APPENDIX D: EXPERT WITNESS STATEMENTS ON KEY DISCIPLINES

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Marinus Link Environment Effects Statement and draft Planning Scheme Amendment

Inquiry and Advisory Committee hearing

Expert Witness Statement of David Schwartz

1 Introduction

My name is David Schwartz and I am a Principal with SGS Economics & Planning at Suite 201, 50 Holt Street, Surry Hills, NSW 2010.

I was the Project Director for the Economic Impact Assessment (EIA), dated May 2024 (**Economic Impact Assessment**) which was Technical Appendix B to the consolidated Environment Effects Statement (**EES**) under the *Environment Effects Act 1978* (Vic) and the draft Environmental Impact Statement under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EIS/EES**) for the Marinus Link Project (**Project**).

1 Summary

Key issues

1) Findings from modelling undertaken for the Economic Impact Assessment identified that impacts during construction would be a key issue with 7,908 FTE job-years in demand during construction, 1,297 FTE job-years of which would be in Northwest Tasmania and 2,159 FTE job-years of which would be in Gippsland.
    a. These are significant impacts for the regional areas because both have a shortage of civil engineering professionals, electricians and electrical engineers, as well as qualified and available workers in the construction industry.
    b. The Victorian Social Impact Assessment also highlighted that given this lack of depth in the labour supply, there is a possibility of a boom-bust cycle before and after construction.
    c. These circumstances could place competitive pressure on other industries in the regions for limited labour, creating labour shortfalls for existing industries unless managed (e.g., through a social impact management plan, identified as S01 in the EPRs)
    d. The other significant issue resulting from such high levels of labour demand during construction is pressure placed on the existing housing market and land for housing. The negative impact from this set of circumstances is upward pressure on rental rates and housing and/or land prices unless unmanaged (e.g., through a workforce and accommodation strategy identified as S02 in the EPRs)
2) Findings from updated modelling undertaken and reported in the Supplemental SGS Report identified that overall impacts could be 10% higher than previously estimated (8,709 FTE job-years) during construction, with a potential 68% increase in FTE job-years in Northwest Tasmania (2,180 FTE job-years) and a potential 22% increase in FTE job-years in Gippsland (2,633 FTE job-years)
    a. On one hand, given the labour supply and skills constraints already identified, these updated potential impacts elevate attention to the effectiveness and execution of EPRs S01 and S02
    b. On the other hand, the regions also have low labour force participation rates among youth and First Nations people. Such increased labour demand presents an expansion of economic and employment opportunity for these populations in terms of skills and training opportunities

c. Given the protracted construction timeline, another issue arising is the extended impacts felt by temporary disruptions to the tourism industry, elevating attention to the effectiveness and execution of EPR S02. d. With regard to whether any additional mitigation measures or EPRs would be recommended, SGS believes that the EPRs remain appropriate upon re-examination following the updated economic impact modelling.
Opinions 1) The statements above reflect key issues arising from analysis conducted with the limited information available to SGS. 2) As such, these findings and conclusions of key issues are a best estimate based on information currently available. 3) The EPRs as exhibited are still appropriate and reasonable to manage the impacts as identified above.
Recommendations for changes to the draft Planning Scheme Amendment and Environmental Performance Requirements I consider the draft Planning Scheme Amendment and Environmental Performance Requirements are appropriate as exhibited.

2 Qualifications, experience and expertise

I am a planning policy and economic consultant with 18 years' experience across the United States, Canada and Australia. I specialise in market and economic assessments, financial feasibility, social and economic impact assessment, infrastructure planning, public policy frameworks, funding and financing strategies and implementation.

I have supported elected officials, government, for profit and not-for-profit developers, landowners, attorneys, advocates, trade associations, universities, and other institutions. I have advised a wide variety of clients on the development and operations of residential and non-residential real estate development, affordable and mixed-income housing, lodging, tourist attractions, business investment, transportation, public and community infrastructure, use of public financing and funding incentives, as well as policy, programming and implementation.

Following 15 years of planning policy and economic consulting for public and private sector clients across the US and Canada, I joined SGS Economics & Planning in 2021 and have supported clients at the Commonwealth, state, and local levels with economic impact, cost-benefit analysis, feasibility studies and policy review.

A statement setting out my qualifications and experience is provided as Annexure A.

