Before the Independent Hearing Panel
Appointed by the Southland Regional Council

Under	the Resource Management Act 1991 (**RMA**)
In the matter of	an application by **South Port NZ Limited** to dredge parts of the Bluff Harbour

Statement of evidence of Simon Childerhouse

29 March 2022

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Qualifications and experience

1 My full name is Dr Simon John Childerhouse. I am presently employed as a Senior Marine Scientist specialising in marine mammals at the Cawthron Institute in Nelson.

2 I have a PhD in Marine Science (2009; Thesis – Conservation Biology of New Zealand sea lions) and a Graduate Diploma in Wildlife Management (1993; Thesis – Individual photographic identification and population size estimates for sperm whales at Kaikoura, New Zealand) from the University of Otago, and a BSc in Zoology (1991) from the University of Auckland.

3 I have worked as a marine mammal scientist for more than 25 years in New Zealand, Australia, Antarctica, the USA, Canada and the South Pacific. My work has included: pure and applied marine research; leading and managing large-scale, international research projects; publication across a broad range of marine research topics; lecturing and teaching at various universities; representation of both Australian and New Zealand Governments at international meetings; development of national and international policy and strategic documents; and delivering applied and practical solutions to challenging marine conservation and resource utilisation issues. I have considerable experience in the ecology and behaviour of marine mammals and the identification and mitigation of impacts of anthropogenic activities on marine mammals.

4 Previously I worked as a Senior Research Scientist at Blue Planet Marine, an environmental consultancy company for 7 years. I have worked as a Marine Mammal Scientist for 11 years at the Department of Conservation (DOC) and a further three and a half years at the Australian Government's Marine Mammal Centre. I was a member of the Scientific Committee of the International Whaling Commission for more than 15 years, during which time I have held the positions of Head of the New Zealand delegation for eight years, Chair of the Southern Ocean Whales sub-committee for three years and a member of the Australian delegation for three years.

5 I am also an Executive Officer of the South Pacific Whale Research Consortium, a member of the Convention on Migratory Species (CMS) Scientific Council's Aquatic Mammals Working Group, a member of DOC's New Zealand Threat Classification System team for marine mammals and am the New Zealand Coordinator for the International Union for the Conservation of Nature (IUCN) Marine Mammals Protected Area Task Force.

6 I have three book chapters and over 60 peer-reviewed research papers published in the international scientific literature. These include papers on

nine different New Zealand marine mammal species including: New Zealand sea lions; whales (sperm, humpback, southern right and blue); and dolphins (Hector's, Māui, dusky and bottlenose). I have also authored more than 90 unpublished research reports.

7 I have provided expert evidence on marine mammal ecology and / or the potential impacts on marine mammals for a wide range of resource consent applications under both the Resource Management Act 1991 and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. I have provided technical advice on behalf of applicants, submitters, the Crown and Regulators.

8 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence has been prepared in accordance with it and I agree to comply with it. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Scope of evidence

9 I have been asked to prepare evidence on behalf of South Port NZ Ltd (South Port) in relation to the assessment of potential effects on marine mammals from the proposed capital dredging operations and associated activities both inside and outside Bluff Harbour. The topics covered include:

(a) A brief description of the proposed activity;

(b) A description of the existing environment in relation to the known residency, migratory and seasonal patterns of marine mammals in the Bluff Port Area (BPA) and wider Southland region;

(c) A review of national and international literature to describe the potential effects associated with the project activities;

(d) A summary of the overall risk of any potential effects in terms of their possible scale, duration / persistence, likelihood and possible consequences, while taking into consideration the findings of other assessments being undertaken for the project; and

(e) Recommendations for possible mitigation and monitoring options where applicable. Further details of proposed monitoring and mitigation is included in a separate *Marine Mammal Management Plan* (Childerhouse 2021b).

10 A full assessment of environmental effects of the proposed project with respect to marine mammals is provided in *South Port Bluff Harbour Capital Dredging Project Assessment of Environmental Effects - Marine Mammals*

(Childerhouse 2021a) with additional details available in the *Marine Mammal Management Plan* (Childerhouse 2021b). I have drawn on my existing expertise, my experience with similar projects elsewhere and on the material in both these documents to develop my Evidence and adopt these as part of my evidence. I have also drawn on relevant sections of the Evidence of other experts including Beale (2022), Miller (2022), Stephenson (2022) and Pine (2022) and the Section 42A Officer's Report (PDP 2022).

Executive summary

11 South Port New Zealand Ltd (South Port) is proposing to undertake a channel and harbour deepening project within the Bluff Port and nearby area (hereafter referred to as the Bluff Port Area or BPA). The dredging project involves removing outcrops of rock from the entrance channel (to support improved navigational safety and operational capacity) and also removing sediment from the inner harbour. The proposed work is likely to include some or all of the following activities: drilling, blasting, dredging, rock breaking and spoil disposal. South Port contracted the Cawthron Institute to provide an Assessment of Environmental Effects evaluating the potential impact of this project on marine mammals.

12 The greater Southland and Foveaux Strait region is considered an important area for a large number of New Zealand's whale, dolphin and seal species. At least 6 marine mammal species are considered year-round residents and / or seasonal visitors of these waters, with several baleen whale species migrating to and through Foveaux Strait each winter / spring, and more offshore species wandering into shallow regions over warmer months. The species most likely to be affected by the proposal are Hector's dolphins, New Zealand fur seals, New Zealand sea lions, bottlenose dolphins, southern right whales, humpback whales and killer whales.

13 Based on existing information, there is no evidence indicating that any of these species have home ranges restricted solely to the BPA. There is also little evidence that the area of activity is considered significant in terms of feeding, resting or breeding habitats for any particular species relative to other regions around the greater Foveaux Strait region. The possible exceptions are southern right whales and the South Coast South Island (SCSI) sub-population of Hector's dolphins. Southern right whales, given their use of Foveaux Strait waters as potentially important winter mating habitats, may be found occasionally within and around the BPA. The SCSI sub-population of Hector's dolphins stretches from Te Waewae Bay to Waikawa Bay including the BPA, which they may transit through. However, while the wider Foveaux Strait area is likely to be important to both these

species, the BPA itself represents only a small fraction of general habitats available to support those marine mammal species around the wider coastal region and, is not considered an important feeding, breeding or resting area for either of these species. Results from one year of acoustic monitoring for marine mammals undertaken by South Port within the BPA are consistent with the overall assessment that marine mammals have a low occurrence in the area and, when present, are only present for short periods.

14 Based on the potential impacts highlighted in this report, the overall effects of the proposed dredging, drilling, blasting, rock breaking and disposal operations on marine mammal species are assessed as *less than minor* when considered in conjunction with the recommended mitigation actions. The single exception to this is the potential impacts of habitat exclusion / displacement from underwater noise from blasting activities. However, when undertaken in conjunction with the recommended mitigation, blasting has a residual risk assessed as *minor*. To ensure that the most appropriate mitigation measures are in place, a companion report, the *Marine Mammal Management Plan* has been developed which outlines best management practices, mitigation actions, and monitoring to help ensure any residual risk to marine mammals is low or avoided.

Description of the proposed activity

15 South Port is proposing to undertake capital dredging operations and associated activities both inside and outside Bluff Harbour project. The project involves removing outcrops of rock from the entrance channel and dredging sediment from the berth pockets and swing basin within the harbour to increase the operational capacity of the port. South Port proposes to undertake the project between February and September 2023. The entire project is based on a one-off 8 month programme including drilling, blasting, rock breaking, dredging, and spoil disposal. A full description of the project activities is provided in Section 3 of the Project Assessment of Environmental Effects (AEE; Beale 2020) and Section 2 of the AEE for marine mammals (Childerhouse 2021a).

16 The activities which pose the highest potential risk to marine mammals include blasting and rock breaking. Drilling, dredging and spoil disposal pose lower potential risks to marine mammals. Details of the potential impacts of these activities are covered in the following sections.

Description of the existing environment

17 A full description of the existing environment with respect to marine mammals is available in Section 3 of Childerhouse (2021a). A brief summary is provided here.

18 When considering potential implications of marine developments on marine mammals, the appropriate scale of consideration is not at the site level but rather is at the temporal and spatial scales relevant to the marine mammals involved. As a result, the importance of the BPA is placed in context of the species' regional (i.e., Southland) and New Zealand-wide distributions. This is because most marine mammals regularly range over hundreds to thousands of kilometres. ***Attachment 1*** highlights the extent of the region examined in order to assess the marine mammal species potentially found in the wider area, including those individuals passing through Foveaux Strait and the Stewart Island area. This wider area will be referred to as the 'Area of Interest' or AOI for the remainder of the report.

19 The primary sources for most marine mammal data are generally opportunistic sightings reported to DOC (including from the public, tourism vessels, seismic surveys, etc.) and strandings as summarised in the *DOC Marine Mammal Sighting and Stranding database*[1]*.* Additional data sources included published and unpublished data plus data from one year of dedicated marine mammal acoustic surveys undertaken by South Port. Collectively, this information is used to evaluate those species most likely to be affected by the proposed project and to determine what is currently known about the relevant species' occurrence, behaviour, and distribution within the AOI.

20 I note that detailed information on abundance, distribution and critical habitats is available for only a limited number of New Zealand's species, despite New Zealand's prominence as a marine mammal global hotspot. Even in the absence of adequate population information, the potential risks to marine mammal species associated with various anthropogenic activities can still be assessed based on the species' life history dynamics (e.g., species-specific sensitivities, conservation listing, life span, main prey sources) summarised from New Zealand (e.g., local and national databases, New Zealand Threat Classification System, NABIS) and international data sources (e.g., peer-reviewed journals, IUCN Red List of Threatened Species, etc.).

[1] Data accessed on 10 December 2020 and therefore analysis includes all data up until this date.

Marine Mammals in the Area of Interest

21 Of the more than 50 species of cetaceans (i.e., whales, dolphins and porpoises) and pinnipeds (seal and sea lions) known to live and / or migrate through New Zealand waters, at least 24 cetacean and 4 pinniped species have been recorded within the AOI. ***Attachment 1*** and ***Attachment 2*** highlight the various marine mammal species recorded within the AOI. It is important to note that a large majority of these sightings are opportunistic rather than systematic. Consequently, the number of sightings in these figures do not necessarily represent unique animals (i.e., the same animal may be reported by multiple members of public or on 2 separate days). Nor are these sightings from systematic surveys, meaning that ports, favourite fishing spots and tour boat tracks are likely to be over-represented in places where these operations normally occur and during favourable conditions (e.g., warmer and calmer periods, or daylight). Therefore, the apparent distribution from these data may not accurately reflect the species' actual distribution patterns.

22 A list of the more prevalent and commonly reported species within the AOI is presented in ***Attachment 3*** and divided into 3 general categories that describe the current knowledge about their distribution patterns:

(a) Resident – a species that lives (either remaining to feed and / or breed) within the AOI and surrounding waters either permanently (year-round) or for regular time periods;

(b) Migrant – a species that regularly travels through part(s) of the AOI but remain only for temporary time periods that may be predictable seasonally; and

(c) Visitor – a species that may wander into the AOI intermittently. Depending on the AOI's proximity to the species' normal distribution range, visits may occur seasonally, infrequently or rarely.

23 The more common species occurring within the AOI, and those therefore most likely to be affected by the proposed project, include Hector's dolphins, New Zealand (NZ) fur seal, NZ sea lions, bottlenose dolphins, southern right and humpback whales and the occasional killer whale. A full summary of these and other relevant species is provided in Childerhouse (2021a).

24 Based on the available data, and in reference to both Section 6(c) of the Resource Management Act (RMA) and Policy 11(b) of the New Zealand Coastal Policy Statement (NZCPS), there is no evidence indicating that any of these species have home ranges restricted solely to the BPA. However,

Hector's dolphins and some colonies of both NZ sea lions and NZ fur seals are likely to be restricted to the broader Southland area.

