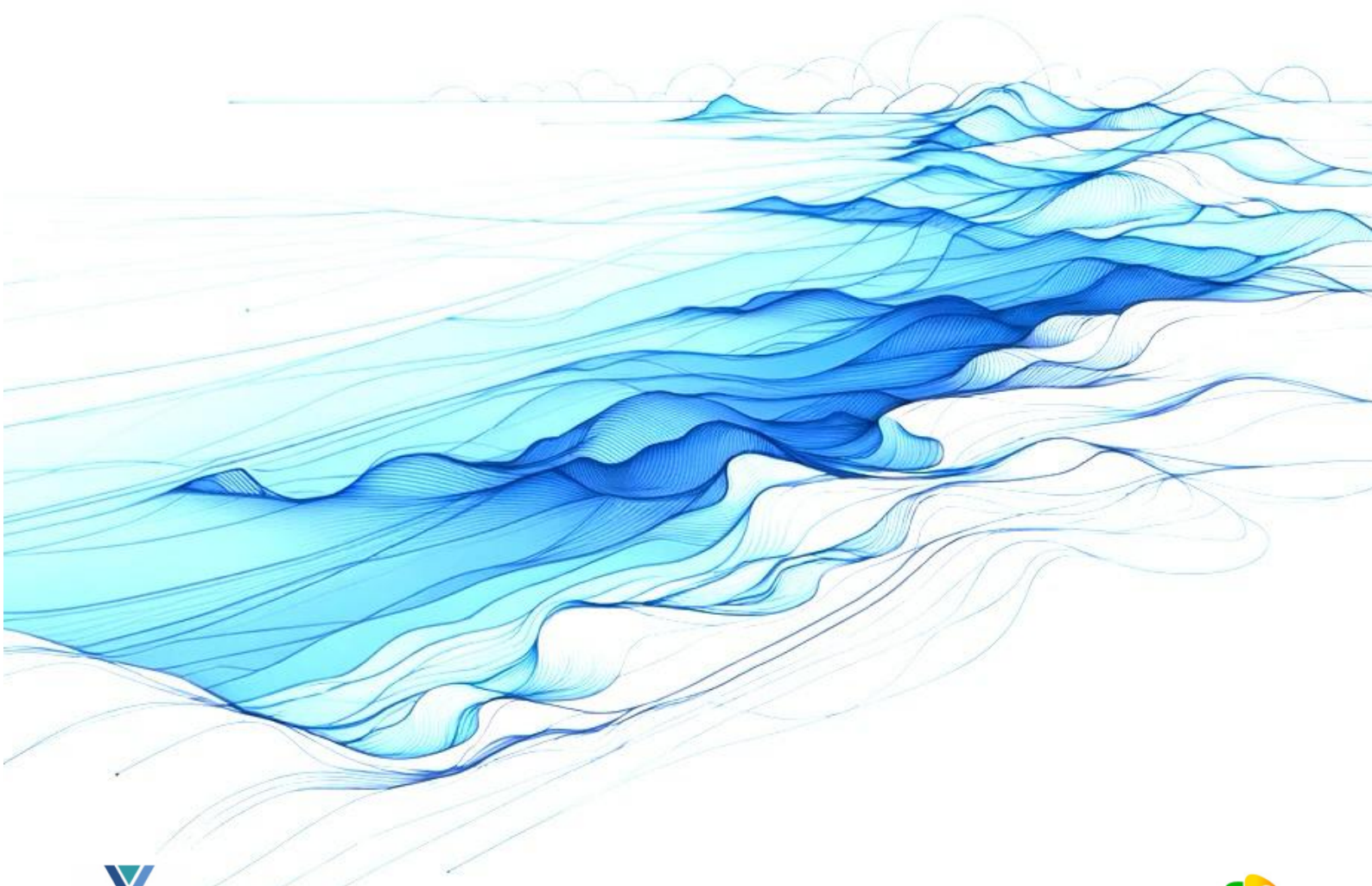
REGIA
Marine Seismic Survey

Impact Assessment
Underwater Sound: Plankton

Appendix E2: REG-EP-021-E2

Rev 5

December 2025



Klarite

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1 Introduction

Underwater Sound was identified through the Preliminary Environmental Impact and Risk Assessment (PEIRA) (Appendix B4) as an environmental aspect needing further assessment. Hence this document presents a detailed examination of **Underwater Sound**, as will typically be produced during the proposed Regia Marine Seismic Survey (**Regia MSS**), and its interaction with the environmental receptor we are collectively calling **Plankton.**

This assessment is built on the information contained in the following four core studies, which should be read in the order they are listed:

1. PEIRA
2. Seismic Sound Studies Report (Appendix B8)
3. Sound Emissions Initial Modelling Report (Appendix B7)

1.1 Purpose and Scope

The purpose of this document is to assess all acceptable sources of information to provide clear outcomes around levels-of-impact, and any associated mitigation and management measures that may be needed.

This assessment is the second stage of the environmental assessment. Its purpose is to rank the impact according to the criteria set out in the Environmental Assessment Process found in Appendix B3. The purpose of this stage of the assessment is to demonstrate that the impact can be managed to an acceptable level through the adoption of mitigation measures and the setting of an appropriate environmental performance outcome.

The measures adopted because of consultation and because of the assessment will be carried through to the ALARP assessment which occurs in stage three of the overall assessment process. Recommendations will be made if there is any further assessment required in the third stage of the assessment.

1.2 Consultation in Preparation of the EP

This document was initially published in draft form and uploaded to the Document Library of the Regia MSS Consultation Hub on 11 September 2023 as a stand-alone document, rather than as part of the much more substantial total EP document. This was done to maximise the ability of interested members of the public to read, interpret and respond within the mandated 30-day public comment period.

As such, public and Relevant persons were invited to comment on the document with an explicit request for feedback on:

- The accuracy of the described environment that may be affected.
- Any omissions of environmental values and sensitivities relevant to the environmental aspect.
- Any errors or omissions of scientific/peer reviewed literature that should be considered.
- Any errors or omissions of relevant legislation or documents of standing that should be considered.
- Any further mitigation or management measures that should be considered.

Up to 22 December 2023, there were no specific comments received on the content of the document.

1.3 Modifications Arising from Further Assessment

To ensure this environmental assessment remains contemporary, accurate, and reflects feedback from the regulator and relevant persons, this document will be updated from time-to-time. In particular, the CGG environmental assessment process requires consideration of whether further assessment was needed to verify, or dive deeper into a topic, to further improve the predictive quality of the assessment. When this has occurred, reference to such changes will be communicated in the Recommendation section and identified at relevant points in the assessment.

2 Aspect – Underwater Sound

2.1 How the Aspect Occurs

The primary sound source will be impulsive underwater acoustic emissions coming from the seismic source releasing compressed air (seismic pulse) and creating a sound wave directed downwards towards the seabed.

Secondary sound sources will include continuous underwater acoustic emissions generated by the survey and support vessels and helicopters. Sounds from vessels are generated by thrusters, engines, and propellers. Underwater acoustic emissions from helicopters are generated via the engine and rotors. Underwater acoustic emissions from Ultra-Short BaseLine positioning are generated within the streamer spread.

An overview of underwater sound and studies relevant to seismic is in Appendix B8.

2.2 Extent and Duration of the Aspect

Impulsive Sound

Duration: 60 days

Extent: Active Source Area + 740 m based on the furthest distance to modelled sound effect criteria. [Updated in response to Matter: F17]

The seismic source will only be active in the Active Source Area.

Continuous Sound

Duration: 90 days

Extent: Operational Area

The survey and support vessels and helicopters will be active in the Operational Area for the duration of the survey undertaking support activities and acquisition.

3 Cause-Effect Pathway

The PEIRA identified a cause-effect pathway for underwater sound for the following environmental components and their social, cultural, and economic features:

- Plankton.
- People and communities.

Potential environmental impacts to plankton identified from the PEIRA are:

- Change in fauna behaviour.
- Change in physical condition.

There is no scientific information on the potential for underwater sound impacts on phytoplankton and no cause-effect pathway has been established. Thus, the impact assessment focuses on impacts to zooplankton from seismic sound emissions.

In addition, there is no scientific information on the potential for continuous underwater sound impacts to plankton and no cause-effect pathway has been established. Thus, the impact assessment focuses on impacts from impulsive (seismic) underwater sound to zooplankton.

From relevant person consultation, commercial fishers have raised concerns in relation to impacts to commercial fish and invertebrate spawning and recruitment. The assessment of impacts to commercial fish and invertebrate spawning and recruitment is covered by species in the underwater sound Impact assessment sections for invertebrates and fish.

From relevant person consultation, concerns have been raised in relation to impacts to zooplankton, particularly the copepod *Nyctiphanes australis*, generally called krill, which is an important component of the upwelling and productivity systems within the Survey Operational Area. These concerns are assessed in this section.

4 Description of the Existing Environment that may be Affected by the Activity

For a description of the baseline soundscape in the region relevant to the Regia MSS, refer to Section 1.1 of Appendix B8. Plankton is a collective term for marine organisms that are unable to swim against a current. This group is diverse and includes phytoplankton (plants) and zooplankton (animals).

Plankton is a key component in oceanic food chains and supports nearly all marine life and is the dominant biomass of marine ecosystems (CSIRO 2015). The carrying capacity of marine ecosystems (the biomass of fish resources) and recruitment of individual stocks is strongly related to plankton abundance, timing, and composition.

Plankton communities are highly diverse, with members from almost all phyla. Phytoplankton are the [plant] base of this community, capturing energy through photosynthesis while drifting with the ocean currents. They are grazed by zooplankton which are comprised of meroplankton which spend only the early part of their lives in the plankton (e.g. larval stages of jellyfish, molluscs, invertebrates, and fish) and holoplankton, such as copepods, chaetognaths and salps, which spend their entire life as zooplankton (White 2018).

The small sizes, short lifespans and high abundances of zooplankton enables fast rates of production and turnover of populations. It is advantageous to grow and multiply quickly to maximise access to phytoplankton resources when they become available (White 2018). Zooplankton are the key trophic link converting primary production into a food source for fish, such as sardines, which in turn are consumed by top predators such as tuna, shark and dolphins.

Watson and Chaloupka (1982) reported a high diversity of zooplankton in eastern and central Bass Strait, with over 170 species recorded while Kimmerer and McKinnon (1984) reported only 80 species in their surveys of western and central Bass Strait.

CSIRO's Australian Ocean Data Network which is a primary resource for marine science data does not contain any data collection points within the Active Source Area. The closest data points, located south of Wilson's Promontory, show that zooplankton samples taken at these sites from 2011-2020 contained copepods, appendicularians, chaetognaths, decapods, thaliaceans, cladocerans, amphipods, cirripedes and mysids with copepods the most abundant group in the samples. Surveys of the Eastern Great Australian Bight also highlighted the dominance of copepods in the zooplankton community (Van Ruth & Ward 2009).

4.1 Regional Oceanography

The two dominant features of the ocean along the southern Australian margin are a warm mixed-surface layer that is underlain by cooler Antarctic Intermediate Water (AAIW). The mixed surface layer flows in a generally east-southeast direction and is known as the Leeuwin Current off west Australia, the Coastal Current off South Australia and Victoria, and the Zeehan Current off west Tasmania. An underlying counter current of AAIW flows in a generally north-westward direction at a depth of about 400-600 m, extending to depths ranging from 500-1500 m (Wood and Terray 2005, Kampf 2024). This is known as the Flinders Current off western Tasmania, western Victoria and South Australia, and the Leeuwin Undercurrent off west Australia (Middleton and Cirano 2002). This is a perennial subsurface slope current and feeds into shallower shelf circulations during summer as wind from the southeast forces the mixed surface layer offshore and triggers a compensatory upwelling of AAIW from greater depths (Kampf 2024, Levings 2025). This currents role in the regional upwelling system includes the transportation of nutrient-rich, sub-Antarctic slope water westward along the continental slope (Kampf 2024). This upwelling, particularly along the Otway Shelf, influences water temperature and nutrient availability, linking to events like the Bonney Upwelling off South Australia.

Analysis of temperature, salinity, and nitrate data for western Victoria described by Levings (2025) showed distinct stratification of the water column over the shelf in the summer. The constant nature of salinity values ranging from 80 m – 200 m, <14.0°C, and the accompanying nitrate values, indicated the water was reheated Antarctic Intermediate Water (AAIW). Hence summer water at temperatures of <14.0°C was upwelled AAIW and measurement of temperature alone was sufficiently robust to investigate for linkages between the Bonney Upwelling off South Australia and the shelf waters of western Victoria.

Langmuir Circulation is a type of wind-driven surface current that occurs on a smaller, localised scale in regions exposed to high-speed winds traversing unidirectionally. Under the strong winds water flows in a series of "Langmuir cells", each of which can be several meters in depth and width. Adjacent cells rotate in opposite directions. Therefore, the overall direction of these cell systems within the Langmuir Circulation process is the same as the wind direction, the rotation of these cells is typically perpendicular to the wind direction. Regions of divergence and convergence between cells also result in upwelling and downwelling formations (Figure E2 - 1). The velocity within Langmuir cells may be in the order of 30cm/s-1 (G Cresswell, described by Levings 2025). This process creates rotating water patterns that transport nutrients and debris, affecting local ecosystems, and further contributing to the oceanographic complexity on a regional scale.

Australia's southern shelves are subject to a seasonal upwelling system known as the Great Australian Coastal Upwelling System (GSACUS) which occurs seasonally during November to April. This system is comprised of three distinct upwelling centres; one of which is the Bonney Upwelling which extends spatially from Cape Nelson to Cape Jaffa (Kampf 2024). Upwelling refers to physical processes that lift or entrain subsurface water into the eutrophic zone, where it can trigger autotrophic phytoplankton production if nutrient limitation is overcome (Shute et al. 2022). Upwelling in this region is catalysed by seasonal prevailing south-westerly coastal winds. Both the South Australian Current (south-eastward flowing) and north-eastward coastal currents also contribute to the surface circulation of water in the region during the austral summer months (Kampf 2024).

Wood and Terray (2005) present findings from a study conducted approximately 40 nautical miles off the coast of Portland, Victoria where data on wave and current dynamics was gathered in this region of the Otway Basin during the austral winter of 2004 (April to October). Findings from this study included the observed typical wave conditions in the Otway Basin as being long-period, open-ocean swell, with an average wave height of 3.7 meters. The dominant wave directions were identified as coming from the southwest, propagating north-eastward.

Currents at the study site were observed to flow parallel with the slope, either eastward or westward, with easterly flows being the most common. Currents were described as rarely being in the cross-slope, or north-south direction. Currents near the surface were observed as being stronger than those measured in deeper layers. Peak current speeds were recorded as being 2.8 knots near the surface. Current speeds were however observed as being less than 1 knot more than 90% of the time. At 50 meters, peak measured speeds were less than 2 knots while peak speeds were 1.4 knots at 200 meters. In all cases, the strongest currents reportedly flowed eastward. Deeper currents flowed westward typically, especially below 500 meters. Near-bottom currents were affected by local bathymetric relief, but generally flowed downslope (i.e., southward) (Wood and Terray 2005).

Results from Phase I (late autumn, early winter) suggested that currents at the study site could be defined as a two-layer system: the top layer (Coastal Current) flowed eastward while the bottom layer (the Flinders Current) flowed toward the west. The depth interface between these two major current systems appeared to be about 100-200 meters in April, deepening to about 500 meters by late June. Correlations between the upper layer and deeper layers improved during Phase II (winter) of the study when the water column was observed to move in a more uniform manner, with currents near the surface moving in the same direction (generally) as those in deeper layers. It was unclear whether these changes were due to seasonal influences (Wood and Terray 2005).

Deeper currents were most commonly westward, and much weaker typically than those eastward flows nearer the surface. Despite these 'normal' conditions, the study described instances during the six-month study, especially those observed during Phase II (July to October) when the entire water column appeared to flow in the same direction, contradicting the general assumption of two distinct layers. These instances (i.e., when entire water column flowed eastward) was observed as occurring every 30 days on average. Significant variability was also observed with deeper currents, below the eastward-flowing upper layer (the Flinders Current). These deeper layers which were typically observed to flow weakly westward, occasionally reversed to flow to the east (Wood and Terray 2005).

The metocean oceanography of the Otway shelf exhibits complex, seasonal patterns of stratification and mixing, interannual variation, with contributions from diverse locations. Variability of metocean conditions over the Otway Shelf is the subject of ongoing research, to refine understanding of this variability, ecosystem impacts, and climate influences on the region's oceanography.

