BEFORE ENVIRONMENT SOUTHLAND
AT INVERCARGILL

IN THE MATTER OF A HEARING UNDER S100A OF THE RESOURCE MANAGEMENT ACT 1991

BETWEEN	JIM MAASS-BARRETT & ZANE SMITH Applicants
AND	TE RŪNANGA o AWARUA, DEPARTMENT OF CONSERVATION, MINISTRY FOR PRIMARY INDUSTRIES, SANFORD LTD, EEC LTD, and BLUFF OYSTER MANAGEMENT CO. LTD. Submitters

EVIDENCE OF JOHN FRANCIS ENGEL – FURTHER INFORMATION

2 OCTOBER 2019

INTRODUCTION

1 This evidence is in response to the Commissioner's request for additional information on historic mussel production and phytoplankton carrying capacity, consideration of the Aquaculture Stewardship Council's "Pelagic Effect Assessment Criterion" or similar, and information on the existing navigation lights on marine farms in Big Glory Bay.

2 I have also taken the opportunity to respond to the procedural matters raised at the start of the hearing, namely, the information relating to the correct map for notification and the site co-ordinates, and the notification of the applicants for Customary Marine Title

PROCEDURAL MATTERS

3 In regard to the site map for the application, the Council confirmed that an amended version was lodged with the response to a request for further information in a letter dated 17 August 2018. The map references are provided in the New Zealand Transverse Mercator 2000 grid, which is the grid it normally requires on application forms. The Eastings and Northings are correct and located in Big Glory Bay.

4 One of Sanford Ltd's witnesses believed that the references were wrong but acknowledged that this grid was not one he was familiar with. The numbers, although bearing similarities to numbers in other grid systems, must be converted to be plotted in other systems.

5 In regard to the notification of claimants for customary marine titles under the Marine and Coastal Area Act (MCAA), I can confirm that Ngāi Tahu Whanau was notified shortly after the application was lodged.

6 In addressing this requirement, I relied on the information provided on the website for the Office for Māori Crown Relations (OMCR), which I now know to be an error as some applications are made directly to the Crown and others were made to the High Court, and there is considerable overlap. The OMCR site identified Ngāi Tahu Whanau and Cletus Maanu Paul as claimants, noted that the Minister for this Office had declined to engage with Mr Paul and that there was no need for resource applicants to seek his views.

7 I now know that Mr Paul also lodged his application with the High Court and to my knowledge that claim is still to be addressed.

8 In regard to the New Zealand Māori Council/Te Kaunihera o Aotearoa application for customary marine title, I have been unable to find any reference to that claim on either the OMCR site or the High Court's list.

9 Although it is now late in the process, on 20 September 2019, I sent copies of the application to both Mr Paul and the New Zealand Māori Council. I have explained the circumstances and advised what stage the application is up to, and apologised for the oversight in the process. To date there has not been any response.

10 Finally, the procedural oversight is acknowledged but I submit that it is not a matter that need to delay processing of the application. Ngāi Tahu Whanau was notified early in the process, as well as when the application was publicly notified and has not submitted. In regard to the other two claimants, when notified of applications, the response has either been a standard letter in regard to Mr Paul or no response in regard to the New Zealand Māori Council. For other applications, Environment Southland has not taken the matter further in regard to those claims.

OTHER MATTERS

11 In regard to the other matters that information is requested, these have been addressed by the Applicants.

John Engel
Manager, Bonisch Environmental

BEFORE ENVIRONMENT SOUTHLAND
AT INVERCARGILL

IN THE MATTER OF A HEARING UNDER S100A OF THE RESOURCE MANAGEMENT ACT 1991

BETWEEN JIM MAASS-BARRETT & ZANE SMITH

Applicants

AND TE RŪNANGA o AWARUA, DEPARTMENT OF CONSERVATION, MINISTRY FOR PRIMARY INDUSTRIES, SANFORD LTD, EEC LTD, and BLUFF OYSTER MANAGEMENT CO. LTD.