25 The BPA is not considered ecologically significant in terms of feeding, resting or breeding habitats for any particular species. However, the Foveaux Strait and wider Southland region are recognised as important areas for the SCSI sub-population of Hector's dolphins and for southern right whales. The SCSI sub-population of Hector's dolphins stretches from Te Waewae Bay in the west to Waikawa in the east, which includes the BPA. This wider area is an important breeding and calving habitat for this sub-population. The same general area is also important for southern right whales including mating and breeding. While the wider Foveaux Strait area is likely to be important to both these species, the BPA is not considered an important feeding or breeding area for either of these species and the BPA only represents a small fraction of similar habitats available to support those marine mammal species utilising this larger coastal region. Results from acoustic monitoring for marine mammals undertaken by South Port within the BPA are consistent with the overall assessment that marine mammals have a low occurrence in the area and, when present, are only present for short periods. A full summary of results from this acoustic monitoring is included as ***Attachment 4***.

26 As discussed above, Foveaux Strait waters also support potential sub-populations of endangered species, such as bottlenose dolphins and killer whales, as well as local recovering colonies of the vulnerable NZ sea lions. These species are particularly relevant in regard to Policy 11(a) of the NZCPS, which refers to avoiding any adverse effects on nationally and / or internationally recognised threatened species.

Assessment of effects

27 Full details of the assessment of potential effects on marine mammals is provided in Childerhouse (2021a).

28 Most consequential impacts between marine mammals and anthropogenic activities result from a direct overlap between the spatial location of activities and important habitats (i.e., feeding or nursing) and / or migration routes of the species (OSPAR 2009; Nowacek et al. 2013; Todd et al. 2015). Currently, there are few available data on marine mammal responses to activities associated with coastal construction as a whole (see review by Todd et al. 2015 and references therein). There are a range of activities included in this proposal (e.g., drilling, blasting, dredging, rock breaking and spoil disposal) that have the potential to impact on marine mammals depending on the exact scale and nature of these activities.

29 Based on what is known about marine mammals using the BPA, the focal species for this assessment are from three main groups: dolphins (i.e., Hector's, common, bottlenose, killer whales), seals (i.e., NZ fur seal, NZ sea lion) and whales (i.e., southern right whales). While these 3 groups do not cover all the possible marine mammals that may occur within the area of activity, they represent either (i) the species that occur in the area most commonly or (ii) that may occur in the area less commonly but have a threatened status. The consideration of potential impacts on these three groups is likely to broadly cover any potential impacts on any of the other species that are not being directly addressed.

30 ***Attachment 5*** identifies the range of potential impacts on marine mammals relevant to this proposal. There are several general factors that are pertinent when assessing potential impacts from this application. These include:

(a) the low occurrence and short periods over which marine mammals appear to use the BPA;

(b) the area of activity does not appear to be an important area for any species' critical life history stages (e.g., feeding, breeding);

(c) the highly localised nature of the activity (i.e., it is essentially confined to the inner harbour, channel and adjacent spoil disposal area); and

(d) the short-term nature of some parts of the activity (i.e., blasting operations only once per day).

31 ***Attachment 6*** provides a summary of assessments of the potential risks from each activity in the absence of any mitigation and also when appropriate mitigation is undertaken. A summary of the general conclusions from the assessment are provided below.

32 The likelihood of ***physiological injury to hearing*** is assessed as *negligible* for dredging, *less than minor* for drilling, and *significant* for blasting and rock breaking. For all of these activities, any physiological injury will only occur when the activity is operating and only in the area within 1–2 km around vessels / operations. Based on these assessments, mitigation will be required for blasting and rock breaking activities but not for dredging or drilling although some minor mitigation actions could be beneficial.

33 The likelihood of ***behavioural disturbance*** is assessed as *negligible* for drilling and *less than minor* for dredging and rock breaking and *minor* to *more than minor* for blasting. The primary reason for this assessment is these low levels of risk are related to the short period of time that marine

mammals will be exposed to any impacts. This means that any marine mammals that do enter the activity area may alter their immediate behaviour in response to the proposed activities, but only while within the zone and only for the duration of the activity or while an animal is present. In addition, marine mammals are transient visitors to the BPA. Dolphins and seals may be potentially using the area to feed but the area only represents a very small part of a much larger foraging range likely spanning hundreds of kilometres.

34 There is a low likelihood of any ***habitat exclusion and / or displacement*** from dredging and drilling. The exclusion/displacement impacts arising from rock breaking and blasting are assessed as having a moderate and high likelihood, respectively. This area of exclusion could extend as far as the underwater noise is audible, which could be kilometres from the source. Although blasting is instantaneous, the total programme could run for as long as 120 days with 1 blast each day. The duration over which marine mammals may be excluded from the BPA and even the surrounding area may be relatively short and may have no meaningful effect if individuals and groups are simply passing through the area. There is considerable uncertainty around the actual area over which the impact may occur and also whether any displacement will actually occur as there are few data to assess this. The overall assessment of the risk is *minor* and *more than minor* for rock breaking and blasting overall respectively.

35 The likelihood of ***entanglement*** is assessed as low and the overall risk of between *less than minor* and *significant*. Good operational practices will be important in achieving and maintaining low levels of risk.

36 In this case, the likelihood for ***vessel strike*** is considered low for all species. However, the consequence of such a rare event is highly dependent on the animal(s) involved as several of the potential species found in the area are listed as threatened or endangered and a fatal entanglement could have potentially serious regional or population level repercussions. While whales are most at risk, evidence suggests that the risk can be reduced through appropriate and strict operational procedures. Obviously, the impact on the individual could be *significant* (as the struck individual could be severely injured or killed) but the overall population level impact is likely to be *less than minor* as, with a low risk activity, it is unlikely that many individuals in a population will be impacted.

37 The likelihood of ***direct toxic effects*** is considered nil for marine mammals with an overall risk assessment of *negligible*. This evaluation is based on the low levels of contaminants in the spoil, the low uptake and short term

exposure of marine mammals, and the high dilution rate through mixing with seawater.

38 The likelihood of ***indirect toxic effects*** is considered not applicable for all marine mammals. This evaluation is based on the low levels of contaminants in the spoil and also in potential marine mammal prey and the short-term exposure of marine mammals, and the high dilution rate through mixing with sea water. The overall risk is assessed as *negligible*.

39 With respect to ***cumulative effects***, the likelihood of most of the above effects occurring is dependent on the scale and intensity of activities within the Bluff Port area relative to the amount and types of habitats needed for the various functional requirements of the different marine mammal species. Other anthropogenic activities also affect the environment in which Southland marine mammals live, including bycatch in fisheries; bottom disturbance (e.g., fishing dredges and trawls); shipping and boating impacts; underwater noise; land-based sedimentation; reclamation; contaminant and nutrient enrichment; and marine farms.

40 Few studies to date have researched the potential cumulative effect of multiple anthropogenic activities on marine mammals. As a result, attempts to regulate any of these issues, individually or cumulatively, are currently extremely difficult as little is known about their biological significance for any species of marine mammal. Additional work is also needed to assess whether overseas modelling frameworks being developed to address cumulative effects, such as Interim Population Consequences of Disturbance Model (IPOD; Donovan et al. 2016), could be expanded to include other sources of disturbance and to be applicable for different marine mammal species.

Mitigation of effects

41 Overall, most of the potentially adverse impacts from project activities that could affect local and visiting marine mammals were assessed as *less than minor*. There were 8 activities which could have impacts that are more than minor in the absence of mitigation (see ***Attachment 6*** for details). A range of different options for mitigation that are likely to reduce the risk of these activities are considered further below. Additional mitigation is also suggested for other lower risk activities but where they are feasible with little additional effort or cost. A summary of these mitigation goals plus recommended Best Management Practices (BMP) and reporting and monitoring are provided in ***Attachment 7***.

42 As noted previously, a *Marine Mammal Management Plan* has been developed that outlines appropriate BMPs, mitigation and monitoring to

help ensure all adverse effects on marine mammals are reduced or avoided. In addition, a *Marine Fauna Operational Plan* has also been developed to integrate the mitigation for marine mammals with mitigation for other species such as sharks (see Miller (2022)) and seabirds (Stephenson (2022)). The *Marine Fauna Operational Plan* outlines the specific responsibilities of Marine Fauna Observers (MFOs) in undertaking the required mitigation and is included as ***Attachment 8***.

43 South Port are proposing the use of MFOs and the application of Marine Fauna Observation Zones (MFOZ) to protect marine mammals (and other species) from activities. The mitigation zones are applied in that if any marine mammal (or other marine fauna of concern) comes inside the zone, then operations will be stopped until the marine mammals move out of the area, when operations will continue. Childerhouse (2021a) provides an outline of these mitigation actions with the exact details included in the *Marine Mammal Management Plan* (Childerhouse 2021b) that accompanies the resource consent application. This specific mitigation will ensure that there is no risk of hearing damage from any of the proposed activities to any marine mammal and that these potential effects are avoided.

44 The outcome of implementing the mitigation proposed in ***Attachment 7*** is that the impacts identified as significant without any mitigation, are reassessed as *less than minor* when undertaken in conjunction with appropriate mitigation. The only impact that has a residual risk of *minor* is habitat exclusion and / or displacement, meaning that these outcomes are possible from the blasting operations. While the area of effect can be large (e.g., underwater noise can be audible over kms), all the data that I have on marine mammals in the area combined with an understanding of their general ecology, allow us to make the following assessments:

(a) Bluff Harbour, including the area over which underwater noise may be audible, is not considered an important feeding, resting or breeding area for any marine mammal;

(b) The area of effect (e.g., kms) only represents a very small proportion of the total home range of any marine mammal species (e.g., most marine mammals have home ranges that span hundreds or thousands of km^2);

(c) No marine mammal is resident within the area and most appear to be only transient or short-term visitors to the area; and

(d) We have little information on what level of underwater noise will lead to displacement or exclusion which makes it very difficult to accurately assess the true area of effect and the actual level of impact.

45 Overall, these facts lead to the following conclusions about habitat exclusion and / or displacement:

(a) Marine mammals may be excluded from an area around the activity, but the range of exclusion is unknown and will vary by season, species and behavioural state; and

(b) Even assuming the worst-case scenario (i.e., that marine mammals are excluded from the area over which the activity is audible), which is a highly precautionary assumption, there are unlikely to be any biologically significant impacts on any individual or population as the area they may be excluded from is not deemed to be important habitat nor are any individuals thought to be resident or spend significant time there.

46 As noted previously, Policy 11a(i) of the NZCPS specifies a duty to avoid adverse effects on indigenous taxa that are listed as at risk in the NZ Threat Classification System lists. The mitigation proposed to be undertaken as part of the activity has reduced the assessed risk for all potential impacts to less than minor with the exception of possible habitat exclusion and / or displacement from blasting being assessed as minor. Therefore, the proposed mitigation is expected to be successful in avoiding adverse effects from the proposed activity.

Response to any issues in section 42A report

47 The Section 42A report (PDP 2022) provides a useful summary of issues relevant to marine mammals, especially in *Section 3.4.4 Marine Mammals* of that report. In general, the Section 42A report agrees with most of the conclusions of the application with respect to marine mammals. I provide responses below to the main issues identified in Section 42A report.

48 Section 3.4.4 states that, "… *there are necessary amendments to the conditions of consent*"[2]. I note that following discussions between South Port and DOC, revisions have been made to the originally proposed consent conditions to improve the clarity and certainty of the conditions (revised conditions are appended to Mr Beale's evidence). I believe that these revisions address the concerns of both DOC and the Section 42A

[2] Paragraph 2, Page 17 of Section 42A Report (PDP 2022)

report appropriately. I also note that ***Attachment 8*** has been developed specifically in response to an issue raised by DOC around improving the clarity of mitigation between the different species.

49 Section 3.4.4 states that, "… *as much emphasis is placed on the Marine Mammal Management Plan (MMMP), and the need to have more rigour in the certification of it and changes anticipated, I consider the operational actions within the management plan need to be reported more frequently, and I see the potential need for some independent audits (by Environment Southland as a regulatory authority) during the MMO operations*".[3] With respect to the first point, I note that Section 1.3 of the MMMP (Childerhouse 2021b) clearly states situations and timings of when the MMMP should be reviewed and amended where necessary. The MMMP also notes that, "*Any changes to the MMMP shall be submitted in writing and certified by Environment Southland*".[4] Therefore, I believe that the MMMP already addresses this issue.