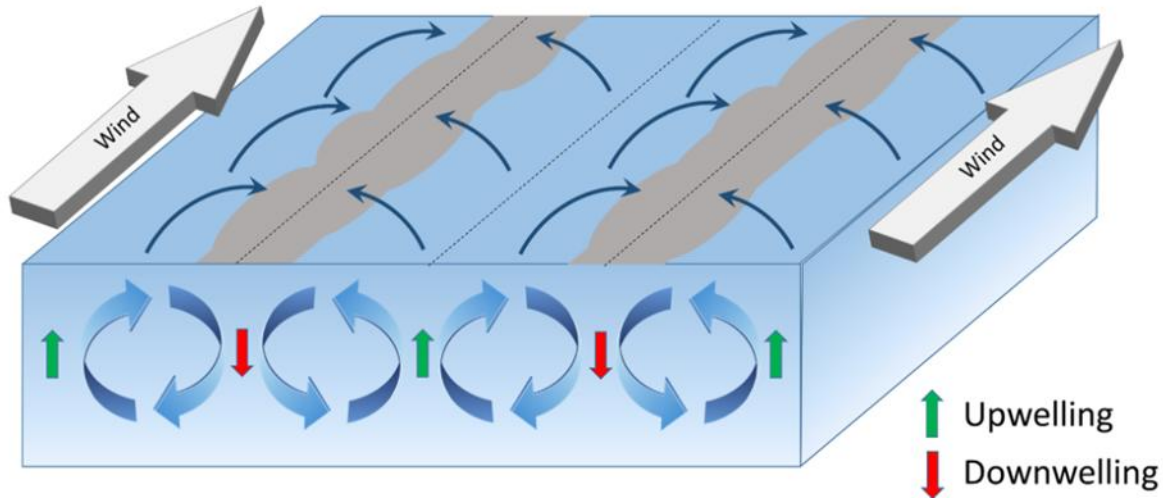


Figure E2 - 1 - Schematic of Langmuir Circulation (Webb 2023).

4.2 Krill - *Nyctiphanes australis*

N. australis is a common endemic coastal species of krill in southern Australian waters and plays an important role in the ecological significance of upwelling events in the area (e.g. the Bonney Coast Upwelling). *N. australis* is one of the most important dietary items for Pygmy Blue Whales, Jack Mackerel, Short-tailed Shearwater, Fairy Prion, Australian Salmon, Skipjack Tuna and Tiger Flathead among other abundant fish and seabirds (Nicol and Endo 1997).

The latitudinal range of *N. australis* in Australian waters extends from 31°S–44°S latitude to 132°E–156°E longitude, reaching their highest abundances in shallow waters of the continental shelf, predominantly during night-time vertical migrations (Hosie 1982). This vertical migration pattern is more evident during summer than winter (July to September), when *N. australis* becomes relatively scarce in the upper water column, even during the night. In southeastern Tasmania, highest abundances are found in summer between the surface and 40 m during the night and 30–100 m during the day; however, it is not rare to observe large numbers swimming ("swarming") at the surface during daytime (Lagos 2021, Gill 2002).

N. australis has one of the highest production-to-biomass ratios, including moulting and egg production, among all krill genera, about 10 times higher than values found for the Antarctic krill species, *Euphausia superba* (Lagos 2021). Production of *N. australis* ranges from 78.3–84.8 mg m^{-3} y^{-1}

(Ritz & Hosie 1982). It also has the fastest growth rate of the *Nyctiphanes spp.* at 40 d (Haywood & Burns 2003 in Lagos 2021).

As detailed in Butler et al. (2002) *N. australis* live ~ 1 year, reach sexual maturity at 3-4 months, with a maximum length of 20 mm and weight of 40 mg and are known to be omnivorous. The species broods its eggs until they hatch rather than spawning them directly into the water column. There is continuous maturation of ova, with an individual female capable of releasing a total of 1100 eggs in a lifetime, which are deposited as a series of batches into a pair of external ovisacs, every 30 days (Hosie 1982).

There is a main peak of spawning from early spring to late autumn, but reproduction continues through all months with as many as three generations produced each year. Continuous reproduction through the year coupled with a high growth rate means that *N. australis* has very high productivity (UTAS 2003). Gill and Morris (2003) noted that surface swarms of *N. australis* were sighted in all months that aerial surveys have been conducted except September, when no surveys were conducted. Sighting covered shelf waters from near King Island to waters 50 km west of Robe, SA.

Krill cannot swim horizontally, which implies that coastal currents are the only means by which krill can appear in the Bonney upwelling region during the seasonal upwelling plumes. These transport route of krill along Australia's southern shelves are currently unknown. Particle tracking conducted in a study by Kampf (2024) suggests that krill swarms are advected northwestward along the narrow continental shelf by the coastal upwelling current and winds, that extend the entire coastline to Cape Otway.

Kampf (2024) suggests that the upwelling current may be too weak in some upwelling seasons to transport krill all the way downstream past Cape Jaffa into the upwelling plume, so it is therefore likely that the largest number of krill swarms remain present in coastal waters upstream from Cape Nelson. This may explain frequent sightings of blue whales in this region. Kampf also notes that the continental shelf becomes narrower from Cape Otway to Cape Nelson, and that this feature supports the funnelling of krill swarms into a narrow, confined stream making it relatively easy for whales to obtain food.

Upwelling-favourable winds in the region have been measured as having a speed of 5-6 m/s (Nieblas et al. 2009). The continental shelf along the Bonney Coast is ~60–100 m in depth. The upper continental slope is relatively steep (up to 1o slope). With a speed of the upwelling jet of ~0.4 m/s (Kampf 2024), it has been determined by Kampf (2025) that it takes 8–10 days for a water parcel to travel along the entire Bonney Coast upwelling region. A key finding from the Kampf (2025) study identified Long Bay as potentially important upwelling shadow, with high zooplankton abundance and a potential region of larvae retention. This pivotal finding offers valuable new insight into the Bonney Coast, identifying a specific region that may serve as a critical zone of heightened productivity for zooplankton in the region.

4.3 Upwelling and Productivity

Upwelling refers to physical processes that lift or entrain subsurface water into the eutrophic zone, where it can trigger autotrophic phytoplankton production if nutrient limitation is overcome (Shute et al. 2022). Phytoplankton are the food source underpinning the trophic structure and flow of energy through marine food webs as they are consumed respectively by zooplankton and these in turn are consumed by larger and larger predators (CoA 2015a).

Each year during summer, a number of well-described coastal upwelling centres develop along Australia's southern coastline off the Bonney coast (Lewis, 1981, Schahinger 1987), the southern tip of the Eyre Peninsula (Kämpf et al. 2004), and the west coast Tasmanian shelf (Kämpf 2015). Upwelling also occurs along the Otway Shelf between Portland and King Island (where the Regia MSS will be undertaken). However, upwelling along the Otway Shelf is primarily sub-surface, with only a narrow

band of surface upwelling inshore during strong upwelling events (Levings and Gill 2010). These sub-areas of upwelling are recognised as components of a unified upwelling system extending from the eastern Great Australian Bight to western Bass Strait/west coast Tasmania and are referred to as the Great Southern Australian Upwelling System (GSACUS) (Kämpf 2004, 2015).

The GSACUS is active during autumn and summer, driving simultaneous upwelling along the Bonney and Otway Coasts (Levings and Gill 2010). Cool upwelled water from depths of 200-400 m is nutrient rich, enhances subsequent upwelling events and leads to phytoplankton growth in the region (Rogers et al. 2013).

4.4 Bonney Coast Upwelling Key Ecological Feature

The Bonney Coast Upwelling (BCU) occurs between Cape Jaffa, South Australia and Portland, Victoria (DCCEEW 2023). It is a productivity hotspot, with high densities of zooplankton including the coastal krill (*N. australis)* which is an important food source for fish, birds and whales.

The BCU is driven by the frequent south-easterly winds which are the result of southern migration of the subtropical ridge (Nieblas et al. 2009, Schahinger 1987), during the austral summer. The upwelling occurs via Ekman dynamics, where the ocean surface experiences a steady wind stress resulting in a net transport of water at right angles to the left of the wind direction which brings cold, nutrient rich water to the sea surface.

The Bonney Coast Upwelling has been shown to follow a clear temporal pattern. When the upwelling season starts during late spring and early summer (November and December), the influence of the BCU was found to be often restricted to the coast. During the mid-summer and early autumn (January to March) when the upwelling is the strongest, the upwelling influence often extends to the shelf break before retreating in April (Huang and Wang 2019).

Gill et al (2011) states that the Bonney Coast Upwelling generally starts in the eastern part of the Great Australian Bight and spreads eastwards to the Otway Basin. At the height of the upwelling during February and March, its area of influence often exceeds 12,000 km^2, while its sea surface temperature anomaly often exceeds 1°C, and its chlorophyll-a concentrations are often >1.5 times adjacent areas (Huang and Wang 2019).

The BCU is one of only two identified seasonal feeding areas for blue whales in Australian coastal waters and is one of 12 known blue whale feeding aggregation areas globally. Sightings of Sei whales and Fin whales in the upwelling indicate this is potentially an important feeding ground for these species also (Gill et al. 2015, Morrice et al. 2004).

The BCU is regionally important as it supports the lucrative local fishing and tourism industry off the Otway towns such as Portland, which annually holds an Upwelling Festival in late October/early November to celebrate the abundance of the Bonney Upwelling, and to begin the summer fishing season (Glenelg Shire 2023).

The Bonney Coast Upwelling is defined as a Key Ecological Feature as it is an area of enhanced pelagic productivity and has high aggregations of marine life (DCCEEW 2023). In addition to whales, many endangered and listed species frequent the area, possibly also relying on the abundance of krill that provide a food source to many seabirds and fish. The high productivity of the Bonney Coast Upwelling is also capitalised on by other higher predator species such as little penguins and Australian fur seals feeding on baitfish (DCCEEW 2023).

The Regia Operational Area overlaps the eastern end of Bonney Coast Upwelling Key Ecological Feature by 1.21 % (Appendix B12 MAP-REG-EPM-003). The Regia Active Source Area does not overlap this KEF. [Paragraph updated in response to Matter E01].

4.5 Marine Flora

In Australia, shallow (<30 m) temperate reefs are defined largely by the distribution of *Ecklonia radiata* kelp forests, which span more than 8000 km of coastline from the subtropical waters of northern New South Wales down the east coast of mainland Australia, around Tasmania, along Australia's southern coastline and north as far as Kalbarri in Western Australia (Bennet et al 2015). Most of Australia's kelp-dominated temperate reefs lie within the 'coastal zone' under state jurisdiction (3 nautical miles or 5.5 km from shore) (Bennett et al 2015). On the south and west coasts of Australia, E. radiata forests typically occur in mosaics of mixed species with large canopy-forming fucoids (e.g. *Cystophora* spp., *Scytothalia dorycarpa*), covering most of the rocky reefs.

Timing of reproduction is variable across its distribution range with seasonal peaks in Western Australia and more continuous reproduction of sori and zoospores in Tasmania. Water temperature is the key driver of reproductive timing but is also influenced by other variables such as wave action. Once *E. radiata* zoospores are released, they have the ability to swim for at least 24 h (although they often do so for only 1–2 h), until they settle onto the substratum and germinate into male or female gametophytes. *Ecklonia radiata* can disperse via three modes; zoospores, sperm and detached fertile drift material. Population genetic studies on *E. radiata* using neutral microsatellite markers (Dolman & Coleman 2009, reported in Wernberg et al 2019) have identified that genetic structure around the Australian continent is weak, suggesting widespread gene flow that is mediated by the strength and direction of prevailing ocean boundary currents. Such strong connectivity should imbue considerable resilience on this species; however, climate change is operating at such a large scale that warming temperatures are negatively affecting kelp across its entire range.

Due to the depths associated with the Survey Acquisition Area, with no discharge of the sound source at full power to occur in water depths less than 50 m, impacts on larger plants and nearshore planktonic phases arising from the activities associated with the Regia MSS are not anticipated. There is no scientific information on the potential for noise-induced effect in macroalgae and no functional cause-effect relationship has been established. Therefore, impacts from acoustic disturbance on macroalgae/ marine flora, or associated cultural values has not been considered further.

It is understood there is potential for kelp in shallower, more coastal areas to be impacted in the highly unlikely event of a marine oil spill, and a detailed description of kelp, its cultural and seaweed industry value, and risks to kelp associated with a spill are detailed in EP Appendix D4 (Accidental Release of Fuel).

[Section added in response to Matters: E09, E10 and FN06].

4.6 People and Communities

4.6.1 Social and Economic Features

During consultation, as presented in Annex 2, objections and claims were raised regarding how impacts of the Regia MSS on plankton and the Bonney Upwelling could affect the reputation, health and function of the local ecosystem. These receptors are assessed below in Section 9.

4.6.2 Cultural features

The Bonney upwelling, where cold, nutrient-rich waters rise to the surface, is a key element in this ecosystem, boosting phytoplankton populations that sustain many species culturally important to the Gunditjmara (GMTOAC, 2023)

Kelp forests, home to giant and bull kelps, are identified as culturally significant to the Wadawurrung People as habitats and food sources for species with cultural values, including rock lobster and abalone and their ability to be used to create water carriers (WTOAC, 2020)

5 Relevant Legislative Requirements

CGG has considered all the relevant legislative requirements, conservation management and recovery plans for species of plankton that may be affected (see Appendix B3). No measures were identified from this process.

6 Defining Acceptable Levels of Impact

To define acceptable levels of impact to plankton, zooplankton, and krill sound exposure guidelines for eggs and larvae have been used by CGG from the American National Standards Institute (ANSI) accredited report of Sound Exposure Guidelines for Fishes and Sea Turtles (Popper et al. 2014).

The sound exposure guidelines from Popper et al. (2014) are based on references and studies on potential impacts of noise emissions on fish eggs and larvae prior to 2014. Results presented in Day et al. (2016b) for embryonic lobsters and Fields et al. (2019) for copepods align with those presented in Popper et al. (2014), which is that mortality and sub-lethal injury are limited to within tens of metres of seismic sources. Additionally, the Popper et al. (2014) sound exposure guidelines are extrapolated from simulated pile driving signals which have a more rapid rise time and greater potential for trauma than pulses from a seismic source.

For eggs and larvae, the sound exposure guidelines provide sound exposure metrics for:

- Mortality and potential mortal injury: Popper et al. (2014) suggests that injury to larvae resulting from seismic impulses may occur for sound exposures above 207 dB PK or above 210 dB SEL_{cum}. However, Popper et al. (2014) suggest that recoverable injury and TTS is likely within tens of metres of a seismic source, which is generally less than the distance associated with their proposed mortal injury threshold, hence there is some discrepancy. The threshold proposed for mortal injury is derived from pile driving impacts to fish and is likely to be conservative. The body of literature indicates that mortality and sub-lethal injury are limited to within tens of metres of seismic sources.

Within these sound exposure guidelines, there was insufficient data to make a quantitative guideline for:

- **Recoverable injury:** There are few studies to base criteria on, however, Popper et al. (2014) provides acoustic criteria extrapolated from simulated pile driving signals which have a more rapid rise time and greater potential for trauma than pulses from a seismic source. Popper et al. (2014) does not recommend a timeframe for cumulative sound exposure levels and thus 24 hrs has been used as is current industry practice.
- **Temporary threshold shift (TTS) in hearing:** There are currently no acoustic criteria for plankton, fish and invertebrate eggs or larvae, however, a scale of relative risk is provided
- **Behaviour / Masking:** There are currently no acoustic criteria for plankton, fish and invertebrate eggs or larvae, however, a scale of relative risk is provided in Popper et al. (2014). The scale assumes that a behavioural response is possible.
- For these impacts, a subjective approach of 'relative risk' (low, moderate, and high) is used to assess risk at three distances from the seismic source (near - tens of metres, intermediate - hundreds of metres, and far - thousands of metres)

Natural mortality rates within the plankton are variable but usually high, across all taxa (e.g. Garrido et al 2015). Estimates can range all the way from very little to as high as >99% (see review by Vaughn et al. 2010). Despite this level of mortality adult populations survive and thrive under natural conditions, indicating that such high mortality levels in the plankton are not an impediment to population persistence. Any potential mortality to planktonic communities from seismic needs to be assessed against this background mortality.

CGG defined acceptable levels of impact and risk as part of its decision-making processes and published them as part of its consultation efforts, inviting relevant persons to comment on their appropriateness. During the preparation of the EP, it became clear that assessment specific statements would be necessary to create a stronger link between the defined acceptable level and the predictions of impacts and risks.

As such, Table E2-1 shows the general acceptable level statements which cover the whole of the activity (which are consistent across all environmental impacts and risks), and the corresponding assessment specific defined acceptable levels established for this assessment. This sets the foundation for relevant and targeted demonstration later in this assessment. [1]

Table E2-1 - General and Assessment Specific Defined Acceptable Levels

Category	Defined Acceptable Levels (General)	Defined Acceptable Levels (Aspect Specific)	Rationale
Principles of ESD	The petroleum activity results in temporary / reversible, small scale, and/or low intensity environmental damage.	Sound exposure to plankton communities does not compromise ecological integrity of the pelagic food web. Plankton communities should not be exposed to sound exposure levels of >210dB $SEL_{cum24hr}$ over a spatial or temporal scale likely to result in significant disruption to population dynamics.	Plankton communities are a critical component of marine ecosystems, forming the base of the food web and driving nutrient cycling. Although some individual plankton proximate to the sound source may experience lethal effects, acoustic impacts must not alter community structure or productivity. Maintaining ecosystem integrity ensures broader ecological functions are protected. Scientific literature (Popper et al 2014) and modelling (Appendix B7) conservatively indicate that levels above 210 dB $SEL_{cum\ 24hr}$ cause mortality or sublethal effects in plankton. This threshold represents the onset of ecologically meaningful harm and is a scientifically robust benchmark for assessing acceptability. The threshold can be modelled to understand the distance ranges at which mortality or mortal injury occur.
	The impact and risk assessment process are based on sufficient information to understand if: Serious/irreversible environmental damage is predicted; or The application of the precautionary principle is applied in the presence of scientific uncertainty.		
	Environmental management of the activity must not be inconsistent with EPBC Act Management Plans and Recovery Plans.		
Biological	Impacts and risks to biological features will be temporary / reversible, small scale, and/or low intensity environmental damage at population levels.		
Ecological	Impacts and risks to ecological features will be temporary / reversible, small scale, and/or low intensity damage to the overall health, diversity, or functioning of the ecosystem.		
Economic	Affected persons will not be worse off because of the activity.	Industries, livelihoods, and ecosystem services remain viable, with no sustained financial or operational consequences resulting from changes in species behaviour, abundance, or access to resources.	Reflects Commonwealth and State policy objectives for sustainable resource use and protection of ecosystem services.

