decision states that completely inadequate information was available to detect any trend in the population, as data on breeding pairs, breeding success rates, and age and sex ratios was almost completely lacking. This does not recognise the reality that it is these and many other aspects of a species' population dynamics that contribute to the balance of recruitment and mortality that results in a static or stable population over time. Adverse effects from environmental stressors having a substantial impact on critical aspects of King Shag population dynamics would be reflected in the population counts available since 1951. King Shag are adapted to a specialist niche habitat, provided only in the Marlborough Sounds. This niche habitat has been subject to a range of anthropogenic and stochastic stressors over the past 50 years with no observed effect on the population of King Shag. A complete understanding of the population dynamics of the species will not alter this fact.

[314] I find there is adequate information to support the alternative finding that it is extremely unlikely that there will be adverse effects on the population of King Shag from the proposal.

Evaluation

[315] The subject site is within the ecological overlay (Map 69) described in Appendix B, Notation 1/11 of the Sounds Plan defining the significant foraging habitat of King Shag. A very small proportion of mussel farms occupy space within this Area of Ecological Value as it primarily covers areas seemingly favoured by foraging King Shag at depths below 30 metres. The adverse effect of a reduction of 10 hectares available to King Shag for foraging in the context of the extent of the ecological overlay is minimal and extremely unlikely to result in a decrease in the number of King Shag. The significant habitat identified within Beatrix Bay remains viable. Policy 4.3(1.2) of the Sounds Plan is satisfied.

[316] There is no question that Policies 11(a)(i) and (ii) NZCPS apply. Adverse effects on King Shag may include reduction in the area occupied by King Shag and reduction in habitat quality. While the existing mussel farms may have displaced King Shag from feeding in that area of the species' habitat occupied by mussel farms in Beatrix Bay, this has resulted in no harm to the population. The numbers of King Shag foraging in Beatrix Bay has not diminished over the 25 years since snapshot foraging bird surveys were first carried out in 1991 and the population of King Shag has not shown any downward trends since mussel farms were first established in the Sounds.

[317] Policies 11(a)(i) and (ii) are satisfied by this finding. Indigenous biodiversity in Beatrix Bay is not compromised by adverse effects on the habitat of King Shag. That habitat remains viable and the population of King Shag as far as it exploits this part of its natural range is not adversely affected by mussel farms.

[318] Policy 11(b)(iii) NZCPS refers to avoiding significant adverse effects on rocky reef systems. Adverse effects of the proposal on the rocky reef area at the head of the promontory have been evaluated in the majority decision which found there to be a low probability of there being a more than minor effect on the ecology of the reef. The

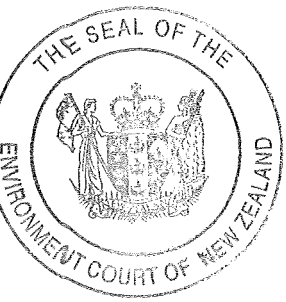
majority decision also evaluates the adverse effects on the indigenous eco-system within the intertidal range as required by Policy 11(b)(iii) finding that it is likely there will be only minor (if any) independent or cumulative effects on the intertidal zone. Policy 11(b)(iii) it is therefore satisfied by these findings.

Comment

[319] Concern for the effects of new salmon farms being introduced into the area of occupancy of King Shag was raised at the Board of Inquiry (BOI) into the New Zealand King Salmon proposal. The BOI found that there were potential adverse effects of low probability but high consequence that needed to be considered. The Board adopted a precautionary approach to these effects in granting consents within King Shag habitat by including in consent conditions the requirement for an adaptive management approach under a King Shag Management Plan (KSMP). This approach was confirmed as part of the wider consideration of adaptive management conditions by the Supreme Court[403].

[320] The KSMP is required to include a baseline survey of King Shag numbers followed by repeat surveys at least every three years. The BOI identified a statistically significant decline in King Shag numbers of 5 percent as a threshold for investigation of whether the marine farm was contributing to the decline and possible remediation measures if such a contribution was identified. The baseline counts for the KSMP were those included in the evidence of Mr Schuckard and Dr Fisher and recorded in the majority decision. If, as the majority decision suggests, a residual low risk remains that the reduction in King Shag habitat from this proposed farm either directly or cumulatively with all other mussel farms may adversely affect the King Shag population, then a similar adaptive management approach would seem to be appropriate.

[321] The scale of this proposal in comparison to the King Salmon application does not justify a specific adaptive management approach for King Shag as applied by the BOI decision. It is very important, however that the mussel industry within the Sounds generally becomes linked in some manner to the KSMP. A way needs to be found to involve the mussel industry in monitoring the KSMP results as they are published on the



403 *Sustain our Sounds Inc v Marlborough District Council* [2014] NZSC 40; (2015) 17 ELRNZ 520 at [140] and [158].

New Zealand King Salmon website and contribute to any subsequent investigation if the threshold 5 percent decline in King Shag population is exceeded in order to establish whether mussel farming is contributing to that decline and response measures that could be adopted. This would be a sensible and pragmatic marine farming approach to a potential effect of low probability but high consequence, but is not one we can impose on a single consent holder in this case.

[322] The alternative approach is to decline all future applications for marine farms in the natural range of King Shag until such time as sufficient information is available to determine with certainty the risk posed by marine farms on the King Shag population. This seems to be the approach taken in the majority decision.

Conclusion on King Shag

[323] The majority decision largely turns on the interpretation of Policy 11(1)(iv) NZCPS and the directive within that policy to avoid adverse effects on habitats of an indigenous species and the risk this poses as a potential contributor to the decline (or indeed demise) of King Shag. This, in my view, is not a correct application of the policy.