Submitters

EVIDENCE OF JIM MAASS-BARRETT – FURTHER INFORMATION

2 OCTOBER 2019

INTRODUCTION

1. The Commissioner has asked that we, the applicants, provide further information on:

   - phytoplankton carrying capacity of Big Glory Bay;
   - our assertion that mussel harvest volumes have been higher in the past without any measured adverse effects on phytoplankton carrying capacity; and
   - a consideration of the Aquaculture Stewardship Council's (ASC) "Pelagic Effect Assessment Criterion"

2. In regard to Item 3, we note that we are not applying for certification under this scheme at this time.

PHYTOPLANKTON CARRYING CAPACITY

3. There is a distinction between production carrying capacity and ecological carrying capacity. There will be competition for plankton between unfarmed species and farmed species that must be managed so that population of the unfarmed species does not become unsustainable. The effects will not be 'nil' under any level of farming so it is the level at which ecological health effects are no more than minor that is important but cannot be precisely determined.

4. Cawthron Report, No. 1476, April 2009, is referenced in the application document (page 8). Section 2.4.4 Ecological carrying capacity, states that there are no definitive studies that provide a clear answer to the question of carrying capacity in relation to New Zealand mussel farming. Spatial modelling tools offer a way of estimating the extent to which the cumulative effects of mussel farming may be approaching ecological carrying capacity on "bay wide" and "regional" scales.

5. However, knowledge gaps are still evident in these models, particularly in the biological aspects, which are still areas of active research. Production is closely linked to the Southern Oscillation Index (SOI) and can be projected from climate data. Before this relationship was understood there were concerns that carrying capacity had been reached within the Marlborough Sounds system. However, mussel growth and production have subsequently recovered, suggesting that farming levels were not the driving factor.

6. In the ASC explanatory notes for the formulas used, on page 31 it states "under reasonable conditions, phytoplankton growth is in the order of 1-2 days". Pridmore (1990) gives 2-3 days ,and Newcombe says 1-3 days, so a conservative figure could be 2.5 days.

7. In order to estimate phytoplankton carrying capacity, we need to take account of retention (flushing) time of water in BGB. Pridmore and Rutherford (1990) give a time of 4.5 - 5.5 days under conditions of 10-15 m/sec of wind (54km/hr), down to 12-14 days at light winds of 1-2 m/sec .

8. The ADS Carrying Capacity update, Volume 1 Summary of Findings, October 2017 (part of the Sanford application for an amendment) gives a longer time period with its flushing model, showing approximately 60% exchange by day 14 and 85-90% flushing after 28 days.

9. The fact that flushing is only partially complete guarantees that the residual water with its "algal buffer stock" is able to multiply speedily, more than keeping pace with the current grazing of mussels. This effect can be seen by observing the phytoplankton levels in the monitoring results provided by Cawthron from the samples that are sent away regularly for biotoxin testing (Attachment 1).

10. There is generally a build up of phytoplankton levels from late winter, with a rapid increase in early spring. A normal high level of phytoplankton remains in the bay through to late May, the beginning of winter, with occasional fluctuations. Spring tides and strong winds can lower algal levels, especially if the waters in Paterson Inlet are low in phytoplankton, with the converse true during times of light winds and moderate tides allowing algal levels to build quickly. If phytoplankton depletion was an issue, this rebuilding would not always be observed.

11. The large area of Big Glory Bay to the SW of the main mussel farming area and up to the head of the Bay is completely "ungrazed" by mussels and, as it is shallower, it usually has a high level of phytoplankton that "seeds" the rest of the Bay through winds and tidal flow.