[1] Note: The acceptable levels related to demonstrating ALARP and the adoption of specific measures to ensure the effectiveness of control measures can be found in Appendix F2 and B3 respectively. As they are criteria integral to the acceptance of the Environment Plan, and they are documented elsewhere, these criteria are not discussed further in this assessment.

Category	Defined Acceptable Levels (General)	Defined Acceptable Levels (Aspect Specific)	Rationale
Cultural	Impacts and risks to cultural features including cultural values, traditions, or practices, will be temporary / reversible, small scale, and/or low intensity.	Culturally important species, places, and practices can continue without disruption to their role, accessibility, or long-term viability.	This level reflects the principle of maintaining cultural values and heritage as protected under national and state legislation. It ensures that activities do not interfere with traditional practices, spiritual connections, or ongoing access to culturally significant areas.
Social	Measures have been adopted based on the consultation process to address relevant objections and claims of relevant persons. The views of public have been considered in the impact and risk assessment.	People and communities can continue engaging with the natural environment, recreational activities, and heritage values without experiencing long-term or irreversible disruption.	This level reflects broader social licence to operate, ensuring that environmental activities do not lead to degradation of public amenity, loss of recreational use, or impacts to non-Indigenous heritage values. It aligns with Commonwealth policies promoting public access, well-being, and sustainable use of the marine environment.
Company	Environmental impacts and risks are consistent with the CGG impact and risk assessment process such that for an impact or risk the effect/ consequence rating is medium or below.	As per the general levels.	CGG is a company familiar with managing the effects of seismic sound on the marine environment, and its global operational history supports the reliability of its internal assessment process. The use of CGG's impact and risk matrix, when consistently applied, has not resulted in unacceptable environmental outcomes, which indicates the process produces conservative and realistic assessment outcomes.

7 Consultation Input

CGG carried out the consultations required by the regulations to:

- Improve the predictive quality of this assessment by seeking relevant person input into the preparation of the EP.
- To verify the description of the environment that CGG produced as part of its environmental assessment process through information provided to CGG by relevant persons.
- Receive objections or claims about the adverse effects of the activity on a relevant person's functions, interests, or activities.

The information received from relevant persons can be found in each relevant person consultation report. It has been considered in the preparation of this assessment.

Objections or claims about the adverse effects of the activity can also be found in each relevant person's consultation report. They have been assessed for merit and CGG has written a statement of its response to each objection or claim. Any objection or claim relevant to this assessment and subsequently considered in its preparation can be found in Annex 2.

8 Minimisation of Impacts Through Activity Design

As part of planning and design of the activity, several activity limitations were considered in accordance with the hierarchy of controls and through the consultation process (see Annex 2). These limitations were evaluated to determine whether the source of impact could be eliminated or substituted through changes in the timing, technology, or design of the activity. As described in Appendix F3, section 3.16.2, due to the interconnection between the tangible and intangible cultural values, all activity limitations are relevant to safeguarding social, economic, and cultural features and values, ensuring protection across all areas.

8.1 Elimination

Elimination involves removing the source of an impact or risk entirely through changes to the activity design. In the context of underwater sound, elimination involves removing the source of underwater sound or preventing its generation in the first place. Two main options were considered and subsequently adopted:

No discharge of sound sources within the Bonney Upwelling KEF

The activity design explicitly excludes any sound source discharge within this sensitive ecological area, thereby preventing disturbance to the unique assemblages and biodiversity it supports. Discharging sound sources in this region could disrupt plankton populations by causing increased mortality rates or altering their distribution, which could have cascading effects on the broader marine ecosystem. By prohibiting any sound source discharge within this KEF, this measure ensures that the region's high ecological value is maintained and that the biological processes dependent on plankton productivity remain undisturbed during this key period of productivity in the region.

No petroleum activity to be carried out between 1 January and 15 September. The elimination of sound discharge during these months helps to protect plankton populations at their peak productivity levels, reducing potential mortality and ensuring that the full extent of their role in nutrient cycling and energy transfer remains intact. Additionally, this measure aligns with stakeholder concerns regarding the protection of the region's biodiversity during critical upwelling events, such as the Blue Whale which is known to utilise this upwelling as a key seasonal feeding site.

The sound source will not be discharged at full power while stationary

A stationary sound source at full power would potentially lead to repeated exposures above predicted levels of impact to plankton. Whilst is it operationally unplanned that the sound source would remain active whilst the seismic vessel is stationary that does not mean it couldn't occur. That also make this commitment somewhat easier to make and it provides a clear reduction in impact for no cost.

8.2 Substitution

Where elimination is not viable, substitution involves altering the timing, location, or sequencing of the activity to reduce the likelihood or consequence of the impact. Two main options were considered and subsequently adopted:

Sound will not be emitted above the stated capacity

Underwater sound emissions are a key concern for plankton, as exposure to high-intensity sound waves has been linked to increased mortality, particularly in larval stages. By ensuring that sound emissions remain within predetermined capacity limits, this measure ensures that the effects on plankton remain below the levels predicted by acoustic modelling. Limiting sound intensity also reduces the likelihood of disrupting plankton distribution patterns, which is critical for maintaining local food web stability. This option ensures that the effects of sound emissions remain within predicted and acceptable limits, ensuring compliance with environmental standards.

Data acquisition will follow along the 293°/113° azimuth orientation

The orientation of data acquisition was initially set to optimise for geophysical data needs and minimise the duration of the survey (due to costs). There was some feedback from relevant persons that the survey orientation should also be optimised for reduced impacts to plankton due to current speeds in the area and the Richardson et al (2017) suggestion to conduct surveys into or across prevailing currents would result in fewer exposures for individual plankters. CGG's analysis of ocean currents could not corroborate the claims of relevant persons about current speeds and directions. Indeed, the Otway is a confluence of ocean currents with currents running in different directions at different depths, as well as rotating the prevailing direction seasonally. As such, any orientation of the survey would have similar impacts to plankton as other orientations. That isn't to say that a fix orientation isn't required. A fixed orientation is necessary for efficient acquisition, predictability of movements for other marine users, and to ensure impacts are within predicted parameters. As a result, the survey will be undertaken along the 293°/113° azimuth in alignment with the modelled parameters. In previous versions of the EP this was stated as being 130° as an angle from the horizontal. This phasing is less precise than is necessary for marine operations.

9 Predicted Levels of Impact

To arrive at the predicted levels of impact of underwater sound on plankton at this stage in the process requires the reader to have assimilated all prior relevant information that has been assessed on plankton. The EP documentation is coded alphabetically to guide the reader through what is a natural process of temporal accumulation and review of evidence. The following documentation forms the evidence lineage for predictions on plankton as described here.

- B7 – Sound Modelling Reports SLR performed a numerical modelling study of underwater sound levels associated with the planned Regia Marine Seismic Survey (MSS) to assist in understanding the potential acoustic impacts on key regional receptors including plankton along with marine mammals, fish, turtles, benthic invertebrates, and recreational divers and swimmers. Acoustic thresholds derived from this document are used to guide assessments of impacts.
- B8 – Seismic Studies Report – This report provides a detailed assessment of the scientific literature related to sound (and specifically seismic) effects on plankton and other fauna. This literature is the key evidence base from which impact levels are derived.

Therefore, all species, taxa or groups identified have been assessed through the framework provided by B7 and B8. Because of commonalities among species/taxa/groups in their sensitivity to seismic it is not always necessary to describe effects to each species individually but rather as groups defined by their sensitivity to different frequency levels of sound and shared life-history behaviours.

9.1 Change in Fauna Behaviour and Physical Condition

As detailed from the underwater sound and studies relevant to seismic surveys (see the Regia MSS Seismic Studies Summary available in Appendix B8), mortality and injury to plankton has been identified from seismic source sound emissions for individuals within proximity to the seismic source. This can have direct impacts to plankton including krill, fish and invertebrate larvae and indirect impacts to receptors that feed on plankton and recruitment of fish and invertebrate species.

The extent of the area of impact is predicted to be a maximum of 740 m from the sound source during survey acquisition

The predicted effect level on these species is assessed as minor, meaning impacts to plankton are predicted but they will be localised and temporary, with the system having the capacity to recover from the impact in a timescale of days to months given the following:

- Phytoplankton and zooplankton biomass in the oceans varies significantly at spatial scales ranging from hundreds of metres to hundreds of kilometres, and temporal scales of hours, days, seasons and inter-annually, due to tidal and large-scale currents, bathymetry, temperature, salinity, water chemistry parameters and other environmental factors (Gibbons & Hutchings 1996; Holliday et al. 1987; McKinnon et al. 2008; Pearce et al. 2000; Sutton & Beckley 2017). Thus, plankton will be spatially and temporally variable throughout the seismic survey and it follows that predicted impacts will not be ubiquitous to all plankton present within the Active Source Area.
- No impacts to phytoplankton are predicted so they will remain available for zooplankton and other fauna to graze on.
- Zooplankton do not have hearing structures (although they can sense pressure changes) and their bodies are generally the same density as the surrounding water so sudden pressure changes associated with seismic activity are presumed to not cause physical damage (Parry & Gason 2006).
- The Working Group on the Effects of Sound on Fish and Turtles (Popper et al. 2014) detailed (a) there is a low relative risk of plankton experiencing masking impacts at all distances from the seismic source (b) a moderate risk of recoverable injury from TTS behavioural impacts near (tens

of metres) to the seismic source (c) a low risk of TTS impacts at intermediate or far distances from the seismic source (Table E2-51).

- Any potential mortality or permanent injury effects to plankton must be assessed in the context of natural mortality rates. Mortality and/or mortal injury impacts to plankton assemblages (including fish eggs and larvae) resulting from seismic surveys are likely to be inconsequential relative to natural daily mortality rates, which can range from 11.6% (average minimum) to 59.8% (average maximum) as reported by Tang et al. (2014). Mean mortality rates for marine fish larvae have been assessed as equivalent to 21.3% per day (Houde and Zastrow 1993). In the experiment undertaken by McCauley et al. (2017) zooplankton mortality rate background levels were 19%. Thus, predicted impacts to zooplankton from the seismic survey are likely to be well within natural mortality rates.
- Sætre and Ona (1996) calculated that under a 'worst-case' scenario, the number of larvae killed during a typical seismic survey was 0.45% of the total population, and they concluded that mortality rates caused by exposure to the seismic source were so low compared to natural mortality that the impact from seismic surveys must be regarded as insignificant.
- Zooplankton have rapid recovery rates given their life-history characteristics as described earlier (e.g. Huntley and Lopez 1992, Richardson et al 2017). Richardson et al. (2017) modelled the spatial and temporal impact of a seismic survey on zooplankton on the North-West Shelf from a large-scale seismic survey, considering the mortality estimates of McCauley et al. (2017), and accounting for typical growth rates, natural mortality rates, and the ocean circulation in the region. Their results illustrated:
  - Simulations that included ocean circulation showed that the impact of the seismic survey on zooplankton biomass was greatest in the Survey Region where 22% of the zooplankton biomass was removed, while declines moving to the Survey Region + 15 km were 14% of the zooplankton biomass was removed, and when moving out to the Survey Region + 150 km only 2% of the zooplankton biomass was removed. There was no discernible regional-level effect on the entire Northwest Shelf Bioregion. The time to recovery (to 95% of the original level) for the Survey Region was 39 days (38-42 days) after the start of the survey and 3 days (2-6 days) after the end of the survey.
  - Simulations with no ocean circulation showed a much greater impact of the seismic survey on relative zooplankton biomass with 35% of the zooplankton biomass removed for the Survey Region, 22% for the Survey Region + 15 km and 3% for the Survey Region + 150 km. Nevertheless, there was still no discernible effect on the entire Northwest Shelf Bioregion. The time to recovery for the Survey Region from the start of the survey was 64 days (49-100 days) and from the end of the survey was 26 days.
- Though the modelling by Richardson et al. (2017) was done for the North-West Shelf the outcomes provide a reasonable proxy as to the impact and recovery of plankton to a seismic survey in the Otway. Average current speeds within the Otway are within those for the North-West Shelf with the maximum Otway current speed higher than for the Northwest Shelf[2]. Water temperatures are colder in the Otway but during upwellings there is significantly more nutrients to fuel plankton growth. Applying predicted impacts from the Richardson et al. (2017) modelling to a seismic survey in the Otway could result in a loss of zooplankton biomass ranging from 22 – 35% with recovery within 3 to 26 days from the end of the survey. Even under the worst-case scenario of no ocean circulation mortality rates for the whole survey fall within the daily mortality rates of 11.6% (average minimum) to 59.8% (average maximum) as empirically derived by Tang et al. (2014).

[2] RPS (2019) details for Otway monthly average surface current speed was 0.16 to 0.25 m/s, maximum surface current speed ranged between 0.60 m/s and 1.22 m/s, and sea surface temperatures ranged from 13.3°C to 18°C. RPS (2019a) details for Scarborough on the North-West Shelf monthly average surface current speed was 0.4 to 0.26 m/s, maximum surface current speed was ~0.70 m/s, and sea surface temperatures ranged from 15°C to 29°C.

- Tang et al. (2014) examine the role of non-predatory mortality in zooplankton populations and its implications for ecosystem processes, with some relevance to open water systems. The study reveals that a significant proportion of zooplankton mortality results from non-predatory factors such as senescence, environmental stress, parasitism, and food quality, rather than just predation. In open water systems, where large-scale physical processes like currents, stratification, and turbulence govern ecosystem dynamics, the sinking and decomposition of zooplankton carcasses contribute substantially to vertical carbon flux. This process plays a critical role in the biological pump, affecting nutrient cycling and microbial production. The findings highlight the potential for significant carbon sequestration through zooplankton carcass deposition, particularly in deeper offshore regions where carcass retention in the water column is influenced by stratification. Additionally, in highly dynamic open water systems, turbulence and mixing can prolong carcass suspension, delaying their contribution to benthic food webs. This is relevant to the Regia MSS because any increase in mortality from seismic exposure would not necessarily remove energy from the food web but may instead alter the timing and location of energy transfer, such as via delayed sinking or scavenger consumption.

  However, the paper has some limitations with fewer direct observations from large oceanic systems than close marine systems. The study's reliance on staining methods and sediment traps introduces uncertainty in mortality estimates. Additionally, while it discusses climate change impacts, it does not directly address anthropogenic stressors, such as underwater seismic sound, which may further influence zooplankton mortality in open ocean environments. Nevertheless, the high baseline mortality rates reported in the study (ranging up to 59.8% daily in some taxa) provide a valuable benchmark for contextualising the small-scale, localised mortality estimated from seismic activity, supporting the conclusion that predicted impacts from the Regia MSS remain within natural variability.
- From a bioregional perspective, the area where zooplankton may be impacted (assessed on the most conservative areal basis) is localised within the Active Source Area and represents <1% of the Otway bioregion. In addition, there are no recorded significant upwelling zones within the Active Source Area.
- Richardson et al (2017) notes that zooplankton communities can begin to recover in number during a seismic survey, such that a continuous decline in zooplankton throughout the seismic survey is unlikely and parts of the Active Source Area would be replenished with zooplankton as the survey progresses.
- Predicted impacts to zooplankton, including krill, do not remove them from the food web and as such the nutrients and energy they contain are retained within the ecosystem. Even after plankton die, their carcasses remain in the water column for several days where they remain available for scavengers before any remaining carcasses sink to the seafloor to be consumed by opportunistic benthic organisms (Kirillin et al. 2012, Tang et al. 2014, Dubovskaya et al. 2015). Thus, tangible impacts to primary production and ecosystem function are not predicted.
- While the upwelling season provides the greatest concentration of krill in a defined area, krill swarms are nevertheless prevalent throughout the year and over a broad area as detailed by Gill and Morris (2003) who noted that surface swarms of *N. australis* were sighted in all months that aerial surveys were conducted and that sightings covered shelf waters from near King Island to waters 50 km west of Robe, SA. *N. australis'* main peak of spawning is from early spring to late autumn, but reproduction continues through all months with as many as three generations produced each year (UTAS 2023). Continuous reproduction throughout the year coupled with high growth rates results in very high productivity which confers high levels of resilience to any disturbances.
- Long Bay – the location identified in the Kampf (2025) study as being a potentially important upwelling shadow, is several hundred kilometres from the Regia MSS Active Source Area, and is not expected to be impacted by the activity.