50 With respect to the other issues raised, namely increased reporting and independent auditing by Environment Southland, I do not agree with the first and am supportive of the second. I note that both Table 3 and Section 4 of the MMMP provides a detailed breakdown of suggested types of reporting plus the frequency of reporting that I believe are adequate to cover the operation. I agree it would be useful for Environment Southland to undertake independent audits of compliance of the operation with the MMMP and have assumed that this would be included as part of Environment Southland's normal consent auditing process.

51 Section 3.4.4 also states, "*In respect to Marine Mammal Observers and Marine Mammal Observation Zone (MMOZ), I think [a] much more precautionary approach could be taken as to understanding the maximum spatial extent of temporary threshold shift (TTS) and permanent threshold shift (PTS) for any marine mammal from the blasting scenarios*".[5] The size and extent of the proposed MMOZs as proposed are based on a highly precautionary approach. They have been estimated using the best available science and through applying the USA Government's Federal underwater noise guidelines for marine mammals. These zones are estimated from detailed underwater propagation modelling work undertaken by Styles Group (Styles Group 2020, 2021; Pine 2022) to arrive at the precautionary sizes identified in **Table A8-1** of this report. I also note

[3] Paragraph 3, Page 17 of Section 42A Report (PDP 2022)

[4] Paragraphs 1-2, Section 1.3, Page 3 of the MMMP (Childerhouse 2021b)

[5] Paragraph 5, Page 17 of Section 42A Report (PDP 2022)

that these zones are included as a proposed condition of consent. Furthermore, once operations begin, real time underwater noise measurements of the operation will be undertaken to confirm noise levels. Styles group will use these actual noise levels to re-run their modelling to ensure that the zones are based on the best available data. Overall, I believe that the approach is already highly precautionary with respect to estimating the spatial extent of the zones.

52 Section 3.8.1 raises general issue around the suitability of the proposed consent conditions in capturing all the mitigation activities proposed in the various management plans. Marine mammals are used a specific example. I don't propose to specifically cover this issue here, as I believe it has been covered more generally in the Evidence of Mr Beale (Beale 2022). I am in agreement with general conclusion of the Section 42A report in that it is important for conditions to be appropriately defined to ensure that all mitigation proposed in the application is required to be undertaken. However, I would note that given the huge range and variety of mitigation proposed for this activity, it would be impractical to include each as a specific condition and that this is better dealt with through conditions requiring the full implementation of the appropriate management plans.

53 Related to consent conditions suitability is Table 4 on page 51, which provides some suggested amendments to conditions around the MMMP. I am generally supportive of the suggestion to clarify the process of making and certifying changes to the MMMP and note, as in paragraph 49 of my evidence, that there is already some of this detail in Section 1.3 of the MMMP.

54 I note further suggestions to the proposed draft conditions of consent are proposed in Table 4 on page 57 relating to marine mammals. While some of these are useful, I believe that the revised list of conditions proposed by applicant address most of the main issues that the Section 42A report has identified. I would refer discussion of these to the Evidence of Mr Beale (Beale 2022).

55 I note that the Section 42A report identifies bonds as potentially being required for performance of the MMMP (among others). It is not within my area of expertise to comment on whether a bond should be required or not but I can state that I believe, at least with respect to marine mammals, that the mitigation being proposed: (i) represents a highly precautionary approach incorporating uncertainty, (ii) is based on the best available information, and (iii) in my experience, is one of the most stringent sets of marine mammal mitigations proposed for any marine activity in New Zealand.

Response to matters raised in submissions

56 Most of the responses to submitters have been covered in Evidence provided by other experts and, in particular, I would refer you to Beale (2022) and Miller (2022). I have only provided a response to the questions specifically related either directly or indirectly to marine mammals.

57 The Department of Conservation (DOC) raised the following question with respect to Marine Mammals: *The Marine Mammal Management Plan is generally appropriate, subject to ensuring that it is adequately reflected in final consent conditions. However, the plan provides for different approaches depending on what species are involved and different blasting scenarios - it would be more certain and effective if the approach was based on the worst-case circumstances*.

58 There are a wide variety of underwater noise levels produced by the different activities (see Styles Group (2020, 2021) report) and, therefore, it would be inappropriate to set a single standard based on the worst case scenario as that could lead to shutdowns for quieter activities when there in fact was no risk to marine mammals. South Port has advised that there is some complexity involved in implementing different-sized shut down zones based on the specific type of blasting or rock breaking activity and the type of marine mammal present. However, it is important to ensure that mitigation is tailored to each activity to ensure appropriate protection to marine mammals on an activity by activity basis. I understand South Port therefore agrees with DOC that mitigation should be based on the worst case scenarios and will implement the largest estimated shut down zone modelled for each activity and scenario to provide the highest protection for marine mammals. I consider that these proposals would further reduce risk and are likely to satisfy the concerns raised by DOC.

59 South Port therefore proposes to implement Marine Mammal Observation Zones (MMOZ) for each activity based on avoiding any permanent and temporary hearing injuries (i.e., Temporary and Permanent Threshold Shift) to marine mammals. If any marine mammals are seen within this area immediately prior to or during activities, then activities will cease until they are observed to move out of the zone, when activities will recommence. These MMOZs will be monitored by dedicated Marine Mammal Observers to ensure that there are no marine mammals within the zones. Based on the estimated sizes of the primary MMOZs, I consider MMOs will be able to confidently detect all marine mammals with this zone and therefore avoid any permanent hearing effects.

60 Based on the final results from South Port's 12 month acoustic monitoring programme, we are able to confirm that marine mammals are very rare visitors to the Bluff Port Area (see ***Attachment 4*** for full details). Specifically, both Hector's dolphins and southern right whales were detected for less than two hours in total each (i.e., representing less than 0.01% and 0.3% of the total time and total days monitored respectively) during the full 12 months of monitoring. The most commonly detected marine mammals were dolphins (excluding Hector's dolphins) which were detected on 6% of days but only comprising 0.1% of the total time monitored. Given the very low levels of marine mammal being present within the Bluff Port Area, it is very unlikely that marine mammals will be exposed to any effects from the proposed activities. Notwithstanding this, South Port is proposing precautionary mitigation in the rare event (i.e., 0.01-0.1% of the total time) that marine mammals do come into the area. This mitigation will avoid any risk of permanent hearing injury and significantly reduce or avoid any risk of temporary hearing injuries.

61 In addition, during subsequent discussions with DOC, South Port agreed to develop a Marine Fauna Operational Protocol to clarify the mitigation proposed for species of concern (including marine mammals) which is included as ***Attachment 8***.

62 The Royal Forest and Bird Protection Society raised two questions relating directly or indirectly to marine mammals: *The application provides little evidence of how it has stepped through the effects management hierarchy of how the effects can first be avoided or remedied and instead proposes inadequate mitigation methods.*

63 This question has primarily been addressed in the Evidence of Miller (2022) but some information specifically relevant to marine mammals is included here. With respect to potential impacts on marine mammals, South Port is adopting an avoidance strategy. Specifically, all rock breaking and blasting activities will require dedicated Marine Mammal Observers (MMOs) to be on duty and confirm that no marine mammals are within the Marine Mammal Observation Zone (MMOZ) prior to any activity commencing. If any marine mammals are seen within the MMOZ, then the start of activities will be delayed until they are seen to move out. Similarly, MMOs will be on duty during these operations and, if any marine mammals are observed to move into the MMOZ, then activities will be immediately halted and will not resume until the marine mammals are seen to leave the area. This proactive approach will ensure that any potential impacts from underwater noise are avoided.

64 The second Royal Forest and Bird Protection Society question as stated was: *In Forest & Bird's view there is not enough evidence to demonstrate the effects on indigenous species and coastal processes will be minor or less than minor after the mitigations. A lot of the mitigations proposed rely on future studies or onsite monitoring which is not contained specifically in the conditions proposed.*

65 This question has also primarily been addressed in the Evidence of Miller (2022) but some information specifically relevant to marine mammals is included here. South Port has recently completed 12 months of acoustic monitoring for marine mammals in the Bluff Port area with a summary of results provided in paragraph 60 above and full results in ***Attachment 4***. Results have confirmed that marine mammals are very rare visitors to the Bluff Port Area. Given the very low levels of marine mammal being present within the Bluff Port Area, it is very unlikely that marine mammals will be exposed to any effects from the proposed activities. Notwithstanding this, South Port is proposing precautionary mitigation in the rare event (i.e., 0.01-0.1% of the total time) that marine mammals do come into the area. This mitigation will avoid any risk of permanent hearing injury and significantly reduce or avoid any risk of temporary hearing injuries.

Conclusion

66 The purpose of this report is to describe the Area of Interest (AOI) in terms of the local and visiting marine mammals that use and / or are influenced by the Southland / Foveaux Strait ecosystem, with a particular focus on the Bluff Port area (BPA). In particular, information on the various species was reviewed for any life-history dynamics that could make them more vulnerable to any project activities or if the proposal site overlaps with any ecologically significant feeding, resting or breeding habitats. This, in turn, enabled the potential effects associated with the proposal on marine mammals to be assessed.

67 The marine mammals most likely to be affected by the proposed project include those species that frequent the AOI year-round or on a semi-regular basis. These species are Hector's dolphin, NZ fur seal, NZ sea lion, bottlenose dolphin, southern right and humpback whale and the occasional killer whale. Other species including dusky and common dolphin, several species of baleen whale, pilot whale, beaked whale, and sperm whale were also considered in this assessment because of their records of occurrence in the wider area, their known species-specific sensitivities (e.g., underwater noise); and / or potential public and iwi concerns.

68 The BPA does not represent an important area for marine mammals and only represents a small fraction of habitats available to these marine mammals across the wider region. However, it is important to note that several of the above listed species are nationally and / or internationally recognised as threatened species that live in semi-isolated sub-populations or recovering colonies, and thus need to be considered in regard to Policy 11(a) of the New Zealand Coastal Policy Statement.

69 Based on the potential impacts highlighted in this report, the overall effects of the proposed dredging, drilling, blasting and disposal operations on marine mammal species are assessed as *less than minor* when considered in conjunction with the recommended mitigation actions. The single exception to this is the potential impacts of habitat exclusion / displacement from underwater noise from blasting activities. However, when undertaken in conjunction with the recommended mitigation measures, blasting has a residual risk assessed as *minor*.

70 These conclusions are based in part on site-specific information from other consultant reports including the expected levels of benthic, noise and water column effects, as well as relevant information from overseas practices. However, it is acknowledged that there are still considerable knowledge gaps and uncertainty around exactly how marine mammals actually use the Bluff Port area and how they will react to the project. Results from one year of acoustic monitoring for marine mammals undertaken by South Port within the BPA are consistent with the overall assessment that marine mammals have a low occurrence in the area and, when present, are only present for short periods.

71 Overall, with appropriate mitigation in place, the project should pose a low risk to marine mammals when undertaken with appropriate mitigation.