12. It is recognised that N (nitrogen) is normally the limiting factor in phytoplankton production in New Zealand waters. It is not a limiting factor in Big Glory Bay, in fact if there were no mussel farms there, the waters would be in danger of becoming eutrophic, as noted by Rik Pridmore at a meeting of Marine farmers in Invercargill 2nd Feb. 1996:

> *"The main risk to bay is toxic algal bloom (for salmon especially)."*

"The other risk is eutrophication and/or lack of oxygen. At 4-5,000T salmon there is significant risk but at 3,500T salmon I do not consider the Bay to be at risk".

'Big Glory Bay is moderately eutrophic and salmon production has pushed the bay further towards the eutrophication model."

'Mussels, to an extent, move the model back along the continuum towards the oceanic model"

MUSSEL PRODUCTION

13. In answering the second point in the Commissioner's Minute, we have provided a graph showing total mussel harvest tonnages for Big Glory Bay from 2008, the earliest year for which data , up to 2018 (Attachment 2). The Bay has been shown to be reasonably productive in terms of mussel harvest tonnages (4,600T in 2012) and with the current salmon farm feed inputs of more than 400 T/N/year, predicted to rise an additional 250T/N/year by 2024, more mussel farms will help to mitigate some of the impact of that increase.

14. This attached graph needs some explanation to give a better understanding. In 2012, the harvest reached a peak of 4,600 tonnes and fell steadily for the next three years. It was partly caused by the physical limitations of having extra mussel lines emptied in 2012 and there being less available for harvest for up to three years after this time (the harvest jumped by 1,300 tonnes in one year, equivalent to approximately 26-28 backbones). Then, in 2015, there was a shortage of mussel spat from Kaitaia, which lasted through to 2016, substantially affecting harvests for the next years and preventing a rapid upward swing in the production graph.

15. At the same time, Sanford shifted its Salmon farm from Site 249 (12 ha) and left it fallow with no mussel lines on site. The farm was shifted to Site 246 that had previously been two 3 ha mussel farm sites. The mussel lines had been mostly harvested or removed to make way for the salmon farm. The graph also shows a reduced level of harvest in 2018 of less than 2,800T, which may not recover for another year or so because of the MPI ordered oyster cull in July/August 2017. The cull caught up several hundred tonnes of developing mussels that had been seeded with small oysters.

16. We are not aware of any increased time to harvest for those mussel crops at the time of the high tonnages or in subsequent years, and we do not anticipate there would be much

shortening of harvest cycles in future, because of the relatively cold water conditions here in winter that creates a period of dormancy for several months, as explained below.

CONSIDERATION OF ASC CRITERIA

17. As for consideration of the Aquaculture Stewardship Councils certification criteria, we immediately found limitations with this approach as there is no way to make allowances for the large daily inputs of N from the salmon feed going into BGB, currently about 1100kg/day. The ASC formulae are based on a simple model of a bay with a/some shellfish farms relying on tidal exchange and natural processes to generate phytoplankton.

18. The model also references ecological carrying capacity of the water body. BGB has been much modified from the pristine place that it may have been in the early 70's before Penrod turned up and then Salmon farming took off in the 80's. We don't know how that modification has changed the endemic marine flora and fauna though we know that marine farming structures offer a whole lot more surfaces for fouling organisms to thrive upon which were previously not there. Biodiversity certainly gained from the 3-D structures now throughout the bay and the evidence of the small fishes, crustaceans, annelids which live among the mussels and in some cases provide food for bigger creatures such as shags is testimony to the enhanced food webs now occurring in the Bay.

19. In support of this and increased levels of mussel farming if our application is successful, chl-a levels are forecast to rise from approximately 1.5μg chl-a/L on average, to 2.5-4.0 μg chl-a/L in Big Glory Bay, and in Paterson Inlet by 0.5μg/L with the planned expansion of salmon production (from the assessment of environmental effects prepared by Aquatic Environmental Sciences for amended consents to expand salmon farming in Big Glory Bay, Part 2 - 26 April 2018).