[324] The real issue (under Policies 11(a)(i) and (ii)) is the effect of the small adverse reduction in habitat on the population of King Shag. The primary indicator of the population status of King Shag is the reliable data set on the trend in the population over time. This indicates to me that marine farming in the Sounds has not had a negative influence on that population.

[325] The very low residual risk of the adverse effects of mussel farming in the Sounds on King Shag habitat having an adverse effect on King Shag population warrants an industry wide adaptive management approach that piggybacks on the KSMP now in place for New Zealand King Salmon.

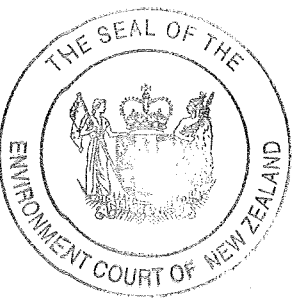
Effects on the Promontory

[326] Competing evidence on the effects of the proposal on the promontory was provided by three independent experts as summarised in the majority decision. All of Beatrix Bay is considered by the experts and accepted by the Court (in *Knight*

Somerville Partnership[404] and elsewhere) as having a high level of natural character. The promontory does not stand out from the rest of the Bay in this regard. The Sounds Plan through its CMZ2 zoning provides for the establishment of marine farms, particularly in the inshore area of Beatrix Bay, as appropriate use of the coastal marine area subject to individual farm assessment. The proposed farm is not exceptional in this environment. The small (2 percent) extension of occupied space at the southeast and southwest ends of the promontory does not differ in effects on natural character from any other farm in the Bay, including the recently consented (by the Court) farm adjacent to the headland between Tuhitarata and Laverique Bays (*Knight Somerville Partnership*).

[327] Mr Glasson's opinion and conclusion set out in paragraph [217] of the majority decision provides an evaluation of the proposal in the context of the land/water interface of the promontory and the presence of existing mussel farms. I accept Mr Glasson's proposition that the proposal will allow the integrity of the promontory to remain intact. When viewed from the south, the most common approach by sea, the end of the promontory and its background are unencumbered by marine farm structures even with this proposal in place. From all other viewpoints, the visual effects of the proposal on the natural character of the promontory cannot be viewed in isolation from existing farms that stretch to the outer margin of the feature. The visual perspective in this regard is already compromised with the seaward extension resulting from the proposal having only a minor additional effect.

[328] The majority decision accepts that cumulative effects on the natural character of Beatrix Bay reported by Dr Steven are significantly adverse. This conclusion does not appear to recognise the collective advice of the landscape experts that the natural character of the Bay remains high. This is inclusive of the presence of 37 marine farms. It was not suggested by anyone that the assigned high status would be revised to some lower assessment category as the result of adding this additional farm. As such, the very small change on a Bay-wide scale of an additional 7.34 ha of mussel buoy lines cannot be considered as significant. To do so would require the acceptance that some concept of threshold for the area covered by marine farms existed, beyond which additional



404 *Knight Somerville Partnership v Marlborough District Council* [2014] NZEnvC 128.

marine farms had significant cumulative effects and were therefore inappropriate despite the CMZ2 zoning. No case for this was made other than Dr Steven's assertion that it was a *reasonable and defenceable proposition* that such a threshold had been reached.

[329] For the above reasons, I give greater weight to the evidence of Mr Glasson than to that of Mr Bentley and Dr Steven in concluding that the adverse effects on the visual/natural character perceptions of the promontory in particular, and Beatrix Bay in general, are likely to be no more than minor.

[330] In considering the Sounds Plan, I agree with the evaluation in the majority decision that Policy 2.2(1.2) seems to render cumulative effects on natural character irrelevant in that it encourages development in already compromised areas of the coastal environment.

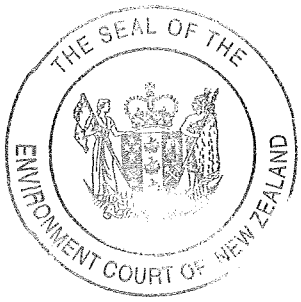
[331] In considering the NZCPS, my finding on the absence of significant adverse effects on natural character and landscape means the "avoidance" directives of Policy 13(1)(b) and Policy 15(b) respectively are not triggered. In having regard to the policy alternative to avoid, remedy or mitigate any adverse effects on natural character and landscapes, I consider that it is not possible to achieve any of these in operating a marine farm that requires visible suspension infrastructure, although the ability to remove this infrastructure can be seen as a mechanism to remedy any unacceptable adverse effects of the mussel farm over time. The adverse visual effects of this proposal in the context of existing marine farms in the visual catchment are of a scale that is not determinative on its own.

Summary

[332] In summary:

(a) An adverse effect on King Shag habitat is likely that is more than minor but less than significant at a cumulative Bay-wide scale.

(b) There is no evidence that the adverse effect on King Shag habitat is having any adverse effect on the population of King Shag generally and the Duffers Reef Colony in particular.



(c) There is a low risk that mussel farms in the outer Pelorus Sounds may have adverse effects on the Duffers Reef Colony of King Shag.

(d) The proposal is unlikely to have significant adverse visual effects on the natural character and landscape of the promontory or cumulatively on the natural character and landscape of Beatrix Bay.

(e) The proposal is likely to have no more than minor adverse effects on non-visual aspects of natural character including benthic and water column effects, recreational amenity, navigation and King Shag.

Result

[333] The application should be granted with standard mussel farm conditions to be advised by the Council.

[334] The majority decision to refuse the application is a disproportionate response to the extremely unlikely risk that an additional marine farm in Beatrix Bay may contribute to a decline in the King Shag population in the Marlborough Sounds. In my view, the proposal represents an appropriate development in the coastal marine area.

J R Jackson
Environment Judge

J R Mills
Environment Commissioner

I Buchanan
Environment Commissioner

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