Dr Simon John Childerhouse

29 March 2022

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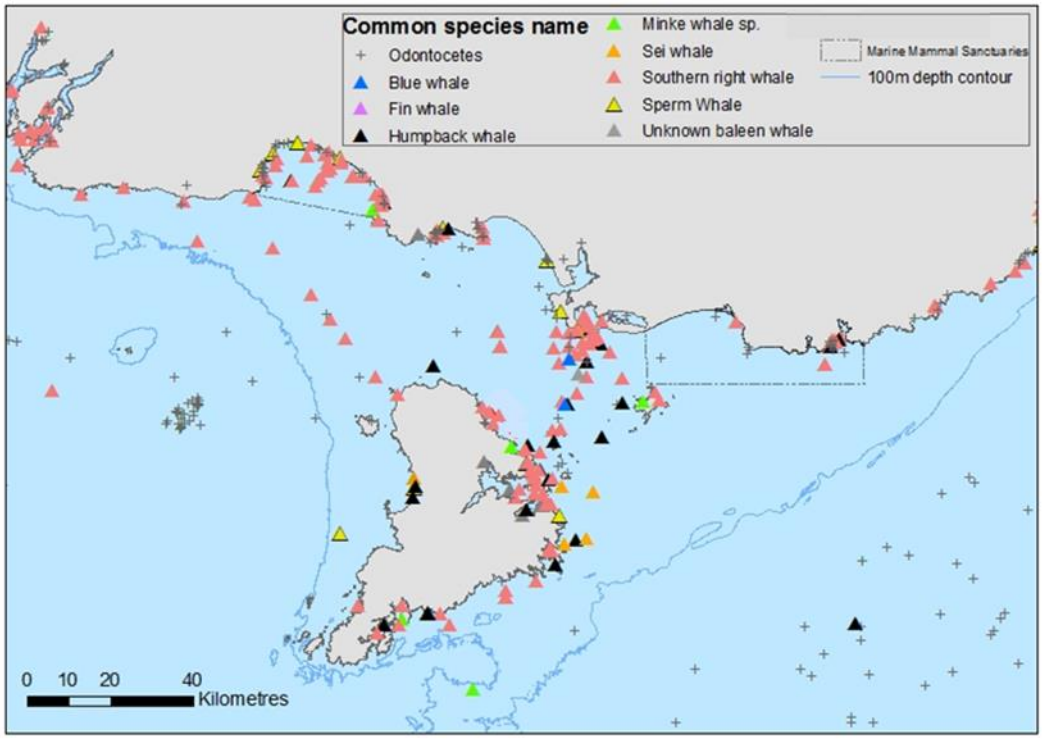
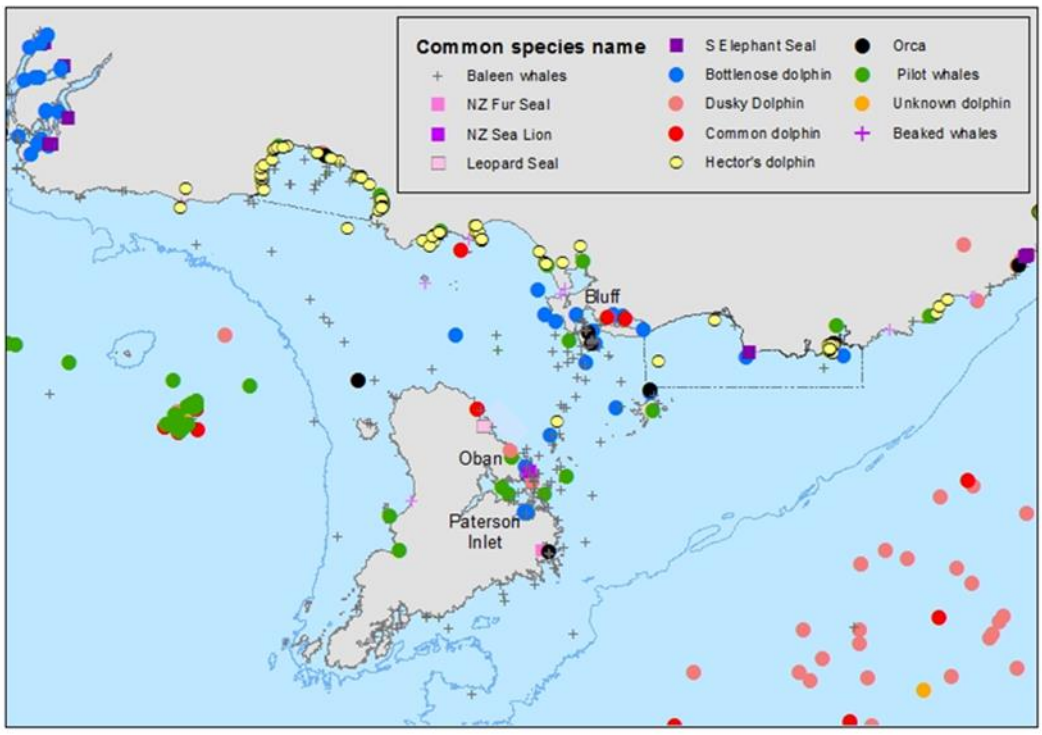
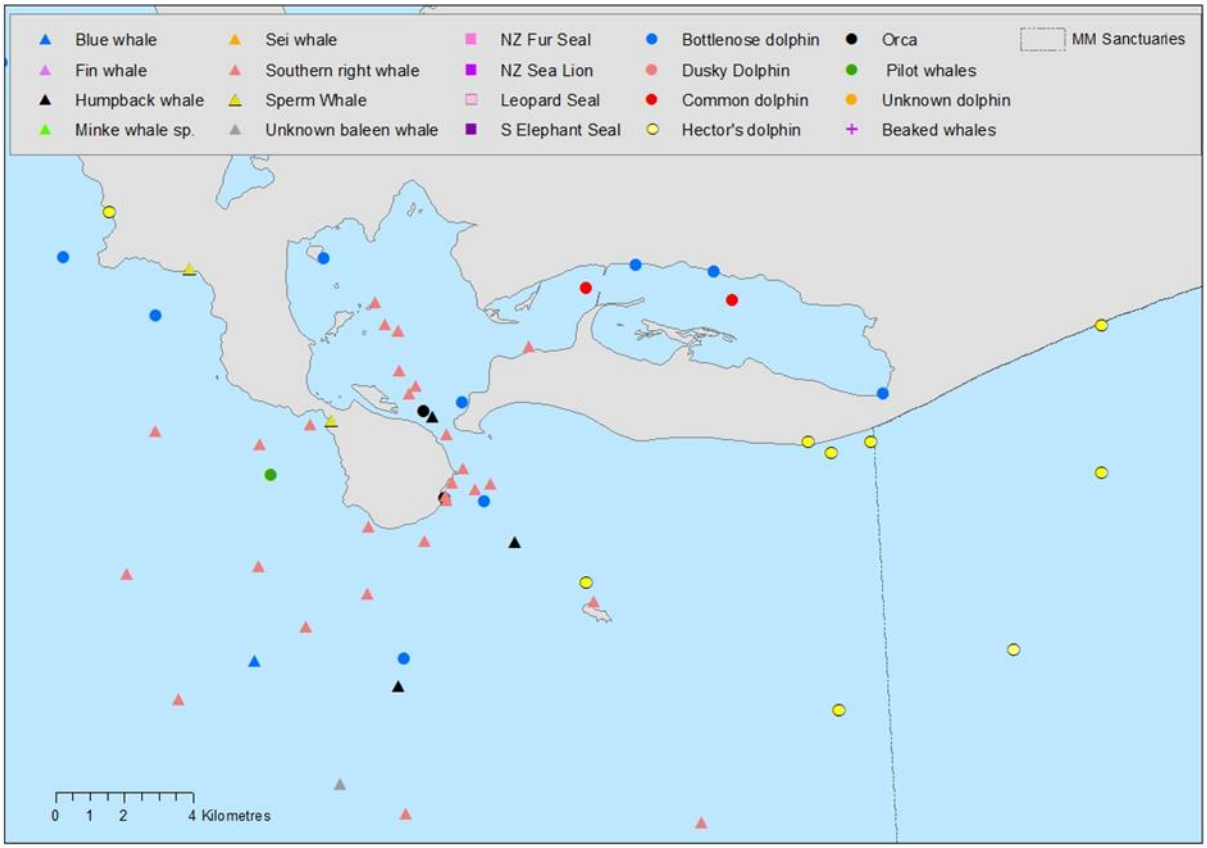
Attachment 1. The distribution of Department of Conservation (DOC) reported strandings (1912–2015) and opportunistic sightings (1977–2018) within the Area of Interest. Migrating baleen whale species (plus sperm whale) are shown in the top image and toothed whales, dolphins and pinnipeds (seals and sea lions) are in the bottom image.





Attachment 2. The distribution of Department of Conservation (DOC) reported strandings (1912–2018) and opportunistic sightings (1977–2020) within the Port of Bluff and surrounding area. These data are the same as provided in Attachment 2 above but zoomed into to the Bluff Port Area and nearby waters.



Attachment 3. Residency patterns of the marine mammal species most relevant to the proposal and known to frequent the Area of Interest. Species' conservation threat status is listed for both the New Zealand Threat Classification System (Baker et al. 2019) and the IUCN system (version 3.1).

Common name	Species name	General description	NZ threat classification	IUCN red listing	Residency category in AOI
RESIDENTS					
NZ fur seal	*Arctocephalus forsteri*	NZ native & resident, evaluated	Not Threatened	Least Concern	Year-Round Resident
NZ sea lion	*Phocarctos hookeri*	NZ native & resident, evaluated	Nationally Vulnerable	Endangered	Year-Round Resident
Hector's dolphin	*Cephalorhynchus hectori*	NZ native & resident, evaluated	Nationally Vulnerable	Endangered	Year-Round Resident
Bottlenose dolphin	*Tursiops truncatus*	NZ native & resident, evaluated	Nationally Endangered	Data Deficient	Seasonal to Semi-Resident
POTENTIAL OFFSHORE SPECIES					
Long-finned pilot whale	*Globicephala melas*	NZ native & resident, evaluated	Not Threatened	Data Deficient	Potential Offshore Semi-Resident
Sperm whale	*Physeter macrocephalus*	NZ native	Data Deficient	Vulnerable	Potential Offshore Visitor
Beaked whales	Ziphiidae species (7 species)	NZ native & resident, not evaluated	Data Deficient	Data Deficient to Least Concern	Potential Rare Offshore Visitors
MIGRANTS					
Southern right whale	*Eubalaena australis*	NZ native & resident, threatened	At Risk-Recovering	Least Concern	Seasonal Migrant
Humpback whale	*Megaptera novaeangliae*	NZ native, evaluated	Migrant	Endangered	Seasonal Migrant
VISITORS					
Dusky dolphins	*Lagenorhynchus obscurus*	NZ native & resident, evaluated	Not Threatened	Data Deficient	Seasonal Visitor
Common dolphin	*Delphinus delphis*	NZ native & resident, evaluated	Not Threatened	Least Concern	Seasonal Visitor
Killer whale	*Orcinus orca*	NZ native & resident, threatened	Nationally Critical	Data Deficient	Seasonal to Infrequent Visitor
Sei whale	*Balaenoptera borealis*	NZ native & non-resident, evaluated	Not Threatened	Endangered	Seasonal to Infrequent Visitor
Blue whale	*Balaenoptera musculus* (sub-spp. *brevicauda & intermedia*)	NZ native	Data Deficient	Critically Endangered to Endangered	Seasonal to Infrequent Visitor

Attachment 4. Acoustic monitoring of marine mammals within the Bluff Port Area Authors: Matt Pine & Simon Childerhouse

1. Introduction

South Port has undertaken a 12-month acoustic monitoring programme to provide data on the exact species of marine mammals that are present in the Bluff Port Area (BPA) and how often they are found in this area. These data have been used to reduce the uncertainty around marine mammal presence which is a key piece of information used to assess the impacts of activities such as dredging, blasting, rock breaking and drilling in consent applications. Monitoring commenced on 15 January 2021 and ended on 11 February 2022. Locations of the acoustic monitoring stations are shown in **Figure A4-1** with an underwater image of one of the recorders in **Figure *A4-2***. The research is being undertaken jointly by the Cawthron Institute and Styles Group.

2. Preliminary results

Full results are available in **Table A4-1** below with a short summary of each quarterly deployment below.

Deployment 1
The first deployment of acoustic recorders (e.g., 15 January to 26 February 2021; n = 42 days) was completed with results shown in **Table A4-1** and **Figures A4-3** to **6**. All recorders were recovered successfully by personnel from e3 Scientific with new recorders put out. The only marine mammals detected during the first monitoring period were dolphins. These were likely to be either bottlenose dolphins or common dolphins which are difficult to distinguish from their vocalisations which are very similar. No Hector's dolphins, southern right whales or any other whale species were detected.

Deployment 2
The second deployment of acoustic recorders (e.g., 26 February to 14 June 2021; n = 108 days) was successful with results shown in **Table A4-1** and **Figures A4-3** to **6**. All recorders were recovered successfully by personnel from e3 Scientific with new recorders put out. One of the acoustic recorders (i.e., North) was found to have a small amount of water inside the housing indicating a leak at some point. However, the recorder had continued recording for the full duration of period and the full data was available. Either bottlenose dolphins or common dolphins were recorded with a total of 415 minutes of detections. There were also 30 minutes of southern right whale detections and 6 minutes of vocalisations of another whale species (possibly sei whales) detected. No Hector's dolphins were detected.