20. This is significant for primary production in Big Glory Bay as the water drawn in from Paterson Inlet will already be "seeded" with higher food levels than it currently has. Itll be possibly be carrying higher levels of available nutrients that haven't been utilised by phytoplankton uptake because some of the water leaving Big Glory Bay re-enters on the next incoming tide.

21. While considering the carrying capacity of the bay, we need to respond to statements and inferences from some of the submitters at the hearing on 16 September 2019.

22. In the letter from Ivan Gorton, the submissions from Peter Schofield (paragraphs 18, 25 and 27), Phil Mitchell (paragraphs 33, 35, 46, and 63), Ted Culley (paragraphs 42 and 44 read by Mike Mandeno), there are inferences or statements that there are already too many mussel farms in Big Glory Bay and carrying capacity is questioned. None of these submissions either acknowledged or disputed that there will be much higher rates of nutrients going into Big Glory Bay in future and, by Sanford's own admission, *chl-a* levels set to increase 2-4 fold.

23. The Commissioner questioned Mike Mandeno about mussel growing times in other areas using Kaitaia sourced spat. He mentioned places such as Banks Peninsula and Port Underwood as places that had water temperatures similar to Big Glory Bay but with faster growing cycles of "18 months to 2 years". The inference was that the slower growth in Big Glory Bay must be the result of too many mussel farms rather than temperature.

24. If that is his opinion, we do not believe it is correct. Firstly, the level of farming in the Banks Peninsula area is very low compared to available water space, e.g. Menzies Bay - 3 sites; Pigeon Bay - 7 sites on one side of the bay; and Port Levy 7 - sites on the west side of an elongated bay and 5 on the east side. With this low number of farms in an area, it would be expected to find excellent growth/harvest cycles but it also should be noted that land use and river flows provide significantly higher nutrient input for phytoplankton production in those areas. In comparison, the land around Big Glory Bay is completely covered in native forest and there are no significant river or stream flows.

25. However, the biggest factor in slowing growth is temperature, and in Big Glory Bay the winter temperatures are lower and remain lower for longer compared to further north. Kaitaia spat are from a warm water stock and we are trying to grow it at its southern limit (very little spawning activity normally). The extended low water temperatures in winter, along with less sunshine due to shorter days and the inclination of the sun, create a dormancy in the mussels that lasts for three or more months sometimes. We have learnt not to transfer mussel spat from Kaitaia before late August/ early September because too often we have had a disastrous failure with earlier shipments. The spat goes dormant when it hits the water here, the weed it is settled on rots slowly away and the sluggish spat falls off the ropes because it has not migrated from the weed.

26. In Big Glory Bay, winter water temperatures are 1 – 2 degrees colder and remain so for longer than further north, which is the critical difference, and peak temperatures are lower

in summer so the mussel growth is slower in summer as well (see table below). Finding suitable data for some sites was difficult. Most of the general compiled data is based on satellite analysis, which, while usually accurate to ±0.2°C, does not allow for much variation over local areas. Historical data for some areas was hard to find so it is this year's temperatures for some sites, and for BGB and Port Underwood 2016 and 2014 respectively were the most recent data that could be found. We also note that the Riverton site is not considered to be the most appropriate for Southland due to the influence of the Aparima and Pourakino Rivers.

27. The following table shows the average monthly temperature for various sites:

Site	**June**	**July**	**August**	**September**	**Year**
Big Glory Bay	*8.9*	*8.5*	*9.3*	*9.9*	*2016*
Port Underwood	-	11.6	10.6	12.4	2014
Riverton	11.5	10.8	10.6	11.0	2019
Akaroa	10.0	10.0	10.0	10.0	2019
Christchurch	10.7	9.8	9.5	10.2	2019

NAVIGATION LIGHTS

28. The following table is the only list of channel markers that we are aware of. It was prepared by Simon Marwick, a former Sanford employee, and dated 13 May 2008. When preparing the table, he included the note that follows it. The lights are marked on the attached plan (Attachment 3) using the reference letters in the table.