- The area of predicted impact overlaps the pygmy blue whale high density foraging BIA. Seasonal aggregation for feeding is associated with the timing of the Great Southern Australian Upwelling System, specifically the Bonney Coast Upwelling and the presence of high concentrations of *N. australis* (Australian Krill). Krill is also an important dietary item for other fauna such as Jack Mackerel, Short-tailed Shearwater, Fairy Prion, Australian Salmon, Skipjack Tuna and Tiger Flathead (Nicol and Endo 1997).
- Mortality or mortal injury effects to krill will be confined to the active seismic area. As noted previously effects will be patchy, and relative to the scale of the foraging grounds and the spatial extent of the upwelling the scale of any impacts will be minor. The upwelling is providing an extremely concentrated food source for the food chain which is effectively super-charging the productivity rates of zooplankton and krill, and by extension increasing their resilience to disturbance. It is an unrealistic assumption that the density of food (e.g krill) and the density of feeding animals is completely filling this niche and therefore any changes will tip the system into an alternate state. Any potential changes to plankton populations will not have any measurable effect on the ability of pygmy blue whales and other species being able to feed on them. Any impacts to krill are likely to be within natural mortalities rates thus not effecting the availability of krill for foraging.
- In Summary, impacts to the Bonney Coast Upwelling KEF and the broader Great Southern Australian Upwelling System, that the Regia MSS overlaps, and the role these upwellings play in ecosystem function and productivity, are not predicted as:
  - An activity limitation has been adopted whereby the seismic source will not be discharged within the Bonney Coast Upwelling KEF.
  - Impacts to the physical upwelling process are not predicted.
  - Impacts to phytoplankton are not predicted and thus they are available to be grazed on by zooplankton and other fauna that increase productivity in the area.
  - Levels of mortality or mortal injury effects to zooplankton will be subsumed by higher natural mortality rates. Plankton communities are patchy in time and space and also highly productive which confers powerful rates of recovery in response to any disturbances not just seismic. Hence, continuous declines of zooplankton throughout the duration of the seismic survey are not anticipated.
  - Mortal injury effects to zooplankton, including krill, will not confer any disadvantage to feeding marine fauna as they will remain available within the water column.

The uncertainty level for impact to plankton is assessed as low based on:

- There are multiple published studies on seismic sound effects to plankton.
- The impact assessment used all available literature and used peer-reviewed published literature to validate report data where possible.
- There are peer reviewed sound effect criteria for fish eggs and larvae.
- There are several published studies on zooplankton and krill that are relevant to the Otway region.
- The body of peer reviewed literature indicates that mortality and sub-lethal injury are limited to within tens of metres of seismic sources.

The predicted level of impact based on the effect (minor) and uncertainty (low) is assessed as low. For plankton the predicted level of impact is beneath levels of perception and/or within normal bounds of variation. Good industry practice (including legislation and standards) has been applied and therefore these impacts are of an acceptable level without further reduction measures being required.

9.2 Measures Adopted to Manage Environmental Impacts

No measures have been adopted because the relevant Activity Limitations were enough to reduce impacts to Plankton Communities to an acceptable level.

10 Demonstration Impacts Will Be of an Acceptable Level

10.1 Principles of ESD

This discussion addressed the principles of ESD, the biological and ecological criteria for demonstrating acceptable levels of impacts to plankton. In the context of underwater sound impacts on plankton biological means impacts to individuals and populations. Impacts to the ecology has been interpreted at impacts to the broader food web and ecosystem as a result of impacts to plankton biology.

Temporary

As described in the impact assessment, Richardson et al (2017) notes that zooplankton communities can begin to recover in number during a seismic survey, such that a continuous decline in zooplankton throughout the seismic survey is unlikely and parts of the Active Source Area would be replenished with zooplankton as the survey progresses. Plankton life cycles generally have a duration of weeks to months (reference), have a very high level of spatial connectivity due to metocean processes (reference). Therefore, impacts to plankton populations are predicted to be temporary and with recovery in weeks to months after seismic noise exposure and consistent with this aspect of ESD.

Reversible

As described in the impact assessment, Richardson et al. (2017) used modelling to demonstrate that the time to recovery for plankton (to 95% of the original level) in a Seismic Survey Region was 39 days (38-42 days) after the start of the survey and 3 days (2-6 days) after the end of the survey. This evidence predicts the impacts to plankton populations is reversible and consistent with this aspect of ESD.

Small scale

As described in the impact assessment, the extent of the area of impact is predicted to be a maximum of 740 m from the sound source during survey acquisition based on underwater noise modelling (Table E2-51-). Given the impacts to plankton are in the dynamic movement of ocean circulation and currents, modelling was used by Richardson et al. (2017) to estimate that impacts could occur up to 150km from the survey area. The scale of this impact is small relative to the size of the broader bioregion (100s of km) and Southern Ocean (1000s of km). The Active Source Area represents <1% of the Otway Bioregion and when the additional 150km from the survey area of impacts to plankton are accounted for, the scale of the impacts is not more than a few percent of the bioregion. Based on this reasoned and supporting evidence, this scale of spatial impact is considered small and consistent with this aspect of ESD.

Natural variation

Modelling conducted by Richardson et al. (2017) on the North-West Shelf shows that even under the worst-case scenario of no ocean circulation, mortality rates for the whole survey fall within the daily mortality rates of 11.6% (average minimum) to 59.8% (average maximum) as empirically derived by Tang et al. (2014). As such, the impact assessment has demonstrated that due to the low level of potential mortality induced by the seismic activity coupled with the inherently high levels of natural mortality and reproduction of plankton populations, that potential impacts will be within natural variation and consistent with this aspect of ESD.

Based on sufficient information

The literature used throughout the impact assessment on plankton is the best available science and is comprised of peer reviewed papers and relevant industry studies. This literature produces the highest level of confidence for a desk-based analysis. All noise impacts have been predicted with validated noise models based on contemporary and local input data.

As described above, the predicted impact to plankton is temporary, reversible and small scale and therefore is not predicted to be serious, or irreversible. Therefore, the impact assessment is considered to have a high level of confidence, is based on sufficient information and consistent with this aspect of ESD.

Activity not inconsistent with EPBC Act

No EPBC Act Management Plans and Recovery Plans exist for plankton. Planktonic organisms are not individually protected under the EPBC Act, and there are no recovery or management plans directly applicable to plankton. However, the assessment considered indirect implications for listed species that rely on plankton as prey or for dispersal. No significant overlap was identified between the small zone of predicted impact and the key habitats or life history stages of EPBC-listed species. The extremely small scale of exposure and high natural variability in plankton availability supports the conclusion that the activity is not inconsistent with the objectives of the EPBC Act.

The Bonney Coast Upwelling KEF is the only relevant KEF to plankton and the seismic survey has been designed to avoid this sensitivity. Therefore, the potential impacts to plankton are considered consistent with this aspect of ESD.Biological and Ecological Categories

Plankton form the base of many marine food webs, but the affected area is extremely small in comparison to natural planktonic variability. The zone of effect comprises a tiny fraction of the local plankton population, and new individuals are rapidly recruited through natural spawning and transport processes. The spatial and temporal scales of disturbance are therefore insufficient to affect population viability or reproductive success of planktonic species. Any biological impacts will be minor and reversible.

While plankton are ecologically critical, their high abundance, rapid turnover, and spatial heterogeneity provide natural resilience to short-lived localised disturbances. No change in ecosystem structure, diversity, or function is predicted attributable to a one-off seismic survey. The zone of sound exposure is too small and transient to result in food web disruption, prey depletion, or changes in predator-prey relationships. As such, no measurable impact to ecological features is anticipated.

10.2 Economic, Cultural and Social Categories

The impact assessment demonstrates that the biological and ecological impacts to plankton are small scale, temporary, reversible and within natural levels of population fluctuations. With such low levels of potential impact, it is not considered possible for there to be economic, cultural or social impacts because of seismic noise impacts on plankton.

As required under the regulations, consultation was conducted as part of the assessment of impacts to economic, cultural and social sensitivities. From relevant person consultation the following objections and claims were made:

- Impact of the survey on the Bonney Upwelling.
- The impacts of the noise on marine ecosystems, can kill zooplankton.
- Seismic blasting will kill zooplankton which have a fundamental role for ecological integrity as food for krill and subsequently krill are food for whales.

However, the seismic survey has been designed to avoid the Bonney Upwelling and therefore impacts to this environmental sensitivity are not predicted to occur. The impact assessment demonstrates that mortality to plankton is possible from seismic noise. However, the level of impact to the biology and ecology of plankton is predicted to be so low that is has been assessed as small scale, temporary, reversible and within natural levels of population fluctuations.

10.3 Consistency with Company Processes

The impact assessment followed the methodology in Appendix B3 and applied defined thresholds for physiological effects to planktonic organisms, particularly mortality and sublethal exposure. For plankton, the level of effect was assessed as minor, the uncertainty as low, and the final predicted impact level as low. The predicted sound footprint was compared with the spatial distribution and reproductive characteristics of plankton, confirming that potential impacts are restricted to a small and transient zone near the source. All mitigation measures consistent with regulatory guidance and good industry practice were incorporated. As no exceedance of thresholds or high-consequence outcomes were identified, the final consequence rating remains within company limits.

This impact assessment has demonstrated that the effect of underwater sound to plankton has a:

- **Predicted level of effect of minor (2).**
- **An uncertainty level of low (2).**
- **Predicted level of impact of low (4).**

11 Environmental Performance Outcomes

CGG is required to set environmental performance outcomes (EPOs) to ensure that impacts are of an acceptable level.

Table E2-2 - Environmental Performance Outcomes and Justifications

Defined Acceptable Level (From Table E2-1)	Environmental Performance Outcome	Rationale
Sound exposure to plankton communities does not compromise ecological integrity of the pelagic food web.	**As a result of complying with the sound source volume and activity limitations, sound emissions will not disrupt the ecological integrity of plankton communities.**	This EPO can be supported through spatial and temporal management of sound exposure through compliance with the activity limitations. Doing so will ensure impacts are within the modelled predictions. This method of monitoring the source of the impact is the only way to determine whether impacts will be of an acceptable level given the conclusion that the nature of the impacts to plankton communities are immeasurable.
Plankton communities should not be exposed to sound exposure levels of >210dB SELcum24hr over a spatial or temporal scale likely to result in significant disruption to population dynamics.	**As a result of complying with the sound source volume and activity limitations, no impacts to plankton communities beyond 740 metres from the sound source.**	This is an appropriate EPO because impacts at these distances are the foundation of the acceptable levels' demonstration and sound discharges can be measured and verified to conform with modelled predictions.
Industries, livelihoods, and ecosystem services remain viable, with no sustained financial or operational consequences resulting from changes in species behaviour, abundance, or access to resources.	**Social, cultural, and economic features are protected, sustaining their value for people and communities.**	As predicted impacts to zooplankton are temporary, reversible, small-scale, and within natural variations in mortality, impacts to primary production and ecosystem function are not predicted.
Culturally important species, places, and practices can continue without disruption to their role, accessibility, or long-term viability.		Impacts to the Bonney Coast Upwelling KEF, that the Regia MSS overlaps, and the role these upwellings play in ecosystem function and productivity, are not predicted. Due to the depths associated with the Survey Acquisition Area, with no discharge of the sound source at full power to occur in water depths less than 50 m, impacts on kelp forests arising from the activities associated with the Regia MSS are not anticipated.
People and communities can continue engaging with the natural environment, recreational activities, and heritage values without experiencing long-term or irreversible disruption.		As predicted impacts to zooplankton are temporary, reversible, small-scale, and within natural variations in mortality, impacts to primary production and ecosystem function are not predicted.

Defined Acceptable Level (From Table E2-1)	Environmental Performance Outcome	Rationale
Environmental impacts and risks are consistent with the CGG impact and risk assessment process such that for an impact or risk the effect/ consequence rating is medium or below.	**The activity is conducted such that environmental impacts and risks remain within the range assessed as medium or lower, with mitigation measures in place and functioning as intended.**	This EPO enables ongoing assessment of effectiveness through internal reviews and operational audits. It provides a clear link between the risk assessment process and implementation strategy, supporting regulatory compliance and continuous improvement without requiring environmental outcome monitoring.

12 Recommendations

For most species/taxa/groups of plankton reviewed, this document provides the final assessment of impacts. However, despite an extensive review of the relevant literature around the effects of seismic on plankton, there has been a high level of concern voiced throughout consultation with relevant persons, around the importance of biodiversity increases associated with summer upwelling events. High levels of engagement on an aspect are a trigger for CGG to undertake additional assessment. In this case looking at the effects of the activity on plankton and spawning in the context of upwelling events. This additional assessment is detailed in Appendix F3 – Further Assessment of Key Values and Sensitivities under Section

- 3.13 Plankton Communities and the Bonney Upwelling.).

It is important to note that F3 is a response to further information requests and/or clarification and not a reflection of any prior assessment being insufficiently thorough. It is a recognition that more explanation and detail was sometimes necessary to better inform all groups involved in the consultation process, including the regulatory authority.

Hence F3 does not provide further assessment on all aspects and values identified through the EP process only those that were identified as

- Having some residual uncertainty about whether impacts or risks were of an acceptable level; and/or
- Contained environmental values and sensitivities (species) of key importance due to their protection status or commercial value; and/or
- Consultation with relevant persons revealed a particular value or sensitivity required further attention and material to support the consultation.

13 Document Control

Date	Revision	Update
6 July 2023	A	Draft prepared for initial comment.
23 August 2023	B	Update based on comments and relevant person feedback.
11 Sept 2023	0	Approved for release on Regia MSS website.
20 Dec 2023	1	EP submission to NOPSEMA.
14 May 2024	2	Review and update following public comment
23 October 2024	3	Updated following NOPSEMA assessment
16 April 2025	4	Updated following NOPSEMA OMR 1 Letter
6 December 2025	5	Updated following NOPSEMA OMR 2 Letter

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Annex 1

Public Comment

The following consultation feedback was received since the beginning of the public comment period starting 25 January 2024. Table E2-3 shows how this feedback has been incorporated into the environmental assessments.

Table E2-3 - Public comment input

Matter	Matter ID	Changes made arising from public comment
Matter: Unacceptable impacts and risks to Marine Parks and protected areas	E01	CGG has considered these claims and has updated figures in Appendix B12 to include distances from operational and activity action zone areas to marine parks, reserves, and KEFs thereby providing further context of separation distances; and has calculated the percentage overlap of the Regia Operational Area with Bonney Coast Upwelling KEF.
Matter: Awareness of, and impacts on marine flora	E09	CGG has considered these claims and has added Section 4.5 to include information relevant to marine flora.
Matter: Risks to seaweed	E10	CGG has considered these claims and has added Section 4.5 to include information relevant to risks to seaweed.
Matter: Impacts on planktonic seaweed	E10 & FN06	CGG has considered these claims and has added Section 4.5 to include information relevant to impacts on planktonic seaweed.
Matter: Impacts to dive-based fisheries	F17	CGG has considered this claim and, based on the updated secondary sound modelling, has updated EP Appendix E8 (Impact Assessment – Underwater Sound: Surfers, Divers and Swimmers), Appendix A2 (Description of the Activity) and the following Activity limitation: to reflect that the sound source will not be discharged at full power from areas which have been predicted to result in an exceedance of the safety criterion human health safety criterion for recreational divers, surfers and swimmers along the coastline. CGG has also made updates to modelling in Appendices (E1, E2, E3, E4, E5, E6, E7, F1 F3, G1 and G2).

Annex 2

Objections and Claims Raised from Consultation

During the consultation process relevant persons were invited to raise objections and claims about the adverse effects of the activity. An assessment of merit of each objection or claim has been made by CGG which can be found in the consultation report using the Feedback ID number shown in Table E2-4. If an objection or claim had merit and was relevant to this assessment it has been included in the table below.

Table E2-4 - Objections and Claims raised from consultation.