Deployment 3
The third deployment of acoustic recorders (e.g., 14 June 2021 to 8 October 2021; n = 116 days) was partially successful with results shown in **Table A4-1** and **Figures A4-**

3 to **6**. All recorders were recovered successfully by personnel from e3 Scientific with new recorders put out. One recorder at the Outer South site had a technical error and didn't record any data but the other two recorders worked perfectly. Hector's dolphins were recorded for 54 minutes for the first time confirming that they are occasionally in the area. In addition, there were 384 minutes of detections of dolphins, likely to be either bottlenose dolphins or common dolphins. No southern right whales were detected but there as some baleen whale vocalisations detections which may be from sei whales.

Deployment 4

The fourth and final deployment of acoustic recorders (e.g., 8 October 2021 to 11 February 2022; n = 126 days) was successfully completed with results shown in **Table A4-1** and **Figures A4-3** to **6**. All recorders were recovered successfully by personnel from e3 Scientific with new recorders put out. There were 183 minutes of dolphins detections, 24 minutes of Hector's dolphins detections, 30 minutes of southern right whale detections and 68 minutes of other whale detections.

Combined data

From the four deployments combined, we collected the following total data:

- 1,029 days of acoustic data recorded from the three sites
- 1095 minutes of dolphin (other than Hector's) detections or 0.07% of the total time
- 70 minutes of Hector's dolphin detections or 0.01% of the total time
- 30 minutes of southern right whale detections or <0.01% of the total time
- 68 minutes of other whale data or <0.01% of the total time

3. *Concluding remarks*

The monitoring programme was extremely successful and delivered a full year of monitoring at two sites and nearly 9 months of data at the third site. The data collected to date are consistent with the overall assessment that marine mammals have a low occurrence in the BPA and, when present, are only present for short periods.

Thanks to Bryony Miller and the dive team at e3 Scientific for the deployment and recovery of the recorders.

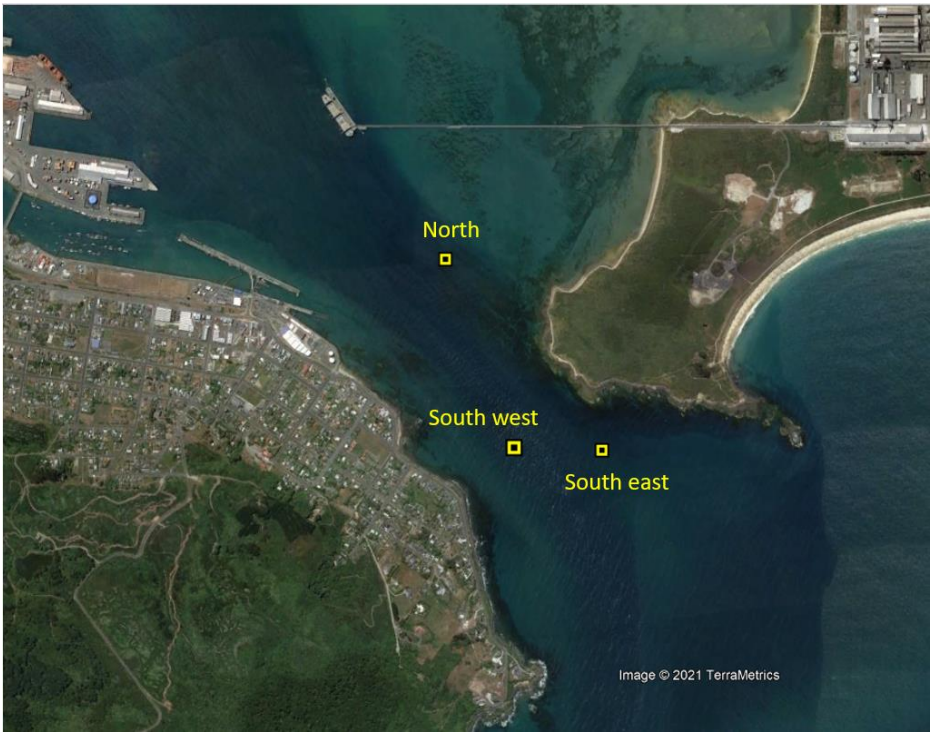


Figure A4-1. Location of the three acoustic monitoring stations in the Bluff Port Area.

Figure A4-2. Underwater image of one of the acoustic monitoring stations in the Bluff Port Area. The acoustic recorder sits within the PVC pipe and the mesh covering reduces biofouling and potential flow noise.

Table A4-1. Summary of the total number of marine mammal detections for the three acoustic monitoring sites (North, South-east and South-west) in the Bluff Port Area over the monitoring period 15 January 2021 to 11 February 2022. No A single detection event is defined as the time between the first and last confirmed vocalisation (either echolocation clicks or whistles) after no vocalisations were detected for more than 30 min following the last detection.

					Dolphins other than Hector's					Hector's dolphin				
	Mooring	Recording start	Recording end	No. of days recording	No. of minutes detected	No. of events#	No. days with detections	% of days with >= event	% time detected	No. of minutes detected	No. of events#	No. days with detections	% of days with >= event	% time detected
Summer 2021	North	15/01/2021	26/02/2021	42	31	5	4	9.5%	0.05%	0	0	0	0	0.00%
	Southeast	15/01/2021	26/02/2021	32	46	7	5	15.6%	0.10%	0	0	0	0	0.00%
	Southwest	15/01/2021	26/02/2021	32	36	3	2	6.3%	0.08%	0	0	0	0	0.00%
Autumn 2021	North	26/02/2021	08/06/2021	102	227	14	9	8.8%	0.15%	0	0	0	0	0.00%
	Southeast	26/02/2021	15/06/2021	109	179	12	8	7.3%	0.11%	0	0	0	0	0.00%
	Southwest	26/02/2021	16/06/2021	110	9	2	2	2%	0.01%	0	0	0	0	0.00%
Winter 2021	North	14/06/2021	06/10/2021	114	359	8	6	5.3%	0.22%	0	0	0	0	0.00%
	Southeast	14/06/2021	06/10/2021	114	25	3	3	2.6%	0.02%	54	1	1	1%	0.03%
	Southwest	14/06/2021	06/10/2021[6]	0	NA	NA	NA	0.0%	NA	NA	NA	NA	NA	NA
Winter 2021	North	06/10/2021	11/02/2022	128	20	4	3	2.3%	0.01%	1	1	1	1%	0.00%
	Southeast	06/10/2021	11/02/2022	128	87	7	6	4.7%	0.05%	24	13	11	9%	0.01%
	Southwest	06/10/2021	11/02/2022	128	76	10	9	7%	0.04%	0	0	0	0%	0.00%
ALL	North	15/01/2021	11/02/2022	386	637	31	22	5.7%	0.11%	1	1	1	0.3%	0.00%
	Southeast	15/01/2021	11/02/2022	383	337	22	16	4.2%	0.06%	78	1	1	0.3%	0.01%
	Southwest	15/01/2021	11/02/2022	270	121	5	4	1.5%	0.03%	0	0	0	0.0%	0.00%

[6] This acoustic recorder did not record any data due to an technical error and therefore there is no data available for this site for this period.

	Mooring	Recording start	Recording end	No. of days recording	Southern right whales					Other whales				
					No. of minutes detected	No. of events	No. days with detections	% of days with >= event	% time detected	No. of minutes detected	No. of events	No. days with detections	% of days with >= event	% time detected
Summer 2021	North	15/01/2021	26/02/2021	42	0	0	0	0	0.00%	0	0	0	0	0.00%
	Southeast	15/01/2021	26/02/2021	32	0	0	0	0	0.00%	0	0	0	0	0.00%
	Southwest	15/01/2021	26/02/2021	32	0	0	0	0	0.00%	0	0	0	0	0.00%
Autumn 2021	North	26/02/2021	08/06/2021	102	0	0	0	0%	0.00%	0	0	0	0%	0.00%
	Southeast	26/02/2021	15/06/2021	109	30	3	3	3%	0.02%	6	2	2	2%	0.00%
	Southwest	26/02/2021	16/06/2021	110	0	0	0	0%	0.00%	0	0	0	0%	0.00%
Winter 2021	North	14/06/2021	06/10/2021	114	0	0	0	0%	0.00%	0	0	0	0%	0.00%
	Southeast	14/06/2021	06/10/2021	114	0	0	0	0%	0.00%	32	4	2	2%	0.02%
	Southwest	14/06/2021	06/10/2021	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Winter 2021	North	06/10/2021	11/02/2022	128	0	0	0	0	0.00%	0	0	0	0	0.00%
	Southeast	06/10/2021	11/02/2022	128	0	0	0	0	0.00%	0	0	0	0	0.00%
	Southwest	06/10/2021	11/02/2022	128	0	0	0	0	0.00%	30	26	23	18%	0.02%
ALL	North	15/01/2021	11/02/2022	386	0	0	0	0.0%	0.00%	0	0	0	0.0%	0.00%
	Southeast	15/01/2021	11/02/2022	383	30	3	3	0.8%	0.01%	38	6	4	1.0%	0.01%
	Southwest	15/01/2021	11/02/2022	270	0	0	0	0.0%	0.00%	30	0	0	0.0%	0.01%

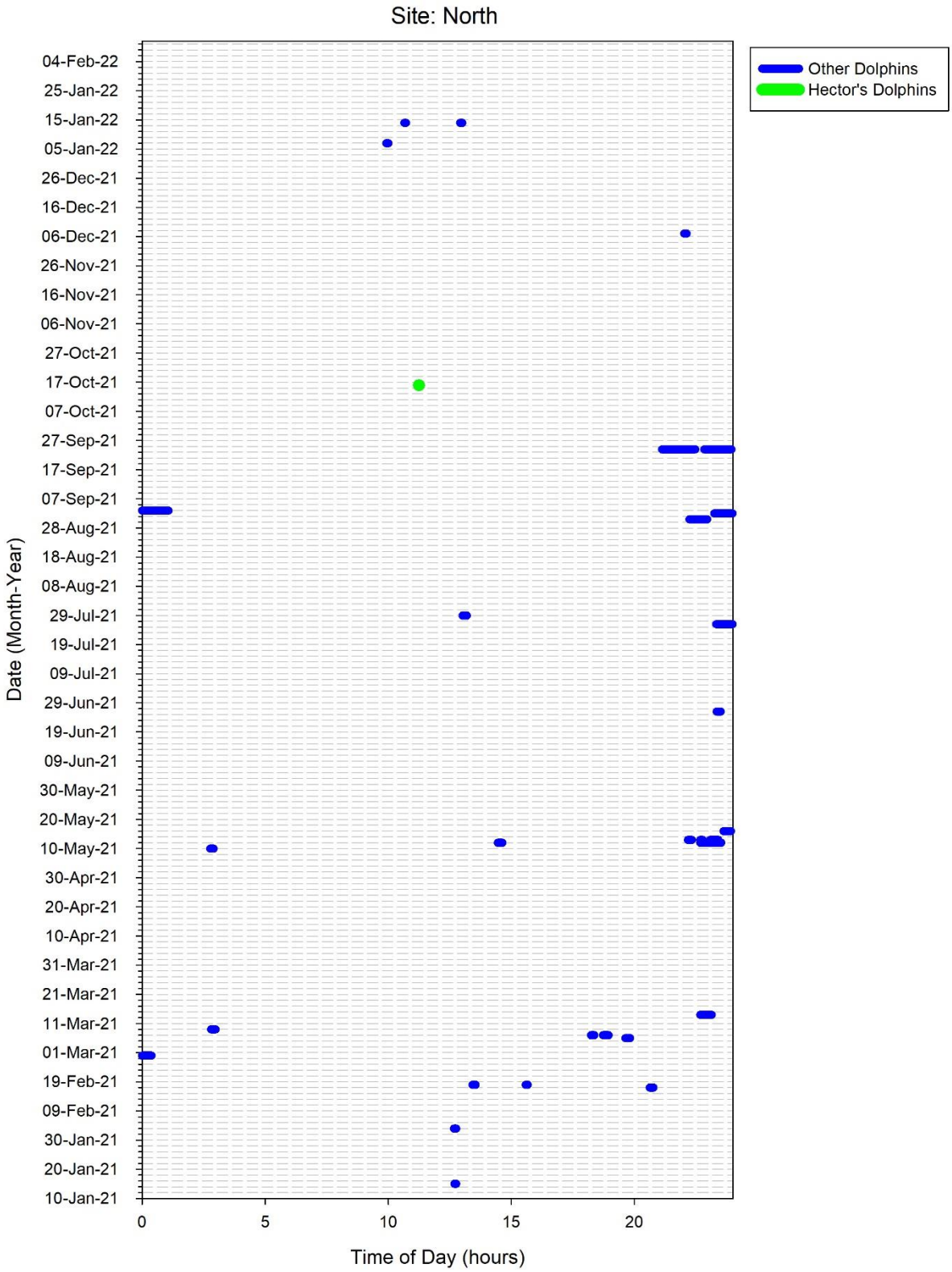


Figure A4-3. Acoustic detection of dolphins from the North acoustic monitoring station in the Bluff Port Area.