Light Reference	Site number	Corner	Range (nm)	Colour	Location NZMG (NZTM)	
					North	East
A	474	SE	2	Green	534 8899 (4786788)	213 8829 (1229214)
B	274	SE	1	Green	534 7960 (4785847)	213 8629 (1229017)
C	365	SE	1	Green	534 7692 (4785578)	2138236 (1228624)
D	244	SW	1	Green	534 7492 (4785374)	213 7119 (1227506)
E	270	NW	1	Red	534 7137 (4785018)	213 6828 (1227214)
F	248	NW	1	Red	534 7229 (4785113)	213 7833 (1228222)
G	275	NE	1	Red	534 7676 (4785565)	213 9323 (1229712)
H	250	NW	2	Red	534 6436 (4786326)	213 9411 (1229798)

Note: The "Location NZMG" (New Zealand Map Grid) is approximate only, the lights are attached to the end of a mussel line. Although securely anchored, mussel lines can be temporarily moved a considerable distance according to the prevailing wind and current direction and speed.

29. All lights are now believed to be in place and operating, which was not the case during the Commissioner's visit. Two lights were being serviced at that time but are now operational. These eight lights were agreed with site owners as being the most appropriate to mark the navigation channel. Placing a light on every corner was confusing and believed to be unnecessary. However, additional lighting is used to mark sites from time-to-time if considered necessary.

30. The mussel sites applied for will require an additional light or lights to mark the channel.

Zane Smith

Jim Maass-Barret

Attachment 1

Phytoplankton count results - Cawthron

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Certificate of Analysis: Final

Cawthron Contract Number: 12225

Project Number: V44992

Big Glory Bay Delivery Centre
C/- Sanford Bluff
PO Box 443
Shortland Street

Sample Details SAMPLE NON-CONFORMANCE: Transit time > 48 hours.

Laboratory ID: V44992-1 **Sample Type:** Composite

Date Sampled: 27/06/2019 09:45
Date Received: 01/07/2019 08:00

Site Description: J328 - 47 South Site 322.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	Toxic in Shellfish	9400	100000	Low
Chrysochromulina spp.	Ichthyotoxic Species	200		Low
Akashiwo sanguinea	Other Dominant Species (Dinoflagellates)	13000		
Thalassiosira spp.	Other Dominant Species (Diatoms)	22000		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

Sample Details SAMPLE NON-CONFORMANCE: Transit time > 48 hours.

Laboratory ID: V44992-2 **Sample Type:** Composite

Date Sampled: 27/06/2019 09:45
Date Received: 01/07/2019 08:00

Site Description: J237 - Kiwa.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	Toxic in Shellfish	4800	100000	Low
Heterosigma akashiwo	Ichthyotoxic Species	200		Low
Akashiwo sanguinea	Other Dominant Species (Dinoflagellates)	6000		
Thalassiosira spp.	Other Dominant Species (Diatoms)	5800		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

Report Number: 779035
Project Number: V44992
V18.36
SL:P

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Certificate of Analysis: Final

Cawthron Contract Number: 12225

Project Number: V46973

Big Glory Bay Delivery Centre
C/- Sanford Bluff
PO Box 443
Shortland Street
AUCKLAND 1140

Sample Details

Laboratory ID: V46973-1 **Sample Type:** Composite

Date Sampled: 29/07/2019 09:15
Date Received: 31/07/2019 08:00

Site Description: J328 - 47 South Site 322.Marine
Sample Comment: Pseudo-nitzschia spp. risk remains high due to bloom collapse.