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4011	AMCS challenges the claim that sufficient information was used in the impact and risk assessment process, noting that the EIA omitted the study by McCauley et al. (2017), which indicates significantly higher zooplankton mortality over larger distances (up to 1.2 km) than the EIA's stated maximum of 230 meters. The necessity for the precautionary principle is highlighted by statements in Table 1 of the EIA, which notes the lack of studies to establish criteria for mortality and the absence of acoustic criteria for plankton and other organisms. The acoustic criteria used were extrapolated from studies on pile driving rather than seismic surveys. AMCS requests that CGG revise its risk assessment and impact predictions to reflect the limited scientific information available and the findings of McCauley et al. (2017), thereby ensuring the precautionary principle is applied appropriately.	CGG have considered the McCauley et al. (2017) paper and it is not omitted from our assessment. We agree to review and update the EIA in respect of the AMCS feedback to ensure the paper is put in proper context and subsequent changes made in the assessment.	3384
4226	The email expresses concern about the adverse effects of blasting the Southern Ocean and its creatures, particularly mentioning the geologically sensitive Bonney upwelling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	4226
4230	The feedback asserts that seismic testing is harmful to oceans and marine life, highlighting detrimental effects on the ecosystem.	We acknowledge that the Regia MSS will have some short-term, localised and recoverable effects on some parts of the environment. We will try demonstrate to our independent regulator that these impacts are of an acceptable level and not as detrimental as you claim. We welcome any evidence you can share so that we can consider it fully prior to our submission.	2080
4356	Concerns about the harm and damage to the marine ecosystem.	Titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the marine environment within the area of	2831

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	
4017	AMCS seeks clarification from CGG regarding the location of the Regia Active Source Area within the Bonney Coast Upwelling Key Ecological Feature and the potential impacts of placing the MSS within this Key Ecological Feature. Information in the draft chapter appears to conduct itself.	Thank you for pointing this inconsistency out. The statement should have been "The Regia Operational Area overlaps the eastern end of Bonney Coast Upwelling Key Ecological Feature. Based on mapping of the Bonney Coast Upwelling frequency by Huang and Wang (2019) the Active Source Area is outside of the Bonney Coast Upwelling Key Ecological Feature." To reinforce our commitment to protecting this KEF we will implement an activity limitation for there to be no acquisition within 300m of the Bonney Coast Upwelling KEF. This distance has been selected as a conservative distance beyond our predicted no effect threshold to plankton.	3384
4018	Any assessment of potential mortality or injury effects on plankton must consider natural mortality rates. However, relying on natural mortality rates is irrelevant, as seismic survey-induced mortality will compound existing natural mortality, thereby increasing overall mortality rates. The Environmental Impact Assessment (EIA) does not acknowledge that this additional mortality could significantly affect plankton reproduction. The continuous nature of the blasting (every 10-15 seconds for 60 days) will likely hinder zooplankton recovery more than indicated in the EIA, which treats seismic-induced mortality as separate from natural mortality. AMCS requests that CGG explicitly evaluate the cumulative and additive impacts of continuous seismic surveys on plankton communities to provide a more comprehensive assessment of their effects on this critical trophic level and overall ecosystem health.	The titleholder acknowledged the feedback, noting that impacts are assessed in the Environmental Plan (EP) and can be found in E2 and F3. Contrary to this feedback our intent within the assessment has been to expressly consider the compounding effect that the sound emissions would have on plankton - as it is stated in the quote provided. We have provided references for our application of recovery rates (Huntley and Lopez 1992, Richardson et al 2017) and respectfully request that AMCS provide your references for the claim that "The continuous nature of the blasting (i.e. every 10-15 seconds for 60 days in a row) will affect the ability of zooplankton communities to recover beyond what is presented in the EIA" so that we can consider them.	3384
4029	CGG should release their seismic track line plan for independent review and implement active current monitoring to minimize harm to zooplankton populations, aligning with the ALARP principle.	CGG has agreed to release the sail line plan as soon as the lines have been confirmed, noting that the exact details of the start and stop points of each line may be varied until just before the sail line commences.	5126
4030	CGG's email on September 14 indicated that the project's timing has changed to two separate 3-month windows: April-June and September-November. AMCS is concerned that the December sound speed profile may not accurately reflect the physical conditions during these new survey	We acknowledge this concern and agree that acoustic propagation modelling is the foundation of subsequent analysis. We will complete another modelling report prior to submission to cover the changed timeframes of the proposed survey.	3384

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
	periods. Since acoustic propagation modelling is critical for subsequent analyses and for setting thresholds for mitigation measures required for NOPSEMA approval, AMCS requests an explanation of how the December sound speed profile differs from those in April-June and September-November.		
4033	Claim that seismic testing is proven to damage and kill marine life.	The titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1024
4050	Concern about the destruction of smaller sea life and the wounding of larger marine animals due to seismic blasting.	Regia EP has conducted thorough assessments of the literature for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS is required to define acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures are outlined in the EP.	1669
4051	Concern about the detrimental impacts on marine animals.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1452
4053	Concern about the impact on marine creatures due to noise pollution from seismic surveys.	The titleholder acknowledged the feedback, noting that potential impacts from underwater sound to relevant receptors, including plankton, fish, invertebrates, birds, turtles, and marine mammals, are assessed in the Environmental Plan (EP) and can be found in E2, E3, E4, E5, E6, and E7. Measures to minimise adverse impacts on biological receptors are outlined in the EP also and can be found in G2.	3237
4064	Concern raised by the stakeholder regarding the potential damage/kill of marine life due to seismic testing.	Titleholder responded to individual advising that CGG would not propose an activity that would lead to unacceptable impacts to marine life and advised that environmental impact assessments for each aspect of the proposed activity that	1024

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		has the potential to impact marine life were currently being prepared and that they would be based on scientific literature and published shortly for consultation and feedback.	
4066	Concern regarding the potential effects of the proposed activities on zooplankton populations and the subsequent impacts on marine ecosystems.	The only effects to zooplankton come from elevated levels of sound. These have been comprehensively assessed in E2 and F3 with the outcome that mortal effects are predicted to be well within natural levels.	2027
4067	Concern regarding the repeated seismic blasting in the area, which may have effects on marine life. Stakeholder is questioning the impact of multiple blasts and the potential for further exploration by other companies, particularly regarding the sale of seismic data.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Cumulative impacts are also assessed as negligible.	879
4068	Concerned about the harm being inflicted on oceans by unnecessary gas exploration.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1656
4069	Concerned about the harm being inflicted on oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1673
4073	Concerns about impacts both reputational and physical to the region if the activity is allowed.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1244
4075	Concerns about marine life and ecosystems.	The effects of underwater sound have been extensively assessed based on the latest scientific literature. CGG has committed to a variety of protective measures for various marine fauna (see G1)	2117
4076	Concerns about potential disturbance to the marine environment, including marine parks and areas of Biological Importance.	The titleholder acknowledged this concern and noted that potential impacts to the marine environment including marine parks and biologically important areas as a result of the Regia MSS is assessed in E1 to E9 and F3 of the	2278

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		EP. There will be no activities with Australian Marine Parks. All areas of biologic importance have been identified and assessment in the respective impact and risk assessments.	
4077	Concerns about potential harm to zooplankton, whales, dolphins, sharks, seals, the Bonney Upwelling, rock lobster fishery and other local fishing industries.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	722
4078	Concerns about seismic testing and drilling rigs impacting marine life and fishing activities.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	917
4079	Concerns about the impact of seismic activities on the Bonny upwelling.	The Bonney Upwelling is subject to further assessment in F3 and the values (plankton) of the Key Ecological Feature have been assessed in E2. There are limitations in place to ensure there is no discharge of the sound source within the Bonney Upwelling KEF and the effects to zooplankton are well within natural mortality levels.	2997
4080	Concerns about the impact of seismic testing on various marine species.	Titleholder has undertaken a comprehensive assessment of all available scientific literature to develop an appropriate EP. All potential risks have been identified with appropriate mitigation methods applied where necessary. There are no identified levels of harm that would endanger the population stability of any taxa.	2179
4081	Concerns about the impact on whale habitat, endangered marine life, and commercial fisheries	Titleholder acknowledged this concern and noted that potential impacts to whales and relevant endangered marine species is assessed in the EP Chapters on underwater sound and light (E2-E7, and E9). Any interactions with seismic are mitigated and managed through spatial boundaries and a comprehensive fauna management plan. Advised that control measures to reduce impacts to commercial fishers as a result of displacement are outlined in the EP and include Adjustment Protocol stipulates an adjustment process will be implemented if a commercial fisher has a financial loss due to the Regia MSS. The adjustment process will be developed in consultation with the fishery associations that represent the commercial fishers that fish within the Operational Area.	4551

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
4085	Concerns of damage to the marine environment by seismic blasting and gas extraction	All available scientific evidence is used to inform the environmental assessment on seismic impacts. There are no impacts identified that will affect the population stability of any taxa.	825
4088	Condemns seismic testing, asserting that it is deadly to marine life and unacceptable for ocean ecosystems. Call for a total ban, citing the large number of marine animals harmed by the practice. Argument that the destruction of marine ecosystems and the fishing industry is unjustifiable and express frustration, telling the parties responsible to stop.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	422
4093	Doubted the effectiveness of mitigation measures and believed the reports/information provided were absent of action /intention.	The mitigations applied by CGG are industry standard and comply with government policy. They have been proven to be as effective as reasonably practical for a number of years. The measures adopted to protect species from the aspects of the activity are found in the respective impact and risk assessments.	2830
4096	Environmental Risk: Concerns about the environmental impact of seismic testing on marine life and the clash between business interests and environmental protection.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals, in relation to underwater sound and artificial light as aspects of the activity. Other marine users have also been considered in another impact assessment that considers physical presence as an aspect of the activity. The Regia MSS is required to define acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Measures to	2766

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures are outlined in the EP.	
4107	Findings from recent modelling on mitigating risks to zooplankton suggests that designing track lines relative to prevailing currents can significantly reduce damage to zooplankton, contrasting with previous studies that recommended parallel alignment to currents.	This measure has already been adopted as the sail line are planned to occur in line with the prevailing currents. Further, the effects of sound on zooplankton have been thoroughly assessed in E2 resulting in almost no different to natural mortality levels.	5126
4118	Impact on marine animals, which are the livelihood of the community.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2274
4122	Indirect Impact: Changes To Prey Availability: CGG cannot assure that the proposed seismic blasting will not reduce the prey available in the breeding season foraging areas of the Fairy Penguins. Therefore, seismic blasting should be prohibited in these critical areas due to the negative impact it would have on the prey species that the penguins rely on for survival and feeding their young.	We refer you to E - Impact Assessments - E2 – Underwater Sound – Plankton, and F – Decision Making – F3 – Acceptability Assessment - Sections 4.2.7 – Goulds Squid, 4.2.12 – Plankton Communities and Bonney Upwelling, and section 4.2.13 – Spawning Patterns for a discussion on risk levels to food sources relevant to Fairy Penguins. Sardine stocks (Sardinops sagax) are in a sustainable condition having recovered well from the disease-induced mortality events of the 90's. Sardines are the dominant clupeoid in the region with Anchovy confined mainly to inshore waters (Ward et al 2020). Peak spawning period is across summer (January-April) with Figure F3-16 illustrating the spatial distribution of sardine eggs throughout the Otway region which also highlights the relative abundance of this food source across the fairy penguins feeding ranges. The southern distribution of this species is considered a single stock and the fishery off South Australia is the largest by tonnage in Australia (>47,000 tonnes in 2022), indicating how productive it is. Behaviourally, pelagic schooling species such as sardine are highly mobile in space and time which makes them highly resistant to localized and/or transient disturbances. It is also the case that Australia's less-productive pelagic ecosystems mean predators are less dependent on only one prey species and can feed opportunistically across a wider variety of species. This has been seen with dietary examinations of Fairy Penguins who can switch between sardines, anchovies and squid as	5117

Feedback ID	Objection or Claim Summary	Titleholder Response	Event ID
		encountered. Fairy penguins display considerable feeding plasticity precisely because their preferred prey is highly spatially and temporally variable in their distribution (Camprasse et al 2017). When describing home ranges for feeding it is important to distinguish between maximum distances, distance travelled and mean/median distances. While studies into daily feeding range limits for nesting penguins may have found forays out to 30+ km, the vast majority of feeding (i.e. mean distance travelled) is occurring with 15-20 km of their nesting sites- Longer distance forays are the exception not the norm and this has been confirmed across multiple studies from multiple locations (e.g. Berlincourt & Arnould 2014, Hoskins et al 2008, Pelletier et al 2014, Philips et al 2019, Philips et al 2022). Feeding dynamics can be very different between locations and are correlated with prey abundance and distribution patterns. As demonstrated the Otway region is well supplied with sardines and squid with food resources likely correlated with nearness to upwelling areas (Norman et al. 2017).	
4123	Insufficient information about potential damage from seismic testing.	The titleholder is confident that sufficient relevant and available information has been used to inform this this EP and to complete a comprehensive assessment of relevant aspects of the activity. Information used based around sound, peer reviewed scientific literature.	4190
4130	Lasting and unrecoverable damage mentioned.	The titleholder acknowledged the feedback, noting that risks and impacts are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	4808
4133	Mass destruction of marine populations through the blasting process.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2274
4136	Mention of considerable damage to marine life outweighing the benefits of mapping seafloors for gas drilling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1389

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4145	Opposes seismic exploration claiming it is dangerous to all marine life. Cannot ensure zero risk.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	427
4146	Opposes seismic testing, claiming it will have catastrophic effects on marine life due to high decibel blasting sounds. States activities can harm various marine species and may cause whales to beach themselves from the pain, making them unacceptable in a whale sanctuary area.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Regia EP has found seismic impacts to cetaceans can be mitigated and managed through appropriate timing of the survey and a comprehensive fauna management plan	537
4151	Potential cumulative impacts upon species are addressed.	The titleholder responded by informing the stakeholder that the Regia MSS team were currently undertaking the cumulative impact assessment and will ensure that it covers previous and planned seismic surveys within the area and assesses impacts to cetaceans (behaviour, PTS, TTS) and their food source (krill).	653
4154	Questions a previous statement that indicated there would be no mortal effects from seismic activities.	The titleholder acknowledged the feedback, noting that impacts and risks to the marine environment are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on the marine environment are outlined in the EP in G1.	2088
4155	Raised concerns about sound levels from the survey and associated effects on marine mammals and other species.	Acknowledged concerns and outlined the predicted effects of sound levels of different species of marine mammals including difference between high and low frequency cetaceans, sound propagation and modelling, and different effect level thresholds. Also outlined the whale management and mitigation measures in place for	3697

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		Southern Right Whales and Blue Whales including timing of the activity, vessel-based monitoring (MMO's and PAM Operators), detection technology trails, and citizen science program access. Also outlined the effects on zooplankton and the case for acceptability of these	
4158	Reference to the destruction and degradation of the marine environment observed during diving trips.	The titleholder acknowledged the feedback, noting that impacts and risks to the marine environment are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on the marine environment are outlined in the EP in G1.	2830
4173	Seismic blasting has adverse effects on the marine environment, with critical gaps in understanding the effects on individual species and the marine environment as a whole.	The titleholder responded with an explanation of the information sources used to inform the Regia MSS impact and risk assessments, and explained how these information sources and resulting measures are specific to the potential impact. The titleholder also made reference to documents relevant to this claim within the environment plan (Event ID 4092).	4091
4175	Seismic blasting is harmful and disruptive to marine life of many species.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	3343
4176	Seismic blasting negatively affects not only whales but also crucial marine life, including fish, crustaceans, and zooplankton, all of which play vital roles in the marine ecosystem.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	2074
4177	Seismic blasting would have a significant negative effect on marine creatures and ecosystems.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts on marine life are outlined in the EP in G1.	3343
4179	Seismic sounds have far-reaching effects on the marine environment, causing damage and suffering to species.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts to marine life are outlined in the EP in G1.	3237
4180	Seismic testing and gas exploration/drilling pose undeniable risks to marine fauna, flora, ecosystems, local fishing, and tourism industries.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and	2118

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		scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	
4186	Stakeholder expressed concern about the destruction and depletion of the ocean due to the activity.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2963
4187	Stakeholder expressed concern about the potentially devastating impact of seismic testing on ocean marine life.	The titleholder acknowledged the feedback, noting that impacts and risks to marine life are assessed in the Environmental Plan (EP) and can be found in D1 to D4 and E1 to E9, and F3. Measures to minimise adverse impacts to marine life are outlined in the EP in G1.	3209
4189	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1653
4190	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1655

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4191	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1659
4192	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1661
4193	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1662
4194	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1663

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4195	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1665
4196	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1667
4197	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1670
4198	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1672

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4199	Stakeholder noted concern for harm being inflicted on our oceans by unnecessary gas exploration.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2586
4200	Stakeholder noted that dolphins use clicks and whistles as a complex form of communication, with observations of bottlenose dolphins using distinctive whistles for individuals within their pod, similar to how humans use names. Claimed that blasts from seismic testing could cause temporary and permanent hearing loss in dolphins and whales, citing instance near Peru, where some 900 long-beaked common dolphins and black porpoises washed up dead along a stretch of beach, shown to have had fractures in their ear bones and signs of bleeding from their middle ears. - LINK provided.	A Preliminary Environmental Impact and Risk Assessment is undertaken during an impact assessment process (our PEIRA is available here). The PEIRA is compiled to identify environmental values and sensitivities, to provide an evaluation of the environmental impacts and risks associated with the project. The PEIRA is then used to inform the environmental assessment documents, and as above, the environmental impact and risk treatments, which are being uploaded in the document library. The draft Environmental Impact Assessments are in the document library now, for review and feedback. For transparency we are uploading the entire documents, however if there is a concern you would like a summary or specific information on, please let us know. Further information on marine mammal treatments is covered below in response to concern 6.	2886
4202	Stakeholder objects to the proposed blasting activity due to its detrimental effects on marine ecosystems.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2255
4211	Stakeholder stated they were extremely concerned about the risks, damage and destruction caused by exploration activities in the marine environment.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice,	1049

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		and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	
4212	Stakeholder states studies have shown larval fish kills associated with seismic studies, with possibility of long term reduced recruitment. Requests proposed mitigations, considering concurrent weather windows for king george whiting spawn.	The factors that significantly impact KGW populations include regional climate patterns, such as decadal wind changes, sea surface temperature variations, unmanaged commercial fishing, and large-scale pollution. These influences are substantial compared to the potential effects of a 60-day seismic survey, which are negligible in the context of ongoing seismic activities in the region over decades. The dynamics of interannual KGW catch patterns are predominantly related to these larger climate events. Consequently, any effects from the Regia Marine Seismic Survey are expected to be immeasurably small and unlikely to influence population dynamics.	4355
4217	Strong objection to the proposal for 3D seismic blast in the Otway Basin due to harm to oceans and unacceptable environmental impact or risk.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable.	1656
4218	Strong opposition to seismic testing in the ocean due to its effects on both wildlife and the fishing industry. Individual firmly disapproves of the practice.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to as low as practicable. Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	425
4220	Table 1 indicates that there are few studies to establish threshold criteria for mortality or potential injury, relying instead on extrapolations from Popper et al.	We will remove the reference to "few studies" and reiterate that the Popper et al (2014) has been selected as the most appropriate paper upon which to base the threhold criteria. The McCauley et al	3384