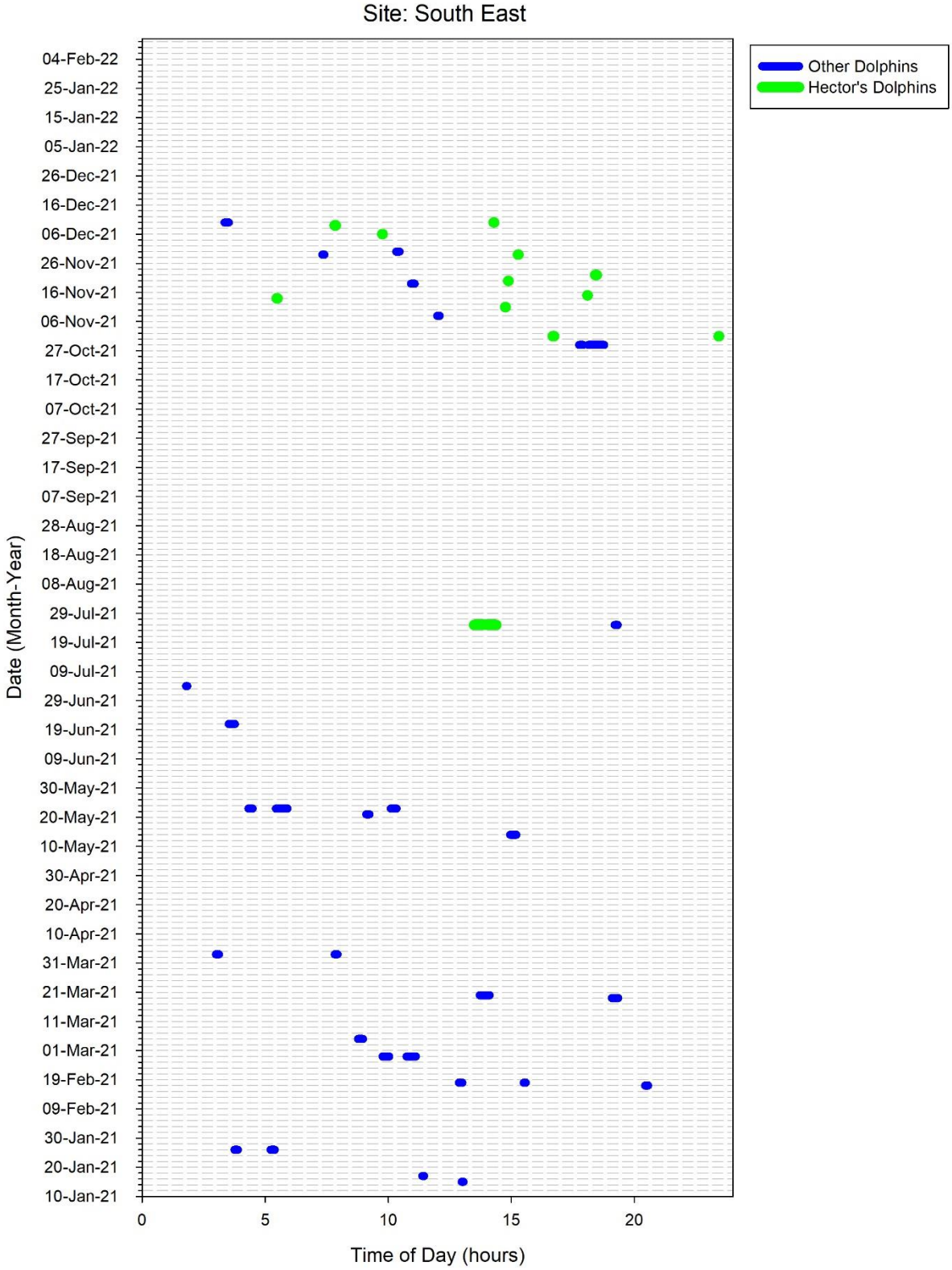


Figure A4-4. Acoustic detection of dolphins from the Southeast acoustic monitoring station in the Bluff Port Area.

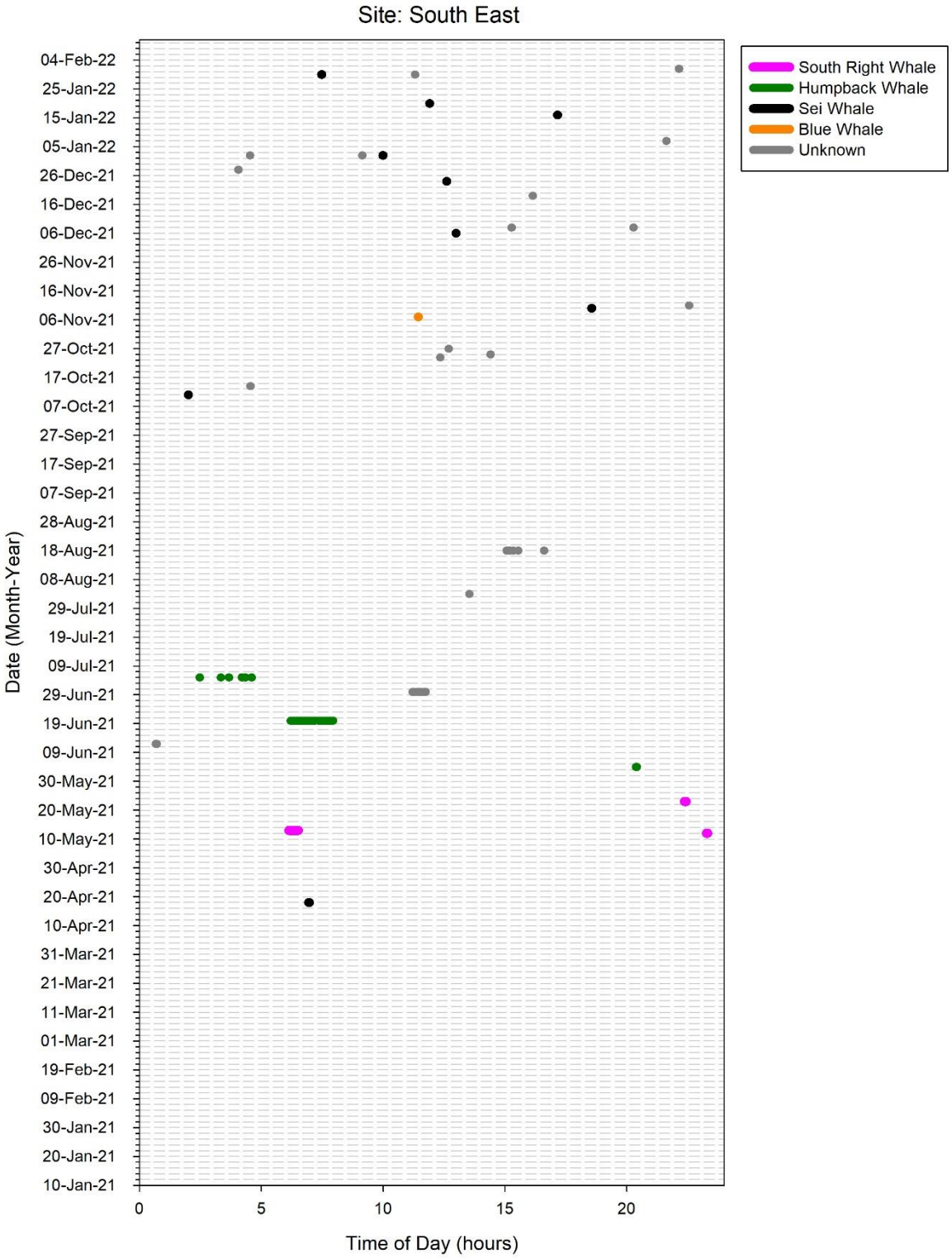


Figure A4-5. Acoustic detection of whales from the Southeast acoustic monitoring station in the Bluff Port Area.

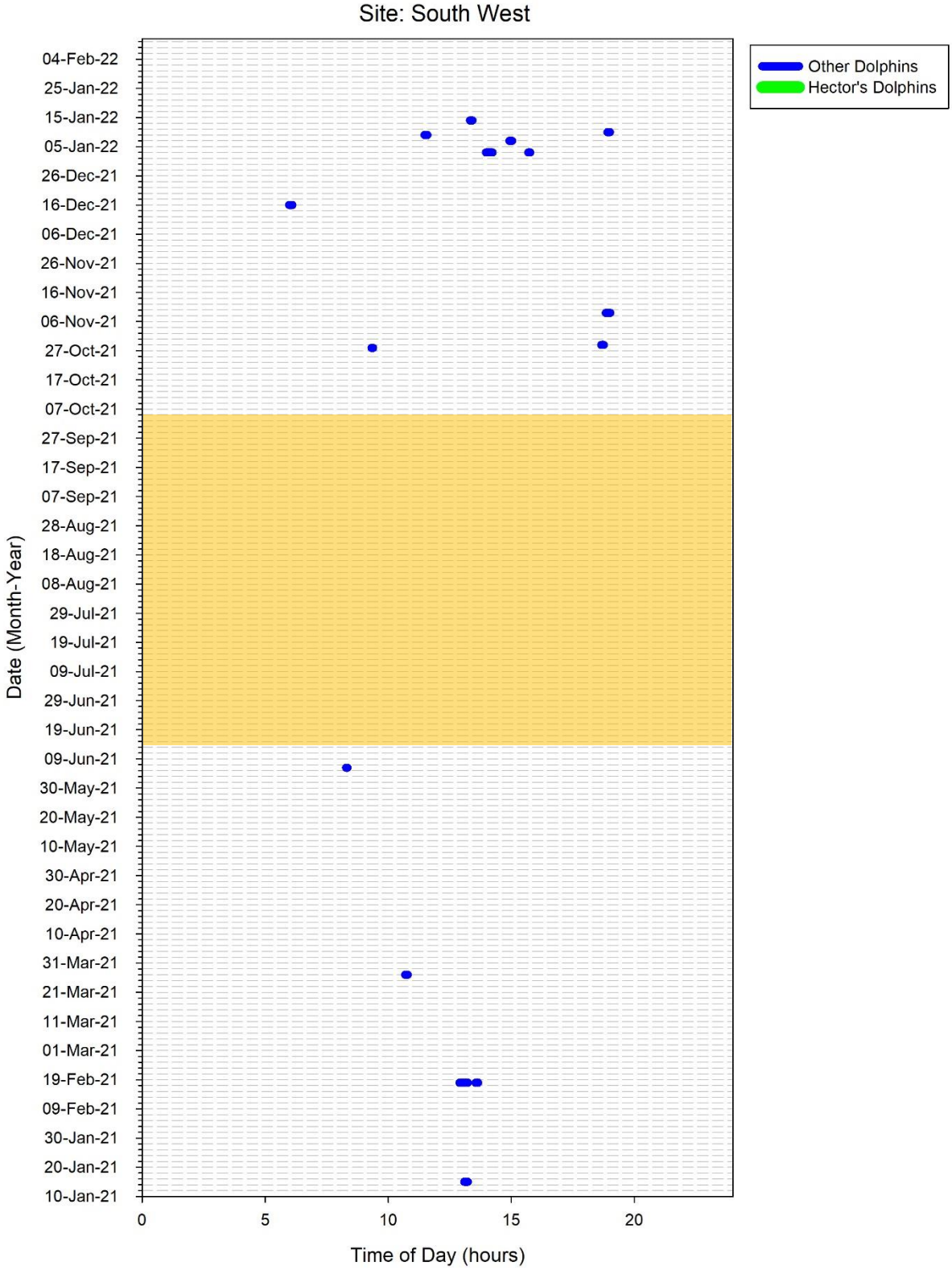


Figure A4-6. Acoustic detection of dolphins from the Southwest acoustic monitoring station in the Bluff Port Area. Note: The yellow area shows when the acoustic recorder was not working due to a technical error and no data were collected.