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	**81000**	100000	Moderate
Chrysochromulina spp.	**Ichthyotoxic Species**	**800**		Low
Dictyocha spp.	**Ichthyotoxic Species**	**200**		Low
Rhizosolenia spp.	Potential Problem Species	200		
Akashiwo sanguinea	Other Dominant Species (Dinoflagellates)	11000		
Chaetoceros spp.	Other Dominant Species (Diatoms)	39000		
Mesodinium rubrum	**Non-toxic bloom forming spp.**	**Low**		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

Sample Details

Laboratory ID: V46973-2 **Sample Type:** Composite

Date Sampled: 29/07/2019 09:15
Date Received: 31/07/2019 08:00

Site Description: J237 - Kiwa.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	**41000**	100000	Low
Chrysochromulina spp.	**Ichthyotoxic Species**	**1000**		Low
Phaeocystis spp.	**Ichthyotoxic Species**	**1400**		Moderate
Rhizosolenia spp.	Potential Problem Species	400		
Chaetoceros spp.	Other Dominant Species (Diatoms)	19000		
Skeletonema spp.	Other Dominant Species (Diatoms)	5400		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

SL:P

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Certificate of Analysis: Final

Cawthron Contract Number: 12225

Project Number: V48872

Big Glory Bay Delivery Centre
C/- Sanford Bluff
PO Box 443
Shortland Street
AUCKLAND 1140

Sample Details

Laboratory ID: V48872-1 **Sample Type:** Composite **Date Sampled:** 28/08/2019 09:00 **Date Received:** 30/08/2019 08:00

Site Description: J328 - 47 South Site 322.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	**9200**	100000	Low
Chaetoceros spp.	Other Dominant Species (Diatoms)	81000		
Skeletonema spp.	Other Dominant Species (Diatoms)	33000		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

Sample Details

Laboratory ID: V48872-2 **Sample Type:** Composite **Date Sampled:** 28/08/2019 09:00 **Date Received:** 30/08/2019 08:00

Site Description: J237 - Kiwa.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	**32000**	100000	Low
Chrysochromulina spp.	**Ichthyotoxic Species**	**200**		Low
Rhizosolenia spp.	Potential Problem Species	600		
Chaetoceros spp.	Other Dominant Species (Diatoms)	555000		
Thalassiosira spp.	Other Dominant Species (Diatoms)	38000		
Mesodinium rubrum	**Non-toxic bloom forming spp.**	**Low**		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

IANZ ACCREDITED LABORATORY

Report Number: 788066
Project Number: V48872
V18.37
SL:P

Unless otherwise specified, all tests reported herein have been performed in accordance with the laboratory's scope of registration.

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Certificate of Analysis: Final

Cawthron Contract Number: 12225

Project Number: V50675

Big Glory Bay Delivery Centre
C/- Sanford Bluff
PO Box 443
Shortland Street

Sample Details **SAMPLE NON-CONFORMANCE: Transit time > 48 hours.**

Laboratory ID: V50675-1 **Sample Type:** Composite

Date Sampled: 25/09/2019 08:15
Date Received: 27/09/2019 08:49

Site Description: J328 - 47 South Site 322.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	14000	100000	Low
Heterosigma akashiwo	**Ichthyotoxic Species**	200		Low
Rhizosolenia spp.	Potential Problem Species	200		
Chaetoceros spp.	Other Dominant Species (Diatoms)	71000		
Thalassiosira spp.	Other Dominant Species (Diatoms)	13000		
Mesodinium rubrum	**Non-toxic bloom forming spp.**	Low		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

Sample Details **SAMPLE NON-CONFORMANCE: Transit time > 48 hours.**

Laboratory ID: V50675-2 **Sample Type:** Composite

Date Sampled: 25/09/2019 08:15
Date Received: 27/09/2019 08:49

Site Description: J237 - Kiwa.Marine

Species	Description	Count (cells/L)	Trigger (cells/L)	Risk
Biomass : Low				
Pseudo-nitzschia spp.	**Toxic in Shellfish**	11000	100000	Low
Chattonella spp.	**Ichthyotoxic Species**	200		Low
Chrysochromulina spp.	**Ichthyotoxic Species**	200		Low
Dictyocha spp.	**Ichthyotoxic Species**	200		Low
Pseudochattonella verruculosa	**Ichthyotoxic Species**	600		Low
Chaetoceros spp.	Other Dominant Species (Diatoms)	205000		
Thalassiosira spp.	Other Dominant Species (Diatoms)	6600		
Mesodinium rubrum	**Non-toxic bloom forming spp.**	Low		

Method: In-house, based on UNESCO 1978 and IOC Manual and Guides 55 2010

SL:P

Unless otherwise specified, all tests reported herein have been performed in accordance with the laboratory's scope of registration.