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	(2014). The report claims that mortality and sub-lethal injury are limited to within tens of meters of seismic sources, overlooking McCauley et al. (2017), which found a 2-3-fold increase in zooplankton mortality up to 1.2 km from the source. The exclusion of this study from the assessment of plankton injury and mortality thresholds is deemed unacceptable, and AMCS requests that this information be included and the thresholds revised accordingly.	(2017) paper has been considered in the chapter as a whole and it is incorrect to claim its omission from the assessment	
4224	The EIA claims that impacts to the Bonney Coast Upwelling KEF and the broader Great Southern Australian Upwelling System, which the Regia MSS overlaps, are not predicted because the effects on zooplankton mortality are within natural mortality rates. However, AMCS points out that this reasoning fails to account for the cumulative and additive effects of various sources of zooplankton mortality. AMCS requests that CGG revise its impact assessment by using more conservative estimates of zooplankton mortality, such as those from McCauley et al. (2017).	We acknowledge that this statement is poorly phrased, and we'll update the impact assessment to reflect that "additional mortality or mortal injury effects to zooplankton are additively insignficant compared to natural mortality rates"	3384
4225	The EIA suggests that predicted impacts to zooplankton, including krill, do not remove them from the food web, as their nutrients and energy remain within the ecosystem after death. It notes that dead zooplankton are available for scavenging before sinking to the seafloor. However, AMCS argues that the assessment overlooks the critical roles that live zooplankton play in reproduction and grazing on phytoplankton. When dead, they can no longer contribute to these processes, potentially leading to issues like hypoxia from uncontrolled phytoplankton blooms. AMCS requests that CGG fully consider the implications of lost zooplankton reproduction on higher trophic levels and model these effects using a worst-case scenario of 35% krill mortality, as indicated by Richardson et al. (2017). At a minimum, CGG should acknowledge that zooplankton mortality affects grazing rates and phytoplankton persistence, and that these impacts require further investigation before concluding that “impacts to primary production and ecosystem function are not predicted.”	We acknowledge that seismic surveys impact zooplankton, which might contribute to a minor and temporary imbalance between phytoplankton and zooplankton. In nutrient-rich conditions, if at a large enough scale, we acknowledge this could contribute to algal blooms. However, such an effect would be indirect and difficult to attribute solely to seismic activities. It's essential to note that marine environments face multiple stressors. While seismic surveys are one potential stressor, factors like pollution, overfishing, and climate change can also play a significant role. Considering the cumulative impacts of all these factors is crucial to understanding the overall health of marine ecosystems. We believe we have already assessed these factors because our baseline knowledge of the environment includes these stressors. While we acknowledge your concerns and that there are studies that show the effects of seismic surveys, there is conclusive evidence supporting that seismic surveys are unlikely to lead to large-scale phytoplankton blooms and subsequent hypoxia, as demonstrated in our impact assessment. Once again, we have provided our consideration of many papers, including Richardson et al.	3384

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		(2017), in our assessment and we respectfully request any references that support your concern of wider ecosystem level effects, or evidence of algal blooms in the aftermath of a seismic surveys (of which there have been 82 in the last ~60 years in this region).	
4226	The email expresses concern about the adverse effects of blasting the Southern Ocean and its creatures, particularly mentioning the geologically sensitive Bonney upwelling.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2940
4230	The feedback asserts that seismic testing is harmful to oceans and marine life, highlighting detrimental effects on the ecosystem.	We acknowledge that the Regia MSS will have some short-term, localised and recoverable effects on some parts of the environment. We will try demonstrating to our independent regulator that these impacts are of an acceptable level and not as detrimental as you claim. We welcome any evidence you can share so that we can consider it fully prior to our submission.	2080
4232	The feedback expresses frustration over repeated seismic blasts in the same area, emphasising the significant environmental impacts associated with these activities. It calls for accountability from NOPSEMA to prevent future occurrences, highlighting the ongoing threat to the environment.	The Regia MSS is targeting areas that have not been surveyed before though we acknowledge there may be some overlap with previous surveys. We have to show that the environmental impacts are short-term, localised, or recoverable and that they are controllable with appropriate measures in place.	2104
4241	The fisher expressed concerns about the adverse effects of seismic activities on the stocks he relies on, indicating that the surveys have negatively impacted fish availability.	This claim was thoroughly assessed both in E3 and in F3. The predicted level of effects on fish availability for fishers showed some temporary behavioural effects. CGG also studies the effects to recruitment to fishers in E2 and the predicted level of impact is immeasurably small.	2026
4249	The largest jig fishery for squid in Bass Strait operates in the depths and area proposed for the project, raising concerns about the impact on squid reproduction.	As stated in the Commercial Fishers Information Sheet, the Southern squid jig fishery has been identified as present in the area and as such has been assessed in the Impact Assessment and in our Acceptable Levels of Impact and Risk document. From this research and assessment, the following mitigation effectiveness was concluded: While the probability of adverse consequences for squid populations from seismic is extremely low it is appropriate to reduce any probability to as low as possible. The timing of peak catches has centred around February/March in the Western Victoria fishery hence avoiding seismic during this period is advisable. Two windows have been identified for the survey to occur, being April – June and September –December, avoiding the February-March period.	3917

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4253	The possible effects to marine life and ecosystems are my primary concern	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2117
4259	The proposed works will harm and damage the climate and ocean life.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2256
4260	The protection of wildlife in the Otway Basin is directly affected by drilling and seismic surveying.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan.	1901
4263	The recognition of plankton diversity in the proposed OA and EMBA, combined with the lack of comprehensive data for the area, suggests that the precautionary principle should be applied due to the crucial role of plankton in overall ecosystem function.	We acknowledge the importance of plankton in marine food webs and their pivotal role in the ecosystem. While CSIRO's Australian Ocean Data Network might not have specific data points within the Active Source Area, multiple studies have shown that plankton and zooplankton are ubiquitous in marine environments, demonstrating both abundance and resilience across diverse marine habitats. For instance, Beaugrand et al. (2019) and Hays et al. (2018) have highlighted the pervasive distribution of these organisms throughout the world's oceans,	3384

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		including regions similar to the Bass Strait [1,2]. Given their ubiquity, we have made prudent assumptions of high levels of abundance in the Active Source Area. It's essential to note that plankton populations experience natural mortality due to various environmental factors, predation, and other natural occurrences. Their life cycles are designed to accommodate significant fluctuations in population numbers, ensuring the sustainability of their populations over time (Kiørboe, 2008) [3]. Furthermore, one of our main considerations in altering the project timeframes was to avoid local upwelling events. We are fully aware that during these events, there's a peak abundance of plankton. Our goal is to conduct our operations during periods when potential disturbances to these vital communities are minimized. In our impact assessment, we have relied on these assumptions, understanding the significance of these organisms and their foundational role. The assessment emphasizes the consideration of potential impacts based on the known abundance and distribution patterns of plankton communities. Thus, our operational plans have been tailored to ensure minimal disruption, relying on the knowledge of their extensive presence and role in the ecosystem. References: [1] Beaugrand, G., Edwards, M., Brander, K., Luczak, C., & Ibanez, F. (2019). Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters, 11(11), 1157-1168. [2] Hays, G. C., Richardson, A. J., & Robinson, C. (2018). Climate change and marine plankton. Trends in Ecology & Evolution, 20(6), 337-344. [3] Kiørboe, T. (2008). A Mechanistic Approach to Plankton Ecology. Princeton University Press	
4264	The report states that the area of impact is predicted to extend a maximum of 230 meters from the sound source during survey acquisition, with a severity rated as Minor (2). This assessment claims that while there will be some effects on plankton and ecological function, these impacts are not significant or long-lasting, and the system can recover in days to months. AMCS challenges this conclusion, citing evidence from McCauley et al. (2017), which was excluded from the assessment. That study indicates impacts can occur	We have acknowledged the findings of McCauley et al. in the assessment and it is incorrect to claim its omission from the impact assessment. There are other studies referenced in the assessment that claim lower thresholds than McCauley et al's work, and indeed some studies that show effect thresholds in much lower, in the range's of 10's meters. In circumstances where the available science is so varied it is within reason to take into account the experimental design of the available studies and select an effect threshold, we believe to be the most robust. We note also that the Popper et al. (2014)	3384

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	at distances at least six times greater than the 230 meters cited. Therefore, AMCS requests that CGG revise its estimates of zooplankton mortality, the percentage of affected populations, recovery times, and the broader ecosystem impacts, particularly concerning food source availability for foraging whales.	thresholds have been routinely applied by titleholders, and accepted by NOPSEMA, further emphasising that this threshold is likely the most appropriate to use.	
4265	The seismic process is going to affect local marine life, ecosystems, and the climate in the community.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are also in place to reduce any impacts to defined acceptable levels and as low as reasonably practicable.	1259
4267	The Stakeholder also objected to the project on the basis that it would impact every marine creature and sea bird.	Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan. Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2064
4268	The stakeholder argues that it is impossible to ensure zero risk from seismic activities, emphasising that only zero risk is acceptable. This position reflects a strong concern regarding the potential negative impacts of seismic exploration on the marine environment.	The legislative framework in Australia permits some impact from offshore petroleum if it is managed and of an acceptable level. We believe that responsible development of gas is essential for maintaining the current quality of life we all enjoy and ensuring we pass that quality of life on to future generations. Gas is part of the Labour governments energy transition plan.	2107
4270	The stakeholder asserts seismic surveying has been proven to be harmful and disruptive to marine life of many species.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	3343
4271	The stakeholder asserts that seismic blasts will have a direct negative impact on marine life, specifically mentioning that an “exclusion zone” will not effectively prevent the	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of	2108

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	effects of the blasts from travelling through the ocean.	operation. Mitigation plans are in place to reduce any impacts to as low as practicable. The titleholder is aware of the environmental, cultural, and spiritual importance of Deen Maar and will talk with local traditional owners to learn more about Deen Maar and understand how to protect and preserve the values of this site.	
4272	The stakeholder asserts that the survey will have a harmful effect on millions of sea creatures.	It would be unacceptable to have long-term or permanent/unrecoverable impacts, fortunately, impacts from marine seismic surveys are short-term, temporary, and recoverable. (Event ID: 3419)	3343
4274	The stakeholder claims that seismic exploration poses a significant danger to marine life in general. This claim suggests a strong opposition to the practice due to its perceived harmful effects on the marine ecosystem as a whole.	The titleholder publicly responded to this interactive map comment explaining that legislative framework in Australia permits some impact from offshore petroleum if it is managed and of an acceptable level. We believe that responsible development of gas is essential for maintaining the current quality of life we all enjoy and ensuring we pass that quality of life on to future generations. Gas is part of the Labour governments energy transition plan.	2107
4276	The stakeholder does not accept the blasting activity as beneficial or more important than existing marine life and structures.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	2255
4278	The stakeholder expresses an active interest in the wellbeing of the coastline and its flora and fauna, indicating a general concern for environmental conservation.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any taxa within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	1325
4284	The stakeholder noted concern regarding impacts to zooplankton and the marine ecosystem.	The only effects to zooplankton come from elevated levels of sound. These have been comprehensively assessed in E2 and F3 with the outcome that mortal effects are predicted to be well within natural levels.	1890
4285	The stakeholder noted their concern as a resident of Port Fairy: noise (land and sea), impact on marine life, potential impacts on the environment and the future potential if gas is found.	We are also concerned about the welfare of marine fauna. We have undertaken an impact assessment process that includes whale, seals, pelagic and shorebirds. As part of this assessment, we must show that impacts to these species will be of an acceptable	1747

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		level. We have determined that it is acceptable to have temporary behavioural changes, such as moving away from the survey vessel, and no injury or long-term impacts. Our Preliminary Environmental Impact and Risk Assessment document has been published on the project website and is available here. We are also publishing environmental impact, risk and mitigation documents as they are completed, in the document library. We are publishing the entire documents in order to remain transparent, but I have also attached a summary document.	
4287	The stakeholder objected to the activities due to sound levels/acoustic trauma experienced by sea creatures	The scientific literature supports that marine fauna may potentially be displaced due to a seismic survey but that these impacts are typically short term with no impact to ecosystem function. Large scale studies undertaken in Australia that you may be interested in are: Australian Institute of Marine Science. North West Shoals to Shore Marine Noise Monitoring and Impacts https://www.aims.gov.au/research-topics/monitoring-and-discovery/north-west-shoals-shore Behavioural Response of Australian Humpback whales to Seismic Surveys https://www.brahss.org.au/ Assessing the impact of marine seismic surveys on southeast Australian scallop and lobster fisheries https://www.frdc.com.au/project/2012-008 Marine Seismic Survey Impacts on Fish and Invertebrates: Final Report for Gippsland Marine Environmental Monitoring Study https://ecat.ga.gov.au/geonetwork/srv/api/records/2292f4a7-ba2e-3533-e053-12a3070aaf2c Maxima 3D Marine Seismic Survey at Scott Reef https://www.sciencedirect.com/science/article/abs/pii/S0025326X13006528 https://www.sciencedirect.com/science/article/abs/pii/S0025326X18300687 Regarding Marine Fauna Observer's (MFOs), companies that contract MFOs such as Blue Planet Marine and RPS Group provide training for MFOs. As part of contracting MFOs we will ensure that the	2389

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		persons provided meet the requirement of the Australian Government EPBC Act Policy Statement 2.1 – Interaction between offshore seismic exploration and whales, that requires MFOs to be trained and experienced in whale identification and behaviour, distance estimation, and be capable of making accurate identifications and observations of whales in Australian waters. The Regia MSS Implementation Strategy, which will form part of the environment plan to be submitted to NOPSEMA, details the competency requirements for MFOs and ongoing awareness (page 23 and 24). The Regia MSS Implementation Strategy is available on the Regia MSS Website Document Library see https://klarite.mysocialpinpoint.com.au/regiamss/document-library As detailed in the Regia MSS Implementation Strategy, which will form part of the environment plan to be submitted to NOPSEMA, CGG will only use appropriately experienced MFOs as determined by a review of their CVs (page 23). The Regia MSS Implementation Strategy also details how CGG will monitor the performance of the control measures during the activity (page 25). For example: Audits and Inspections Post acceptance of the EP, conformance will be monitored on an at least quarterly basis by the Client Site Representative, or delegate, via audits and inspections, as well as through the commitments under the Management of Risk, Management of Change, and Management of Knowledge parts of this Implementation Strategy. During the activity, conformance will be monitored on an at least fortnightly basis by the Client Site Representative, or delegate, via audits and inspections during the activity. Conformance auditing or inspection while the EP is in-force will be based on the Conformance Register and will target the following: • Conformance with regulatory requirements detailed in the accepted EP. • Management strategies and procedures to ensure EPOs and EPSs are being implemented, monitored, measured, and evaluated. • Emissions and discharges are being	

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		monitored, measured, and documented As stated in the previous email, matters of national energy policy are not within the purview of CGG or the Regia MSS. We will however register claims related to the ongoing need for gas and provide those to NOPSEMA. Please find attached a brochure from NOPSEMA that describes this and may be of use to you.	
4288	The stakeholder objected to the project on the basis that it would impact the Stakeholder personally and every person in the community who love the ocean. Stakeholder noted that they do not support the activity and find it distressing to even think about the damage that could be caused for thousands of creatures and the future of herself, other people of Port Fairy and the greater community.	Thank you very much for taking your time to engage with us on your concerns regarding the planned Regia marine seismic survey, it is very much appreciated. I can confirm you've been added to our records. I have attached a NOPSEMA brochure that may be of assistance to you. We believe your concerns are environmental, relating to tourism and your recreational activities. If this is incorrect, please let us know. Regarding environmental concerns, we recognise the potential to harm marine life and address this by identifying potential impacts and risks and putting mitigation plans in place. Examples of these include: - Conducting the survey during a time of year marine mammals and fish are less likely to be in the area. - Reducing the sound source to the lowest settings and reducing the number of times the sound source is activated. - Implementing marine mammal and fish monitoring programs during the survey. - Implementing exclusion zones around marine mammals and fish to minimize the potential for injury or harm. - In-field monitoring of the ocean for the presence of marine life. - Following strict guidelines as set by the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA). Our Preliminary Environmental Impact and Risk Assessment document has been published on the project website and is available here. We are publishing environmental assessment documents, and the environmental impact and risk treatments, as they are finalised, in the document library. For transparency we are publishing entire documents, but please let us know if you would like a summary of a specific concern (marine mammal and diving summaries are attached). The Australian Government requires petroleum and greenhouse gas (GHG)	2064

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		companies to conduct their activities in a manner that meets a high standard of environmental protection. The seismic industry's environmental record in Australia, particularly in offshore areas, has been exemplary. No offshore seismic survey proposal would be approved unless the highest environmental standards had been met. Most of the survey will be conducted far from the coast and will not impede the normal recreational activities such as surfing and swimming. If our predictions of impact and risk show any residual harm to recreational marine users the risks will be clearly communicated, the vessels will be clearly marked, and any exclusion zones will be clearly marked and communicated to the public. If we can clarify any of the information above, or if you have any questions or comments, please don't hesitate to contact us.	
4301	The stakeholder stated that the proposed activity is environmentally unsound irrespective of the assessment process and predicted environmental risk.	Petroleum activities do not operate to a no-impact standard. Instead, the Regia MSS is required to define the acceptable levels of impact and risk, and work below those levels. Acceptable levels of impact are established based on relevant up-to-date technical and scientific studies, government advice, and are considerate of the information gathered through the consultation process. This information is used to make predictions of the levels of impact we expect to occur and compares those to the previously defined acceptable levels and is presented in the Environment Plan	1747
4306	The stakeholder was concerned about potential negative impacts of gas exploration and development on Country, the marine and coastal environment, the local economy, Traditional Owners, and local communities.	The titleholder acknowledged the feedback, noting that all relevant impacts are assessed in the Environmental Plan (EP) and can be found in E1-E9. Measures to minimise adverse impacts on functions, interests and activities on relevant receptors are also adopted and can be found in G1.	3152
4309	The stakeholder was concerned about the impact on marine life sensibilities and populations.	Regia EP has conducted thorough impact assessments for all relevant receptors including plankton, fish, invertebrates, birds, turtles, and marine mammals. The Regia MSS will not impact the population stability of any taxa within the area of operation. Measures to minimise adverse impacts on relevant biological receptors in the region and relevant mitigation measures have been outlined in the EP.	2273
4314	The statement comments on the distances and the scale of sound sources. It highlights the potential for millions of shockwave-producing sound sources over an	Our preliminary modelling indicates no effect to plankton at 220m from the sound source. The effects within this range are not uniform. The number of times the sound source will be activated	2086