Attachment 5. Summary of potential impacts on marine mammals from the proposed activity and their potential causes.

Potential response/impact	**Activity**							
	Physical presence of vessels	*Underwater noise from dredging, drilling, rock breaking and blasting*	*Noise from echo-sounders*	*Lighting*	*Increased vessel traffic*	*Sediment plume*	*Loose or slack lines*	*Lost rubbish or marine debris*
Physiological injury to hearing		X	X		X			
Behavioural disturbance	X	X	X	X	X	X		
Habitat exclusion/displacement	X	X	X		X	X		
Entanglement							X	X
Vessel strike	X				X			
Direct toxic effects						X		
Indirect toxic effects						X		
Trophic effects		X				X		

Attachment 6. Summary of the potential effects on relevant marine mammal species from the proposed activity including assessment of risk both with and without mitigation. Full details of the proposed mitigation are provided in the draft *Marine Mammal Management Plan*. Significant levels of impact that are minor or greater are shaded orange.

Definition of terms used in table:

- Spatial scale of effect: Small (tens of metres), Medium (hundreds of metres), Large (> 1 km)
- Likelihood of effect: Not Applicable (NA), Low (< 25%), Moderate (25–75%), High (> 75%)
- Significance level: Nil (no effects at all), Negligible (effect too small to be discernible or of concern), Less than Minor (discernible effect but too small to affect others), Minor (noticeable but will not cause any significant adverse effects), More than Minor (noticeable that may cause adverse impact but could be mitigated), Significant (noticeable and will have serious adverse impact but could be potential for mitigation).

Potential impact	Potential activity	Description	Spatial scale of effect	Likelihood of effect	Significance level of impact	Proposed mitigation	Significance level of residual impact with mitigation
Underwater noise and physiological injury to hearing	Underwater noise from dredging, drilling, rock breaking and blasting	Physiological impacts are highly unlikely from dredging or drilling due to the low noise levels but are possible from blasting.	Small (dredging)	Low	Negligible	None	Negligible
			Small (drilling)	Low	Less than minor	None	Less than minor
			Medium (rock breaking)	Moderate	Significant	Direct onsite monitoring & exclusion zones necessary	Less than minor
			Medium to large (blasting)	Moderate to High	Significant	Direct onsite monitoring & exclusion zones necessary	Less than minor
	Underwater noise from echo-sounders	Echo-sounders do not have sufficient sound energy and / or within an appropriate frequency range to generate physiological injuries.	Small	N/A	Nil	None	Nil

Potential impact	Potential activity	Description	Spatial scale of effect	Likelihood of effect	Significance level of impact	Proposed mitigation	Significance level of residual impact with mitigation
Behavioural disturbance	Physical presence of vessels	Vessels associated with the activity may include dredges, barges, tugs and other support vessels. While vessels can have negative impacts, they can also create positive or neutral impacts (e.g., attraction to vessel and bow riding).	Small to medium	Moderate	Less than minor	None	Less than minor
Behavioural disturbance	Underwater noise from dredging, drilling, rock breaking and blasting	Behavioural impacts are likely from dredging but limited to the area immediately around the dredge. Behavioural impacts from drilling and blasting are likely to result in impacts over a large area (e.g., kms).	Small to Large (dredging)	Low	Less than minor	Regular maintenance and proper up-keep of all dredging equipment and the vessel (e.g., lubrication and repair of winches, generators)	Less than minor
			Medium (drilling)	Low	Negligible	Regular maintenance and proper up-keep of all dredging equipment and the vessel (e.g., lubrication and repair of winches, generators)	Negligible
			Medium (rock breaking)	Low to Moderate	Less than minor	None	Less than minor
			Large (blasting)	Moderate	Minor to More than Minor	Direct onsite monitoring & exclusion zones will be necessary	Less than minor
	Construction related traffic	Moderate or fast moving vessels can lead to large changes in behaviour including avoidance of the area around the vessel and / or increased risk of vessel strike.	Small to medium	Low	Less than minor	Project induction includes appropriate vessel behaviour around marine mammals	Less than minor

Potential impact	Potential activity	Description	Spatial scale of effect	Likelihood of effect	Significance level of impact	Proposed mitigation	Significance level of residual impact with mitigation
	Sediment plume	Plumes can also result in mixed behavioural impacts including increased turbidity making foraging more difficult or forcing prey from the seabed and into the water column thereby making them more accessible to marine mammals.	Medium to large	N/A	Nil	None	Nil
Habitat exclusion and / or displacement	Physical presence of vessels	Vessels associated with the activity may include dredges, barges, tugs and other support vessels. Marine mammals may avoid vessels.	Small to medium	Low	Less than minor	None	Less than minor
	Underwater noise from dredging, drilling, rock breaking and blasting	All 3 of these activities can generate considerable amounts of noise energy. Exclusion from areas with high levels of noise is well documented for marine mammals and is a direct function of the noise frequency, intensity and duration.	Medium to large (dredging)	Low	Negligible	None	Negligible
			Medium (drilling)	Low	Negligible	None	Negligible
			Medium (rock breaking)	Moderate	Minor	Direct onsite monitoring & exclusion zones will be necessary	Less than minor
			Large (blasting)	High	More than minor	Direct onsite monitoring & exclusion zones will be necessary	Minor
	Underwater noise from echo-sounders	In some circumstances, echo-sounders can cause marine mammals to leave an area but principally this is from military sonar.	Small	Low	Negligible	None	Negligible

Potential impact	Potential activity	Description	Spatial scale of effect	Likelihood of effect	Significance level of impact	Proposed mitigation	Significance level of residual impact with mitigation
	Construction vessel traffic	Moderate or fast moving vessels can lead to large changes in behaviour including avoidance of the area around the vessel.	Medium to large	Low	Minor	Project induction includes appropriate vessel behaviour around marine mammals	Negligible
	Sediment plume	Plumes can also result in marine mammals avoiding an area, but this is unlikely for most species.	Medium to large	Low	Nil	None	Nil
Entanglement	Loose or slack lines and lost rubbish or marine debris	Loose or slack lines have the potential to entangle marine mammals, particularly whales. These could occur from mooring or towing lines. Lost debris (e.g., ropes, lines, plastic) can entangle marine mammals.	Small	Low	Less than minor to Significant (injury or death to endangered individual)	Avoid loose rope or lines (i.e., keep all ropes and nets taut). Proper waste management plans in place.	Negligible
Vessel strike	Physical presence of vessels	Slow moving vessels (e.g., dredges) are highly unlikely to strike marine mammals and, in the unlikely event that they do, injuries will be minor	Small	N/A	Negligible	Project induction includes appropriate vessel behaviour around marine mammals	Negligible
	Construction vessel traffic	Faster moving vessels may strike marine mammals and could injure or even kill individuals. However, the risk is similar to any other vessel transiting through the area. (It is even less as they will have limited movements being mainly stationary expect to transport spoil and will likely be less than 10 knots.)	Small to medium	Low	Less than minor to Significant (could lead to significant injury or death to individual)	Project induction includes appropriate vessel behaviour around marine mammals. Adoption of best boating guidelines for marine mammals, including speed limits, to further reduce any chances of mortality from vessel strikes.	Less than minor

Potential impact	Potential activity	Description	Spatial scale of effect	Likelihood of effect	Significance level of impact	Proposed mitigation	Significance level of residual impact with mitigation
Direct toxic effects	Sediment plume	Disturbance of sediments can release and resuspend any contaminants into the water column potentially making them available for indirect uptake by marine mammals. Given the low levels of contaminants in the spoil and the inherently low rate of direct uptake by marine mammals, this is considered highly unlikely.	Medium to large	Nil	Negligible	None	Nil
Indirect toxic effects	Sediment plume	Disturbance of sediments can release and resuspend any contaminants into the water column potentially making them available for uptake by prey of marine mammals. Contaminants from prey can bioaccumulate and biomagnify until they reach levels that pose a risk to marine mammals. Given the low levels of contaminants in the spoil and prey, and short time marine mammals spend in the area, this is considered highly unlikely.	Medium to large	N/A	Negligible	None	Negligible
Trophic effects	Sediment plume	The disposal of spoil can lead to local mortality of marine mammal prey through direct smothering or indirect effects of sediment plumes. Most spoil will be deposited into an existing spoil ground, so effects are likely to be low due to the already highly modified nature of the area.	Medium to large	Negligible	Negligible	None	Negligible
	Underwater noise from dredging, drilling and blasting	All 3 methods can lead to direct mortality or displacement of marine life from the area of activity. While this is possible, any effects are likely to be highly localised and potential losses are likely to be replaced rapidly from outside the area of effect.	Medium to large	Negligible	Negligible	None	Negligible

Attachment 7. Proposed mitigation goals and practices to mitigate or minimise the risk of any adverse effects of activities on marine mammals. MMMP = *Marine Mammal Management Plan*. DOC = Department of Conservation. BPA = Bluff Port Area. PTS = Permanent Threshold Shift. TTS = Temporary Threshold Shift.

Potential effect	Mitigation goal	Best Management Practice	Reporting / monitoring
Physiological hearing injury from underwater noise from dredging, drilling, rock breaking and blasting operations	1. Avoid physiological hearing injury	1a. Regular maintenance and proper up-keep of all equipment and vessels (e.g., lubrication and repair of winches, generators) can significantly help lessen some underwater noise production. 1b. Ensure that operations are the lowest impact that they can be to achieve the end result (e.g., smallest blasting charge possible, least number of blasts possible). 1c. Implementation of exclusion zones and direct onsite monitoring & shutdown zones. Details to be specified in the MMMP. 1d. Undertaking 1 year of acoustic monitoring prior to works commencing to quantify the frequency of marine mammal use of the area to confirm that the BPA does not represent an important area for marine mammals. 1e. Develop a MMMP including: • Mitigation to follow national and international best practice mitigation. • MMMP to address to consent conditions relevant to marine mammals. • MMMP to be developed by experienced marine mammal expert in consultation with DOC.	• Wherever possible, measure underwater noise levels from activities to confirm levels. • Explanation of the selection of the lowest possible impact activity provided to consent authority. • Report on acoustic monitoring provided to DOC and consent authority for review prior to commencement of works. • Ensure mitigation zones are adequately monitored and all start up and shut down actions complied with. • Marine mammal reporting as specified in the MMMP to the relevant parties.
Behavioural disturbance and habitat exclusion from underwater noise from drilling and blasting operations	2. Minimise avoidance by marine mammals of the operational area	2a. Regular maintenance and proper up-keep of all equipment and vessels (e.g., lubrication and repair of winches, generators) can significantly help lessen some underwater noise production. 2b. Modelling of TTS and PTS exclusion zones and review these data to assess potential range over which behaviour disturbance may be possible.	• Wherever possible, measure underwater noise levels from drilling, blasting and dredging activities to confirm levels. • Confirmation and explanation for lowest impacts possible provided to South Port. • Ensure mitigation zones are adequately monitored and all start up and shut down actions complied with.
Vessel strike from increased vessel traffic	3. Minimise the risk of vessel collisions with any marine mammal and aim for zero mortality	3a. Adoption of clear best practice guidelines for marine mammals, including speed limits, to further reduce any chances of mortality from vessel strikes. 3b. Undertake as part of induction / briefing about appropriate vessel behaviour around marine mammals and vessel Master's responsibilities under the Marine Mammal Protection Act	• All vessels to record and report the type and frequency of any marine mammal sighted during activities including any interactions. • Report to DOC and South Port at conclusion of project.

Potential effect	Mitigation goal	Best Management Practice	Reporting / monitoring
Injury or death from entanglement from loose lines or marine debris	4. Minimise entanglement and aim for zero mortality	4a. Avoid loose rope or lines (i.e., keep all ropes and nets taut). 4b. Ensure an appropriate waste management plan is in place for all aspects of the marine operation.	• Record all entanglement incidents or near incidents regardless of outcome (e.g., injury or mortality). • In case of a fatal marine mammal incident, carcass(es) recovered and given to DOC, and further steps taken in consultation with DOC to reduce the risk of future incidences. • Report to DOC and South Port at conclusion of project.