Attachment 2

Big Glory Bay mussel production 2008 - 2018

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Species	GSM		
Levy Month	**Southland**	**Total**	
Mar-19	248	**248**	
Feb-19	347	**347**	
Jan-19	259	**259**	
Dec-18	260	**260**	2,767
Nov-18	64	**64**	
Oct-18	1	**1**	
Sep-18	1	**1**	
Aug-18	23	**23**	
Jul-18	439	**439**	
Jun-18	278	**278**	
May-18	288	**288**	
Apr-18	311	**311**	
Mar-18	428	**428**	
Feb-18	345	**345**	
Jan-18	328	**328**	
Dec-17	178	**178**	2,479
Nov-17	53	**53**	
Jun-17	10	**10**	
May-17	218	**218**	
Apr-17	320	**320**	
Mar-17	741	**741**	
Feb-17	469	**469**	
Jan-17	489	**489**	

2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
2,916	3,451	3,494	3,319	4,615	4,079	2,653	2,192	2,252	2,479	2,767

Stewart Island Historic Mussel Production
(Greenweight Tonnes)

Attachment 3

Site map showing marker light locations

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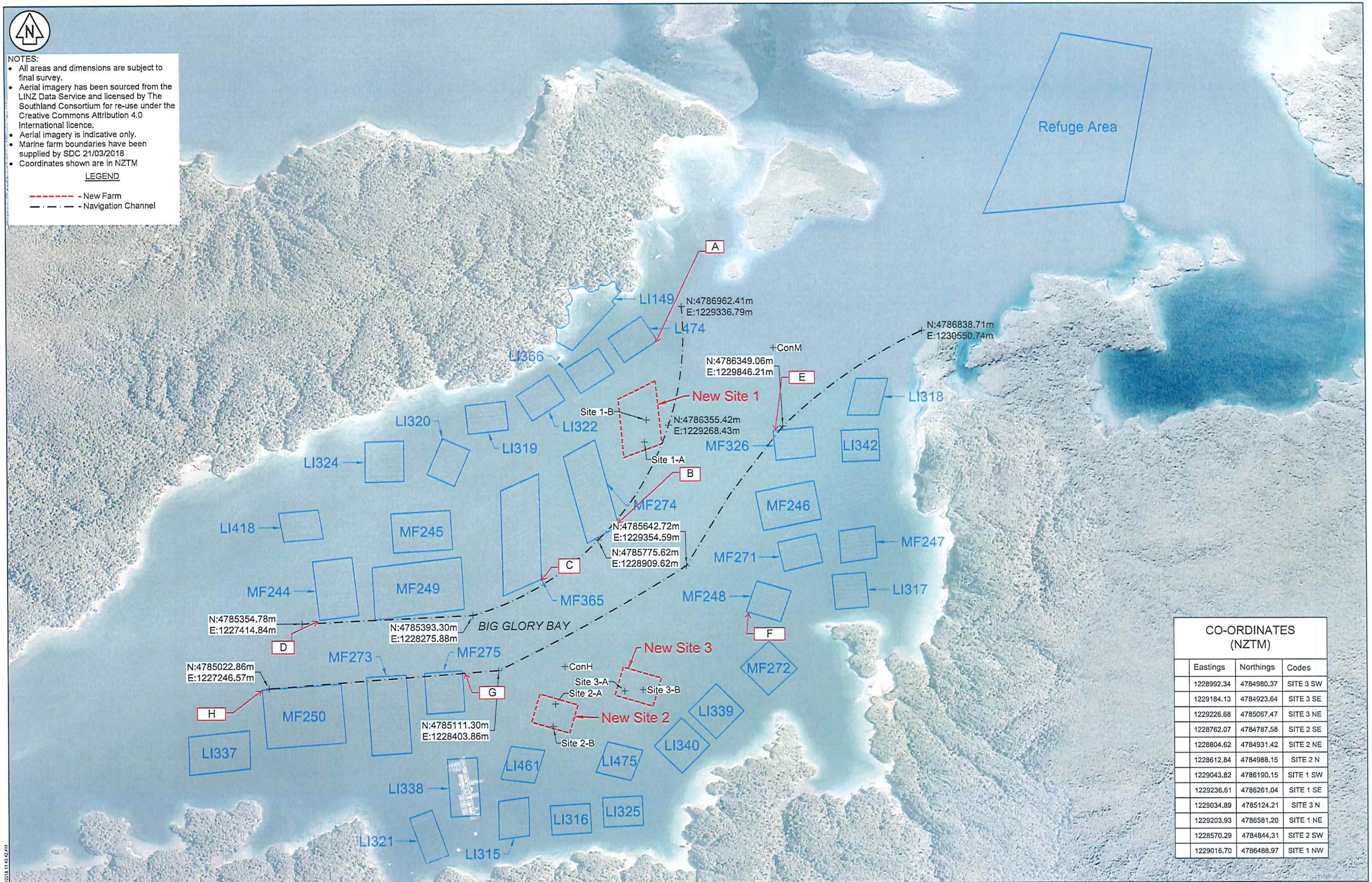
bonisch
environmental