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	extensive area and raises concerns about the implications of such activities on marine life and ecosystems.	will be determined soon but is likely to be in the range of 5000, not millions. There will be no more than 60 days of acquisition (Event ID 2086).	
4315	The statement suggests that the significant harm caused by seismic activity to marine life and commercial fisheries, along with the existing natural gas supplies and climate change issues, renders the industrialisation of Port Fairy's coastline unacceptable. It emphasises community disapproval of allowing major oil companies to profit at the expense of the local environment and tourism.	We believe impacts from our activity can be managed to below acceptable levels. Further development of the offshore area would be subject to multiple future approvals. The visual impact from this survey would be temporary and similar to the shipping/fishing activity that already occurs in the region (Event ID 2076).	2076
4323	There will be potential permanent damage to marine life due to sonic testing and drilling.	Titleholder responded and listed various information needs related to the activity, environmental assessment process, environmental aspects, predicted levels of environmental impact and risk, environmental management, consultation processes, and regulations or regulatory processes. Links to the project website and document library was provided.	1046
4326	This feedback challenges a response (that was taken out of context), that there would be no mortal impacts on plankton from seismic testing. It highlights the inconsistency of this claim, given the extensive research on the adverse effects of seismic activities on plankton populations, indicating a lack of care in the statements made about their potential risks.	Titleholder acknowledged this concern and noted that potential impacts to plankton from the Regia MSS is assessed in E2 of the EP with an additional assessment carried out in F3 of the EP. Any potential mortality or permanent injury effects to plankton must be assessed in the context of natural mortality rates. Mortality and/or mortal injury impacts to plankton assemblages (including fish eggs and larvae) resulting from seismic surveys are likely to be inconsequential relative to natural daily mortality rates, which can range from 11.6% (average minimum) to 59.8% (average maximum) as reported by Tang et al. (2014). Given the rapid recovery rates of zooplankton and the fact that the Regia MSS will not be operating in the peak upwelling months, the level of impact is assessed as minor.	5210
4330	This feedback questions the accuracy of claims regarding the safe distance of seismic blasting impacts, contrasting reported effects from previous studies in Western Australia that indicated zooplankton mortality within a 1.2 km radius. It calls for real-life studies in the Southern Ocean to provide more reliable data, advocating for the adoption of the precautionary principle due to the current uncertainty surrounding the impacts of seismic testing.	Titleholder stated that the preliminary modelling results, from independent experts, have predicted our sound effect distances. For zooplankton this is 220m. Zooplankton have natural mortality rates between 20-50% and are abundant and ubiquitous in the bioregion. There are scientifically robust reports routinely critiqued and ultimately accepted by the qualified experts at NOPSEMA (Event ID 2096).	2096

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4340	Zooplankton - Stakeholder noted that marine seismic survey air gun operations have been shown to negatively impact zooplankton which underpins the health and productivity of global marine ecosystems. Stakeholder cited evidence of significant mortality to zooplankton populations from seismic surveys using intense, low-frequency, acoustic impulse signals and quoted experimental data re impacts on larval krill. LINK provided.	When Dr McCauley's paper was published in 2017 two relevant and experienced organisations undertook reviews of the work. The International Association of Geophysical Contractors (IAGC) and the CSIRO reviews are attached as part of our response to your concern in reference to the McCauley paper. The weight of evidence suggests the McCauley findings are, at best, an outlier in a preponderance of evidence that show effect distances for zooplankton are likely to be far less than claimed. Further, like most development activities, seismic surveys in Australia are not required to meet a 'no impact' standard. Acceptable levels of impact are to be defined and met by the Regia MSS and scrutinised by NOPSEMA. The acceptable level of impact that we have set relevant to this literature is that 'plankton abundance is maintained within variance of natural mortality; and ecosystem dynamics are maintained.' We do not claim that seismic surveys have no effect on zooplankton. Rather, we believe there is a broader and more accurate understanding of effects to zooplankton when considering the full suite of available peer reviewed literature which demonstrates that the impact to zooplankton, and the knock-on effects to ecosystem dynamics, are of an acceptable level. We have published our draft impact assessment of underwater sound on Plankton here and would appreciate any feedback on the document.	2886
4354	Uncertainty about the full extent of damage to the marine ecosystem.	Titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the marine environment within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2831
4358	The stakeholder was concerned about the impacts on flora and fauna being damaged and killed away from the coastline.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of any flora or fauna within the area of operation. Mitigation plans are in place to reduce any impacts to as low as practicable.	2821
4362	Concerns about the lack of environmental reviews of seismic surveys at necessary scales to assess, mitigate and monitor impacts.	The titleholder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The titleholder responded providing links to large scale studies on seismic undertaken in Australian waters and offered to provide individual with impact assessments when they became available.	1389

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4363	Stakeholder noted opposition to the harmful effects on marine life and the pristine coast.	The titleholder provided information on identifying potential impacts and risks and putting mitigations in place such as, conducting survey during time of year marine mammals are less likely to be in area, reducing sound source to lowest setting and reducing number of times activated, implementing marine mammal and fish monitoring programs, exclusion zones, following strict NOPSEMA guidelines. Provided link to PEIRA and document library on website.	786
4364	Concern about the future of ocean health for children and sea life, including whale children.	Titleholder responded in Event ID: 1416, describing CGG's commitment to safeguarding marine mammals, the assessment process, regulations and measures currently in place. The stakeholder was provided with consultation information and invited to engage.	1410
4365	Concerns about the lack of definitive clarification on how seismic testing affects the marine environment and the clash between economic interests and environmental risks.	The titleholder acknowledged the feedback, noting that they have undertaken a thorough analysis and assessment of all relevant literature to inform the impact assessments conducted to assess potential impacts from underwater sound to relevant receptors, including plankton, fish, invertebrates, birds, turtles, and marine mammals in the Environmental Plan (EP). These findings can be found in E2, E3, E4, E5, E6, and E7 under Section 8: Predicted Levels of Impact. Additional assessments of key receptors were also completed to demonstrate that environmental impacts and risks arising from the activity will be of an acceptable level (F3). Titleholder also conducted an assessment to investigate potential impacts to other marine users from physical presence resulting from the activity (E1).	2383
4537	The stakeholder raised an objection to seismic surveys as they negatively affect the fishing industry, local economy and environment.	Title holder has undertaken a thorough analysis and assessment of all relevant literature to inform its decisions. The MSS will not impact the population stability of commercial fish species and sensitive species within the area of operation. The MSS will also not impact the local economy. Mitigation plans are in place to reduce any impacts to as low as practicable.	424
4390, 4414	The relevant person was concerned about the evidence related to potential regional population impacts of seismically induced krill mortality within the ASA.	In the online meeting, Regia's marine scientists explained that the natural variation in the ecosystem was much larger than the potential impacts their model suggested. They also pointed out that the literature did not support the stakeholder's model and that there was no evidence of a population collapse or catastrophic effects on krill from seismic activity. The stakeholder was encouraged to refine his work, particularly regarding the historical	6420

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		effects of seismic surveys, and consider the scale and natural variability of the ecosystem (Event ID 6890).	
4391	Stakeholder claims there is a threat of serious harm to the regional krill population if the Regia seismic survey occurs and a lack of full scientific certainty on the effects, therefore the Precautionary Principle should be applied.	The precautionary principle needs only be applied when there is a threat of serious or irreversible harm and a lack of full scientific certainty. In relation to the effects of sound on plankton and larval krill it is CGG's view that neither of these preconditions are met. Nevertheless, we have adopted precautionary measures as evidenced by: 1. >39% reduction in acquisition area. 2. Avoidance of the key summer months despite this time providing the best conditions for survey. 3. The 60-day limitation on acquisition. (Event ID 5304) The NOPSEMA quote they have used to support their case has been misinterpreted by the stakeholder, that encourages a precautionary approach rather than describes principle: s391(2): The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage. (Event ID 6517) The Regia EP provides scientific estimates on the natural variations in plankton (including krill) communities globally and regionally, as well as mortality levels in these communities.Based on the long history of seismic surveys in the region, there is no evidence of significant harm to plankton populations, suggesting that serious harm is unlikely. These findings help define what constitutes "serious harm." The stakeholder lacks valid data to support their claim of large-scale harm to regional krill populations. (Event ID 6815)	6432
4392	Claims there will be impact to Bonney Upwelling via krill larvae originating from within the MSS zone.	The claim that some krill larvae from the proposed Regia MSS area may reach upwelling regions is acknowledged, but there is no evidence to support the idea that this area is a key source for krill in the Bonney Upwelling system. Krill larvae from across the broader region could also end up in the upwelling area. No cause-and-effect pathways have been identified that show the Regia MSS area as uniquely important for krill supply in the region. (Event ID 6815)	6432
4393, 4409, 4411, 4413	As krill is a critical food source for whales, no seismic should be done between the months of November to April.	The claim that krill is a critical food source for whales is well-established, as whales migrate to upwelling areas to support sufficient densities of their preferred food source. However, the stakeholder provides no scientifically	6432

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		supported cause-and-effect pathways or evidence to justify the prohibition of seismic surveys from November to April. The Regia EP offers scientific evidence showing the fluctuating abundance of krill and its connection to whale feeding patterns. While upwelling events can occur at various times and locations, there is a clear understanding of what constitutes major upwelling events and when they occur – as has been identified clearly in the EP. Whales feed throughout the upwelling season, primarily when krill density is highest, and continue their migrations each year despite significant fluctuations in krill abundance between years. (Event ID 6815)	
4394, 4412	Stakeholder claims their modelling indicates that by actively monitoring currents across the Active Source Area (ASA) and defining appropriate operational limits (no active source if mean currents across ASA (stratified) are > 0.5m/s), CGG can reduce mortality of larval Nyctiphanes australis by up to 80%, as stronger currents increase the volume of water exposed to lethal doses of seismic. This would, in turn, minimize the impacts on the blue whale feeding zone and the broader Bonney Upwelling ecosystem.	The stakeholder's model does not consider the following points: Plankton and larval krill abundance and density are not uniformly distributed in the water column either vertically or horizontally. The meso-scale biological and physical characteristics that are the more appropriate scale for investigating flow-on effects on whale populations or other relevant taxa (i.e. at the population level and not the effect to individuals). The vast differences in abundance of plankton (~krill) month-by-month and year-by-year and the significance of CGG's decisions: To avoid the peak upwelling times, where there is traditionally the highest abundance of plankton and larval krill (January, February and March). To limit the survey duration to 60 days of total acquisition. Any of the 30+ peer-reviewed scientific papers beyond the McCauley and Richardson papers about the Bonney Upwelling and the effects of impulsive sound on plankton and krill. The ecological context and purpose of zooplankton and larval krill: In primary productivity in the region regardless of the state of their physical condition, evidenced by the high levels of natural mortality. As a primary food source for Blue Whale. The ± 50% interannual variation in area extent of upwelling (~population abundance of krill) which is driven mostly by climate influences and within which whale populations continue to recover. In austral summer 2008/09 the upwelling season was constrained to the single month of February – we cannot find any scientific literature that describes this season as catastrophic for the visiting whale population. In addition, assumptions are made	6432

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		about krill behavior, distribution, and density, as well as how the model accounts for patchiness and current speeds. The model's treatment of water and krill as uniformly distributed contradicts scientific understanding of their distribution in space and time. The Regia EP provides evidence of the natural variability in marine systems and highlights the resilience of zooplankton communities, including krill, due to high birth, growth, and mortality rates. These communities exhibit high turnover and production-to-biomass ratios, making them resilient to disturbances. Citing the work of Hosie (1982), the EP emphasizes that Nyctiphanes species have higher turnover rates than Euphausid krill, and that similar mortality rates (88-90%) can be expected in both. The assumptions about krill mortality in the EP are based on well-established scientific literature. (Event 6815)	
4395	The project is adjacent to Warrnambool's Logans Beach Whale Nursery for Southern Right Whales and upstream of the Bonney Upwelling Key Ecological Feature, which could be affected.	The titleholder acknowledges this and has spent two years preparing a comprehensive Environmental Plan (EP). This process included ongoing consultations with communities and individuals, summarizing the EP into webinars, information sheets, and holding in-person meetings. The team recognizes the Otway region's marine environment as both spectacular and dynamic and believes environmental assessments must be thorough and detailed to respect its importance. Impacts are assessed in the Environmental Plan (EP) and can be found in Appendix E7 and F3. Measures to minimise adverse impacts to whales and ensures the Regia MSS does not prevent SRW and BW utilising their BIAs include: No discharge of the sound source in January, February, March (when the upwelling is in its peak month), the sound source will only be discharged in the Pygmy Blue Whale foraging BIA when low numbers of Pygmy Blue Whales and other foraging whales are in the BIA off Otway, and no discharge of the sound source within 15 km of the Southern Right Whale Reproduction BIA or Habitat Critical to Survival (HCTS) while Southern Right Whales are present in the BIA and HCTS. The full list of measures is included in Appendix E7 Section 9 and G1. The claim that some krill larvae from the proposed Regia MSS area may reach upwelling regions is acknowledged, but there is no evidence to support the idea that this area is a key source for krill in the Bonney Upwelling system. Krill larvae	6432

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		from across the broader region could also end up in the upwelling area. No cause-and-effect pathways have been identified that show the Regia MSS area as uniquely important for krill supply in the region. (Event ID 6815)	
4396	Stakeholder objects to Regia's dismissal of the importance of current strength in mitigating impact on krill and Bonney Upwelling biomass as both currents and krill distribution vary with depth, making monitoring at multiple depths beneficial. In the ASA, where water depth is typically less than 200m, larval krill are likely exposed to lethal seismic doses, as noted by McCauley et al. (2017). This region serves as a transport corridor for larval N. australis heading toward the Bonney Upwelling, with a westward current from November to April likely transporting larval krill into nutrient-rich upwelling zones.	The suggestion to monitor all depths lacks a clear rationale or explanation. The assumption that all krill within a specific volume of water will be killed by seismic activity is not supported by evidence. Given the lack of observed effects from past seismic surveys in the region, the model's conclusions are unsupported. If krill and currents are not uniform throughout the water column, the model's assumption of uniform distribution is flawed. The claim that some krill larvae from the proposed Regia MSS area may reach upwelling regions is acknowledged, but there is no evidence to support the idea that this area is a key source for krill in the Bonney Upwelling system. Krill larvae from across the broader region could also end up in the upwelling area. No cause-and-effect pathways have been identified that show the Regia MSS area as uniquely important for krill supply in the region. The model, which originally aimed to show massive krill mortality, takes a simplistic approach based on basic physical principles, such as the effect of current speeds, but ignores the complexity and scale of regional ecosystem dynamics. The model lacks validation and fails to account for key factors in the region's ecology. (Event ID 6815)	6432
4397	Stakeholder objects to the idea that meso-scale biological and physical characteristics are more appropriate for assessing impacts on whale populations or other taxa at the population level, not individual effects, claiming that individual krill disturbances can scale up to affect whale foraging success and overall population dynamics, quoting Williams 2016, Lagos 2022, Guilpin et al 2020, Santora 2011, and Kampf 2024.	Williams (2016) has been used superficially by the stakeholder. A more thorough reading reveals that the paper pertains to Humpback Whales, which show minimal response to food source reductions below 50%. The paper is useful for demonstrating the variability of ecosystems, which is discussed in detail in the Regia EP. Lagos (2022) is cited by the stakeholder to support a general statement about stress, but the thesis actually focuses on ocean warming and UV radiation impacts on krill—large-scale factors, which the Regia EP identifies as primary drivers of population changes. A small-scale disturbance like the MSS does not align with these larger impacts, which the stakeholder dismisses despite citing related studies. The stakeholder also references Guilpin et al. (2020) (not included in the bibliography). This study models how changes in krill density affect blue whale	6432