Attachment 8 Marine Fauna Operational Plan

Simon Childerhouse[7], Bryony Miller[8], Brent Stephenson[9]

1.0 Introduction

This document has been developed to provide a concise summary of the mitigation that will be undertaken by Marine Fauna Observers (MFOs) for a range of species including marine mammals, sea birds and sharks and as a guide for Marine Fauna Observers. The full details of this mitigation are available in the associated reports for marine mammals, marine ecology, acoustics and seabirds (e.g., Childerhouse 2021a, b; Miller & Davis 2021; Styles Group 2020, 2021; Stephenson 2021). The specific aims of this document are:

1. To provide a clear and simple summary and reference guide of mitigation actions to be undertaken during rock breaking and blasting operations; and
2. To ensure that appropriate mitigation is undertaken by Marine Fauna Observers during operations to minimise or avoid any impacts on marine fauna.

This report was prepared by Dr Simon Childerhouse (Cawthron Institute), Bryony Miller (e3scientific) and Dr Brent Stephenson (Eco-Vista: Photography & Research Ltd) for South Port NZ Ltd. The team has extensive experience in developing and implementing Marine Fauna Management Plans for a range of specie with a view to avoiding or minimising potential impacts on marine fauna.

2.0 Background

Various potential effects on marine fauna (i.e., marine mammals, sea birds, penguins, sharks) have been identified as being possible from the proposed project. To avoid and / or minimise these effects, a range of mitigation has been proposed by South Port for rock breaking and blasting operations. The most likely effect from these activities is from underwater noise which may lead to potential impacts on hearing, behaviour and / or injury. The general approach has been to implement Marine Fauna Observation Zones (MFOZ) that will be monitored by Marine Fauna Observers (MFO). These MFOZs have been based on avoiding both Temporary (TTS) and Permanent Threshold Shift (PTS) in hearing in marine mammals with similar approaches also being applied to seabirds and sharks. These MFOZs are based on underwater noise propagation modelling to estimate zones of impact (see Styles 2020). In essence, if any of these specific marine fauna are observed in or on the water within the MFOZ, then operations will immediately stop and not continue until the fauna are seen to have moved out. Seabirds flying over the MFOZ would not trigger a halt to operations, but they would if they landed on the water or started diving. **Figure A8-1** provides an example of these MFOZs and how they

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would be applied for three different scenarios of blasting operations and also for rock breaking operations (see Styles Group 2020, 2021). MFOs will participate and pass an approved MFO course prior to being able to operate as an MFO.

3.0 Implementation

1 The size of MFOZs will be based on underwater noise modelling undertaken by Styles Group (2020, 2021) for both rock breaking and blasting with the aim of avoiding Permanent and Temporary Threshold Shift. The minimum sizes of these zones are shown in **Table A8-1** and **Table A8-2**. These estimated distances will be applied until empirical measurements of actual underwater noise levels are collected following the commencement of operations, whereupon new distances based on the real data will be calculated and applied as the new size of the MFOZs. MFOZs will vary between different function groups with the appropriate MFOZ being applied to each group. If any of the marine fauna species are seen within either the PTS or TTS MFOZs, this will result in the delayed start of the operation or halting of the operation if it is underway.

2 At least one dedicated MFO will scan the water's surface and coastal shoreline around the MFOZ for the presence of any marine fauna prior to, during, and after blasting and rock breaking activities. The presence of any marine fauna within the MFOZ would result in a delay to start of operations or shutdown of operations if underway. Operations will remain shut down until the animal leaves the MFOZ. All MFOs will maintain direct contact with each other and the operations supervisor at all times.

3 Sufficient dedicated MFOs will be placed around the activity site to ensure full coverage of the PTS zone and to maximise coverage of the TTS zone. An example of the proposed deployment of three MFOs are shown in **Figure A8-2**. The actual number and location of MFOs will vary depending on the size of the MFOZ. The location of MFOs must have a clear and unobstructed view of the MFOZ.

4 Specific monitoring requirements for blasting and rock breaking operations include:

(a) Pre-start observations – at least 60m minutes of observations must be completed prior to blasting or rock breaking commencing. Once 60 minutes of pre-start observations have been completed and no marine fauna have been seen within the MFOZ, operations may commence. However, if any marine fauna have been seen within the MFOZ during the pre-start observations, then operations may only commence if:

(i) all marine fauna have been observed to have moved out of the MFOZ, or

(ii) any marine fauna seen within the zone have not been seen to leave the MFOZ, but have not been seen for more than 30 minutes, or

(iii) marine fauna have been seen outside the MMOZ and are assessed as not being likely to enter the MFOZ during the pre-blast observations, and

(iv) 60 minutes of continuous observations have been completed.

(b) Normal observations – Once operations have commenced, MFOs must maintain visual observations until operations cease. If any marine fauna are seen within the MFOZ, then operations must immediately cease.

(c) Post-operation observations – Ideally, the MFO will maintain a watch of the MFOZ for at least 1 hour after operations have ceased. However, the full hour of observations may be reduced if there is less than an hour between the end of operations and when it becomes too dark to continue observations.

(d) Poor visibility procedure – Poor visibility is defined as sea fog (on the water surface), winds greater than ~20 knots and / or rain or sun glare that obstructs more than 50% of MFOZ. If these any of these conditions occurs to an extent that makes it too difficult for the MFO to visually inspect the MFOZ for marine fauna, then activities should be postponed until conditions improve. If the MFOZ is prone to strong sea chop or afternoon sea breezes (i.e., wind greater than 20 knots), and this does not adversely affect blasting operations, an additional MFO should be employed to ensure adequate coverage of the MFOZ.

5 MFOs will keep detailed records of all observation periods, any marine fauna observed and any specific mitigation actions (e.g., shutdowns) undertaken.

6 The consent holder is responsible for ensuring that all aspects on this Marine Fauna Operational Plan are implemented in full with appropriate reporting to the Regulator.

4.0 References

Childerhouse S 2021a. South Port Bluff Harbour capital dredging project assessment of environmental effects - marine mammals. Prepared for South Port New Zealand Ltd. Cawthron Report No. 3618. 55 p. plus appendix.

Childerhouse S 2021b. South Port Bluff Harbour Capital Dredging Project - Marine Mammal Management Plan. Prepared for South Port Ltd. Cawthron Report No. 3619. 25 p. plus appendices.

Miller B 2022. Statement of evidence of Bryony Miller. 29 March 2022.

Miller B, Davis G 2021. South Port capital dredging assessment of marine environmental effects. final report prepared for South Port Ltd. e3Scientific Report 20041.

Styles Group 2020. Physiological effects on marine mammals and fish confined blasting and rock drilling bluff harbour channel. Report for South Port Ltd. 19 November 2020. 35 p.

Styles Group 2021. Predicted underwater noise levels of rock breaker. Report for South Port Ltd. 27 August 2021. 7 p.

Stephenson B 2022. Statement of evidence of Brent Stephenson. 29 March 2022.

Figure A8-1. The maximum spatial extent of temporary threshold shift (TTS) and permanent threshold shift (PTS) for any marine mammal from three blasting scenarios. TTS boundary – green line; PTS boundary – red line. Modelled sound propagation results for the three blasting scenarios examined in the Styles Group (2020). Descriptions of the three scenarios are provided in Styles Group (2020).

Blasting scenario 1

Blasting scenario 2

Blasting scenario 3

Figure A8-2. Marine Fauna Observation Zones showing indicative locations of Marine Fauna Observers with an approximately ~500m effective search area

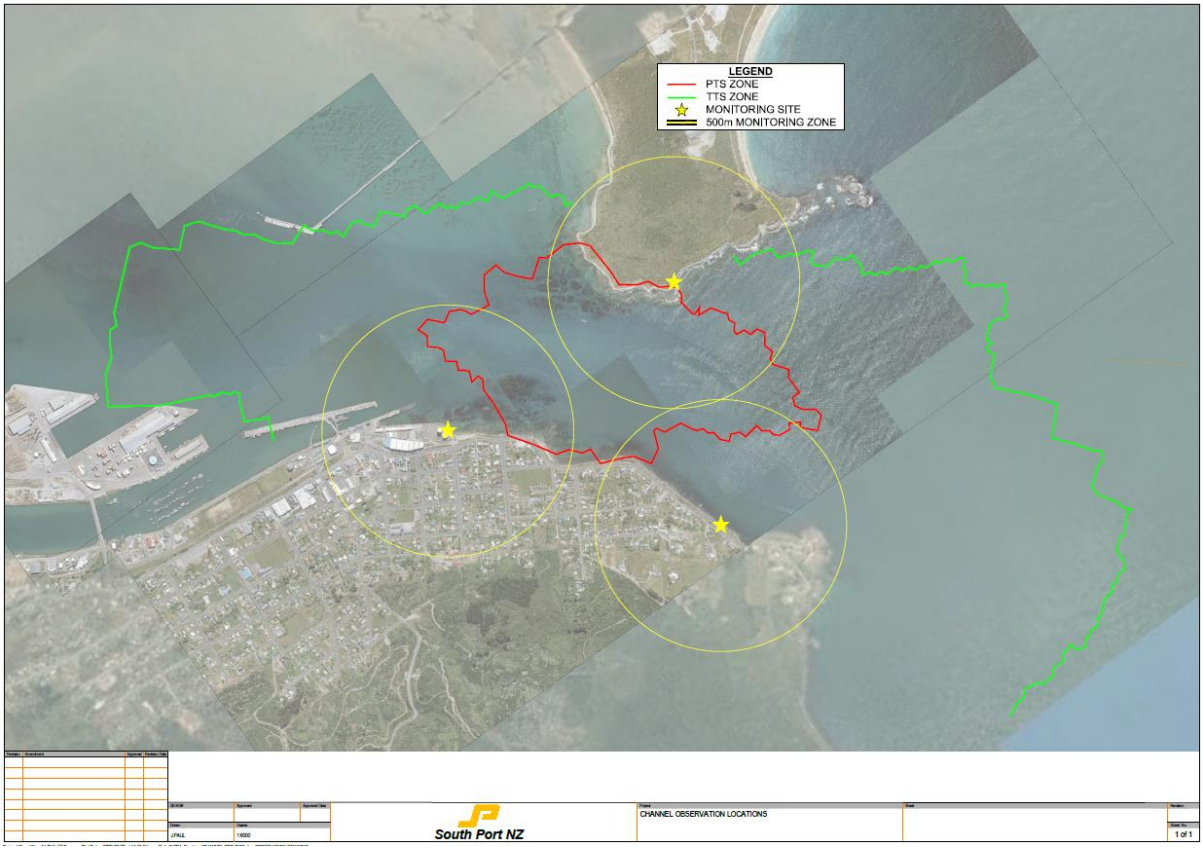

Table A8-1. Estimated maximum size (metres) of Marine Fauna Observation Zones based on avoiding Permanent Hearing injuries. Distances based on underwater noise modelling (Pine 2022). Notes: HF – high frequency; MF – Medium frequency; LF – low frequency.

Activity	HF cetaceans	MF cetaceans	LF cetaceans	Seals, Seabirds, Sharks
	Hector's dolphins	Bottlenose dolphins, Killer whales	Southern right whales	NZ sea lion, penguins, White shark
Blasting Scenario 1 (50 x 10kg)	790	263	427	67
Blasting Scenario 2 (60 x 15kg)	830	345	730	107
Blasting Scenario 3 (10 x 25kg)	841	286	639	80
Rock breaking	175	19	181	11

Table A8-2. Estimated maximum size (metres) of Marine Fauna Observation Zones based on avoiding Temporary Hearing injuries. Distances based on underwater noise modelling (Pine 2022). Notes: HF – high frequency; MF – Medium frequency; LF – low frequency.

Activity	HF cetaceans	MF cetaceans	LF cetaceans	Seals, Seabirds, Sharks
	Hector's dolphins	Bottlenose dolphins, Killer whales	Southern right whales	NZ sea lion, penguins, White shark
Blasting Scenario 1 (50 x 10kg)	1405	1096	1632	467
Blasting Scenario 2 (60 x 15kg)	1449	1607	1704	711
Blasting Scenario 3 (10 x 25kg)	1470	1246	2001	599
Rock breaking	1080	65	1050	28