NOTES:
- All areas and dimensions are subject to final survey.
- Aerial imagery has been sourced from the LINZ Data Service and licensed by The Southland Consortium for re-use under the Creative Commons Attribution 4.0 International licence.
- Aerial imagery is indicative only.
- Marine farm boundaries have been supplied by SDC 21/03/2018
- Coordinates shown are in NZTM

LEGEND

- - - - - - - New Farm
—·—·— Navigation Channel

CO-ORDINATES (NZTM)

Eastings	Northings	Codes
1228992.34	4784980.37	SITE 3 SW
1229184.13	4784923.64	SITE 3 SE
1229226.68	4785067.47	SITE 3 NE
1228762.07	4784787.58	SITE 2 SE
1228804.62	4784931.42	SITE 2 NE
1228612.84	4784988.15	SITE 2 N
1229043.82	4786190.15	SITE 1 SW
1229236.61	4786261.04	SITE 1 SE
1229034.89	4785124.21	SITE 3 N
1229203.93	4786581.20	SITE 1 NE
1228570.29	4784844.31	SITE 2 SW
1229016.70	4786488.97	SITE 1 NW

REV	REVISION DETAILS	DRN	CHK	APP	DATE
A	Draft - for client comment	CHM	JFE	JFE	9/08/2018
B	Consent Issue	CHM	JFE	JFE	16/08/2018

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19 The Crescent, P.O. Box 1262, Invercargill 9840
E john@bonisch.nz
W www.bonischenvironmental.nz

CLIENT: JIM BARRET & ZANE SMITH

PROJECT: MARINE FARMING RESOURCE CONSENT, BIG GLORY BAY, STEWART ISLAND

SHEET TITLE: NEW MARINE FARM LOCALITY PLAN WITH SITE SAMPLE LOCATIONS

SURVEYED:		
DESIGNED:		
DRAWN:	CHM	09/08/2018
DRAWING CHECK:	JFE	09/08/2018
DESIGN CHECK:		
APPROVED:	JFE	09/08/2018

SCALE (ORIGINAL SIZE A1) 1:8,500
DATE ISSUED 16/08/2018
JOB NO 8085 | SHEET 1 of 1 | REV. B

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