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		foraging success, but it highlights that climate change and fishing, not seismic surveys, drive population changes. This supports the Regia EP's focus on large-scale impacts. The stakeholder's citation of Santora (2011) on California upwelling misrepresents the information. The Bonney Upwelling area is well-defined, and the stakeholder is encouraged to consult the DCCEEW website for clarification. Kampf (2024) is used by the stakeholder to suggest upwelling outside the Bonney area, a known fact. The Regia EP addresses how Blue Whale interactions with the MSS will be managed. Kampf's work builds on existing knowledge of upwelling mechanisms, and the stakeholder is encouraged to consider it as a model for understanding ocean dynamics. (Event ID 6815)	
4398	Objects to CGG's actions to avoid peak upwelling (misinterpreted as January–March) and limit survey duration to 60 days, stating that krill populations do not recover linearly after intense disturbances and the life cycle of N. australis is not necessarily aligned with the phytoplankton blooms of the Bonney Upwelling.	The stakeholder cites a study by Rau (2019) to argue that even small disruptions can affect the Southern Ocean food chain. This citation is a clear example of selective use of literature. Rau (2019) is based on aquarium experiments in a freshwater lake in Berlin, and the stakeholder is invited to clarify the relevance of Lake Muggelsee to the Southern Ocean. It appears the stakeholder did not properly review the paper. The peak upwelling season for the Bonney region is well-established through various studies, as noted in the Regia EP. Upwelling is defined by sea surface temperatures (SSTs) and chlorophyll-a (Chl_a) levels, not by wind patterns, as confirmed by the cited Barlow et al. (2021). The stakeholder's assertion that krill exist before upwelling occurs is self-evident. The stakeholder's reference to the Gill (2011) study is also inappropriate, as it does not discuss the lack of synchronization with Bonney upwelling. Furthermore, the stakeholder argues that krill are not closely linked to phytoplankton blooms in the region, contrary to established scientific knowledge. Krill rely on phytoplankton as a primary food source, and upwelling conditions concentrate this food, boosting krill reproduction and survival, which is critical for baleen whales such as Blue Whales.The stakeholder also suggests that whales are not synchronized with upwelling events, despite clear evidence that whales feed in areas where localized upwelling occurs. The Bonney Upwelling is the main upwelling center, but other regions also experience upwelling,	6432

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		albeit less intense, as documented in the Regia EP. Recent work by Kampf (2024, 2025) has provided insights into the mechanisms behind these upwelling events. (Event ID 6815)	
4399	Stakeholder claims that with the potential impact on krill mortality and EPBC protected Blue Whales, the proponent excluding current modelling is not consistent with ALARP framework.	The criticism raised by the stakeholder is unfounded and reveals a misunderstanding of ALARP principles. ALARP involves assessing control measures by balancing environmental benefits with the costs of implementation. The stakeholder's arguments are flawed as they incorrectly suggest mitigation measures should be evaluated independently, only to contradict this by stating that ALARP is about layering controls to reduce risk and they assume their model is a reliable predictor of impacts, yet the model lacks credibility, and there is no justification for assuming mitigation measures will provide any environmental benefit. Timeframe limitations are not control measures but are self-imposed to comply with legislation and support coherent assessments. (Event ID 6815)	6432
4400	The stakeholder claims that CGG's statement fails to consider cumulative effects of seismic blasting, which can push krill populations beyond their ability to recover and disrupt population dynamics. have ecosystem level impacts, disrupting the balance of an evolved system that ensures population stability.	The key point about natural mortality rates is that plankton populations can naturally endure high mortality rates, sometimes exceeding 90%, and still thrive despite large-scale environmental changes like temperature and wind variations. This is well-documented in the Regia EP. There is no evidence to suggest that a single, spatially and temporally limited seismic survey could cause ecosystem changes at the implied scale. The Regia EP explains that planktonic communities can withstand high natural mortality rates and changes in key environmental factors. The comparison of seismic impacts to other natural events, like predation is irrelevant, as predation is a natural process. While climate change and fishing are the most significant drivers of change in marine ecosystems, seismic activity does not pose a comparable threat. The claims about seismic activity's impact on breeding krill lack any relevant scientific support, along with statements about the ripple effects of localized krill reduction. (Event ID 6815)	6432
4401	Objects to CGG's claim that impacts won't be "measurable", arguing that the absence of immediate measurable effects doesn't mean there isn't significant harm.	The case for acceptability does not rely on calculated mortality and recovery levels. Instead, the case is based on the immense size and dynamic nature of the ecosystem. The effects of the seismic survey are considered negligible because they are completely overshadowed by natural variations and dynamics, making any measurable	6432

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		calculation impossible. This argument is further supported by the fact that the survey avoids peak upwelling times, which are when krill populations are expected to be most productive. Additionally, when considering cumulative impacts, any extra mortality caused by the survey is expected to be quickly absorbed by the natural variations and dynamics of the ecosystem, likely within days of the survey's completion. (Event ID 6514)	
4402	Stakeholder claims that equating seismic mortality with natural mortality overlooks the fact that natural mortality is an inherent part of an evolved system that maintains population stability. In contrast, human-induced mortality disrupts this balance by targeting individuals indiscriminately, including those crucial for reproduction and survival.	The Regia EP does not equate seismic mortality with natural mortality. Instead, it defines the scales of natural mortality in plankton populations to provide context for seismic effects. It is clearly stated that the two are not equivalent in any way. The stakeholder seems to misunderstand marine population dynamics, espousing a view of the natural world that was debunked in the 1970s, namely the idea of a stable or climax community where any disturbance disrupts balance. As demonstrated by Connell (1978), high diversity in ecosystems like tropical rainforests and coral reefs is only maintained in a non-equilibrium state. Wu and Loucks (1995) further emphasized that the classical equilibrium view fails because equilibrium conditions are rare in nature, and stability should consider heterogeneity and scale multiplicity. Stability, in ecological terms, is better measured by the ability of a population to continue reproducing through time, ensuring its persistence. For plankton communities like krill, this stability is defined by life-history traits such as rapid population turnover rates, enabling them to withstand extreme fluctuations in numbers and persist over time. Large variations in krill biomass are a fundamental characteristic of stable populations. (Event ID 6815)	6432
4403	Claim of ecosystem impact, as any Krill killed by seismic will become unavailable to predators.	Food chain dynamics in the open ocean are primarily supported by detritus, which serves as the foundation for energy transfer up the food chain. This detritus is mainly composed of dead plankton, with krill carcasses being a significant component, including those potentially killed by seismic activity. Such organic material is consumed by bacteria and other organisms, contributing to the marine food web. However, as demonstrated scientifically, the act of krill falling as marine snow does not cause a large-scale impact. In fact, some models suggest that this process can trigger a positive feedback loop, resulting in a surge in	6432

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		phytoplankton and zooplankton productivity (Skartsaeterhagen et al., 2024). (Event ID 6815)	
4404, 4408 4410	Stakeholder claims that disruptions to krill populations can directly affect Blue Whale feeding, as these whales depend on dense krill aggregations for their energy requirements. Reduced prey densities may impact whale migration and breeding success.	Krill are naturally subject to mortality rates as high as 90%, and their food source fluctuates spatially and temporally, shrinking by up to 50% between and within years. The size, duration, and location of krill swarms also vary. Whales continuously feed across this dynamic space and return annually. The Regia EP argues that there is no evidence suggesting a spatially and temporally constrained MSS would cause a disturbance greater than what already naturally occurs. The stakeholder demonstrates a lack of understanding of how stability is measured in marine environments. The energy whales derive from krill fluctuates month to month and year to year due to natural dynamics in the food chain. The scale of disruption to whale feeding energy when upwelling shrinks by 30% or 50% is far greater than any MSS disturbance. The stakeholder's general statements regarding the MSS's impact lack scientific support. (Event ID 6815)	6432
4405	objects to the assertion that ± 50% interannual variation in upwelling extent, mostly climate-driven, has not constrained whale population recovery.	Whales have evolved to handle significant fluctuations in their food source, with some years yielding more biomass and others less. The Regia EP provides references to support this argument. Upon closer examination of Wiedenmann et al. (2011), which the stakeholder cites, it becomes clear that while whales can adapt to decreases in krill abundance in a particular area, the net effect on their population vital rates is negligible. Wiedenmann et al. (2011) also suggest that blue whales may adjust their foraging behaviors in response to changes in local environmental conditions, mitigating the impacts of declines in krill abundance. They note that blue whales exploit different feeding areas based on large-scale prey abundance and can concentrate in productive areas when prey is scarce, such as during El Nino years (Benson et al. 2002, Bailey et al. 2010). Furthermore, Wiedenmann et al. (2011) propose that blue whales are better equipped to cope with environmental changes than species with more restricted foraging areas, thanks to their adaptive foraging behaviors and ability to travel long distances in a foraging season. (Event ID 6815)	6432
4406	The sender claims that the absence of a defined acceptable threshold	The case for acceptability does not rely on calculated mortality and recovery levels. Instead, the case is based on the	6507

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	for krill mortality in the Regia EP is a core issue.	immense size and dynamic nature of the ecosystem. The effects of the seismic survey are considered negligible because they are completely overshadowed by natural variations and dynamics, making any measurable calculation impossible. This argument is further supported by the fact that the survey avoids peak upwelling times, which are when krill populations are expected to be most productive. Additionally, when considering cumulative impacts, any extra mortality caused by the survey is expected to be quickly absorbed by the natural variations and dynamics of the ecosystem, likely within days of the survey's completion. (Event ID 6514)	
4415	The percentage figure in Appendix E2, Section 4.1 has errors.	The Tang et al. (2014) paper was referenced to discuss non-predatory mortality in zooplankton samples from various marine environments. The stakeholder claimed that this rendered the estimated numbers used in the comparison irrelevant. However, Tang et al. provides a range estimate for non-predatory zooplankton mortality (11.6% to 59.8%) in these samples, which is relevant to the impact assessment. While CGG agree that directly extrapolating these mortality ranges to the entire Otway marine region might be overly simplistic and therefore doesn't carry significant weight in our overall argument, it is still a reasonable and relevant consideration. These ranges can be compared with the potential additional mortality resulting from factors such as predation, other anthropogenic sources, and the proposed survey. (Event ID 6518)	6890
4418	The relevant person raised concern about impacts to plankton and interpretation of the UTAS research in this area within the Regia EP.	Event ID 6321 - The Regia team responded that during consultation, concerns around plankton and the Bonney Upwelling were highlighted by multiple individuals and groups. They explained that they undertook a thorough impact assessment, which can be found in Appendix E2 of the Environment Plan (EP). Following publication of E2, the Regia team continued to receive feedback and as such now have Appendix F3 that provides further assessment of this key sensitivity on Page 48, and updated the appendices analysis with the latest literature, including the ZoopSeis research project funded by the Norwegian Research Council. Despite our assessment outcomes not resulting in the need for the precautionary principle to be applied, the Regia team had adopted measures	6329

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		to assuage the concerns of stakeholders. These are as follows: 1. >39% reduction in acquisition area. 2. Avoidance of the peak upwelling times (January/February/March), where there is traditionally the highest abundance of plankton and larval krill 3. To limit the survey duration to 60 days of total acquisition. Taking these measures into account, along with considering the ecological context and purpose of zooplankton and larval krill (being In primary productivity in the region regardless of the state of their physical condition, evidenced by the high levels of natural mortality, and as a primary food source for Blue Whale), has allowed the Regia team to demonstrate that they have reduced the impact on plankton and larval krill from the Regia MSS to ALARP.	
4419	Concern about the potential impacts of seismic surveys on the planktonic phyllosoma stage of Southern Rock Lobster.	Event ID 6820 - The Regia team responded that the information already provided on Southern Rock Lobster shows the scales of connectivity and dispersal that are intrinsic to the stock of Southern Rock Lobster. They show how any impacts to individual rock lobster larvae within the intended area of seismic will be immeasurably small relative to the mortality that is operating across the regional distribution of this species. Such a well-connected, genetically homogenous stock is, by definition, highly resilient to localised disturbances. Evidence of impacts to individual larval lobsters is not evidence of impacts to the stock of southern rock lobsters. This conclusion is based on published papers presented in the previous document and an understanding of life-history dynamics in marine invertebrates.	6411
4440	Concerned about the impacts of seismic activities on zooplankton.	Event ID 6876 - The Regia team responded in-meeting and provided an outline of the natural dynamic of zooplankton. Explained there may be short term destabilisation but it does not been the impact is additive. Directed fisher to a model study about zooplankton.	6876
4417	The relevant person was concerned that about the proposed seismic activity effecting the behaviours of certain species.	Event ID 6880 - The Regia team responded in-meeting that the first half of the EP is associated with assessment work undertaken prior to commencing the activity. First and foremost, because there are so many different species, they explained that they had grouped species together from a physiological perspective. Secondly, the Regia team explained that their focus is on the mega-fauna and species which have protection under the EPBC act.	6880

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4491	Claims about the SRW and BW BIAs. States proposed activity will cause unacceptable impacts to all Karntubul species, including temporary & permanent hearing loss, displacement from BIAs, vessel strike, prey depletion during peak feeding/migration period, calving interruption, and impact to ecosystems and cultural landscapes as a result of the cumulative impact of these.	CGG has identified all Biologically Important Areas (BIAs) relevant to blue whales (BWs) and southern right whales (SRWs) and incorporated seasonal BIA use into the survey design through substantial temporal and spatial restrictions detailed in the EP. Predicted underwater-sound impacts on these Karntubul species, along with mitigation measures presented in Appendices E7 and F3, demonstrate impacts will remain acceptable and will avoid auditory impairment or displacement from BIAs or Habitats Critical to Survival (HCTS). CGG further notes that vessel-strike risk is already extremely low during seismic surveys and that additional controls in Appendix D2 ensure this risk is prevented and acceptable. It concludes that no changes to ecosystem structure, diversity, or function are expected from the one-off survey, with sound exposure too limited in extent and duration to affect prey, food webs, or predator–prey relationships. A cumulative impact assessment found residual cumulative effects to be low, reduced to ALARP, and acceptable, with no impacts predicted for regional marine parks. CGG also asserts consistency with the National Recovery Plan for Southern Right Whales and the Blue Whale Conservation Management Plan, stating that their objectives and recommended measures have been incorporated. Finally, CGG maintains that all marine mammal species likely to occur in the region have been adequately assessed using up-to-date EPBC Protected Matters data, and that mitigation measures ensure impacts to all listed species will remain acceptable and not inconsistent with EPBC Act protection provisions.	EVT352
4492	Claims that the eastern population of the Southern Right Whale, estimated at only 200–300 individuals, is at particularly high risk because its migration and reproduction Biologically Important Areas (BIAs) overlap directly with CGG's Operational Area and sound propagation footprint. According to the Southern Right Whale Recovery Plan, these whales use the affected region for reproduction between May and September and for migration between April and October. The Recovery Plan also notes that Southern Right Whales do not feed in coastal waters but are expected to feed, and possibly	The Recovery Plan explains that BIAs can be designated for key behaviours such as reproduction, foraging, migration, and resting. While Southern Right Whale BIAs in the Plan cover reproduction and migration, the Plan notes that foraging occurs across a much broader offshore latitudinal range (30°S–65°S) and is not linked to these BIAs. Because the Regia MSS is not located in Antarctic waters, it will not affect cetaceans that forage there. CGG states the survey will avoid peak SRW abundance in the mapped BIA and apply mitigation measures to ensure no SRWs are harmed, injured, or interfered with.	EVT352

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	conceive, within the Australian Whale Sanctuary—an area entirely overlapped by the proposed Regia MSS activity. As a result, the seismic survey could occur within, or affect, conceiving, calving, and feeding grounds for this critically endangered sub-population. The species is particularly vulnerable to human impacts due to its low reproductive rate, long lifespan, and strong site fidelity to key habitats. The submission therefore emphasises the relevance of underwater noise, habitat degradation, and vessel-strike risks in the context of the proposed seismic activities.		
4496	GMTOAC objects to CGG removing a previous control measure limiting seismic discharge in the Pygmy Blue Whale foraging BIA during periods of low whale presence, replacing it with a vague condition requiring CGG to determine whether whale presence is "compatible" with proceeding. GMTOAC argues this new measure lacks detail on how whale presence or "unacceptable disturbance" will be assessed, and that it fails to reference Recovery Plans which define unacceptable impacts. GMTOAC warns that the proposed survey timing (April–June 2026) coincides with peak Pygmy Blue Whale foraging season and Southern Right Whale migration and calving periods, meaning the seismic survey is likely to occur when both species are using their BIAs. Preventing whales from accessing these areas, or exposing them to injury while they remain, would constitute unacceptable impacts inconsistent with Recovery Plan objectives.	CGG has further reduced the likelihood of interactions with marine mammals by excluding the April–June period and commencing the survey only after 15 September. Because blue whales typically do not arrive from Western Australia until November, CGG argues that most of the survey will occur when blue whales are absent from the area. It adds that sighting data show very few blue whales in November and December, with peak abundance occurring later, from January to March during the Bonney Upwelling.	EVT352
4502	GMTOAC objects to the seismic survey's potential impacts on krill populations, including larval krill, which form a foundational part of the marine food web in Nyamat Mirring and are a critical food source for culturally significant species such as Pygmy Blue Whales and Southern Right Whales. They state that CGG's EP downplays potential impacts by comparing them to natural fluctuations in krill abundance, a framing GMTOAC considers inappropriate because it subsumes an anthropogenic disturbance within natural variability rather	CGG undertook an extensive review of the scientific literature to understand regional upwelling systems and their dynamics, assessing more than 65 publications to support the confidence of its analysis. Detailed assessments of upwelling and krill are provided in Appendices E2 and F3 of the EP. CGG does not agree with the suggestion that the assessment is trivial and remains confident in the robustness of its findings. CGG also remains open to receiving questions or new relevant information. Additionally, CGG notes that references to Panama upwelling processes are not applicable to the Regia MSS assessment and maintains	EVT352

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	than assessing it cumulatively. GMTOAC emphasises that Nyamat Mirring and the broader oceanic system are already under significant stress from climate change and other human impacts. They point to the catastrophic Karenia mikimotoi algal bloom in South Australia as an example of how cumulative pressures can destabilise marine ecosystems. GMTOAC also references the recent failure of the Panama Upwelling, the first such event recorded in over 40 years, as further evidence that natural oceanographic processes are increasingly vulnerable to cumulative stressors. They argue that these examples undermine CGG's assumptions about the robustness of the system and highlight the need for a more precautionary, cumulative-impact-focused assessment.	confidence in the supporting literature base.	