3 Instructions

I have been instructed by Herbert Smith Freehills on behalf of Marinus Link Pty Ltd to give evidence on the environmental effects of the Project relevant to Victoria and relevant to my area of expertise and prepare an expert witness statement that summarises the Economic Impact Assessment and responds to the submissions on the EES. A copy of my instructions is included as Annexure B.

4 Statements in relation to Economic Impact Assessment

The role that I had in preparing the Economic Impact Assessment was as the Project Director for economic impact analysis. This involved providing quantifications and qualitative consideration of the economic impact that construction and ongoing operations of the Marinus Link, as well as induced investments in renewable energy generation, might have on the State of Tasmania, including the Northwest region of the state, as well as the State of Victoria, including the Gippsland region of the state.

I had support from:

- Philip Adams, Centre of Policy Studies at Victoria University (CGE modelling)
- Teresa Chan, Consultant at SGS Economics & Planning (researcher)

Details and qualifications of any person who carried out any tests or experiments upon which the expert relied in preparing this statement.

- David Leyden, Associate at SGS (compilation of relevant text excerpts from submissions)

4.1 Adoption of Economic Impact Assessment and Any Departures from Findings

I adopt the Economic Impact Assessment, in combination with this statement, as my written expert evidence for the purposes of the Panel's inquiry into the environmental effects of the Project, along with the following departures from the findings or opinions expressed in the Economic Impact Assessment:

- I am aware of a clerical error made in 2 instances in SGS's EIA (May 2024), regarding the reported power generation capacity of the induced investments. On page 10 (Executive Summary) and on page 53 (Section 6.4), the report states that "these investments represent the inducement of approximately ***33,700 MW*** of additional generation capacity…" Rather, the correct value should have been expressed as an annual average additional generation capacity of approximately ***1,500 MW***. It should be noted that this clerical error and its correction have no impact on the modelling outputs.
- I am aware of a clerical error that resulted in 18 references to "jobs per annum" or "jobs per year" being characterised errantly as "job-years per annum" or "job-years per year" (page 43, 44, 47, 48, 51, 53, 61 and 73 and 74).
- As a matter of clarification, and regarding the commentary on updated employment impacts provided in Section 3.2 of the Supplemental SGS Report, neither I nor SGS have specialised expertise sufficient to interpret (into representative direct employment requirements) the qualitative description (provided in Information Update #1) of the Project's construction regarding earthworks, site preparation, civil works, construction, etc., across the two stages. As such, our modelling was reliant on either the availability of specific inputs for jobs by phase or at a minimum, a breakdown of the apportionment of capital investment value escalation between materials and labour, neither of which were made available to SGS.

  I have no further statements regarding departure from the findings or opinions expressed within SGS's EIA (May 2024) or the Supplemental SGS Report.

4.2 Additional Questions Outside Expertise

- I have not been asked any additional questions falling outside my expertise

4.3 Confirmations

I confirm that the Economic Impact Assessment, to the best of my knowledge, is complete and accurate.

I confirm that I have adopted the key assumptions included in the Economic Impact Assessment to the EES for the Project.

I acknowledge that, as stated below in Section 5.1, updated information was provided to me regarding the proposed timing and capital investment value of the Project changes following completion of the Economic Impact Assessment (May 2024). The extent to which that affects the opinions expressed in that EIA (May 2024) are summarised in Section 6.6 below.

I confirm that I have read Volume 1 Chapter 7 of the EES corresponding to my area of expertise and consider the chapter consistent with my Report, with the exception of the following:

- On page 7-3 under Section 7.1.2, a sentence reads: *"Induced projects were not considered in Victoria as the direction of energy transmission proposed for the project is from Tasmania to Victoria."* I believe it should be pointed out that the Executive Summary of SGS's EIA (May 2024) provides further clarification that such projects in Victoria were not included because information regarding their capital investment values were not known at the time and could not be modelled.
- I am aware that at the bottom of page 7-3 under Section 7.1.2, there appears to have been a clerical error in the transcription of information from SGS's EIA (May 2024). The 4th dot point refers to operational expenditure of pumped hydro projects (induced projects) ranging between ***$18 million and $39 million per year***. As reported in Section 5.3 of SGS's EIA (May 2024), the correct values should have been stated as "ranging between **$7 million and $17 million**."
- As a matter of professional opinion, I would not use the word "predict" to characterise results of economic impact modelling. Globally across Chapter 7 (3 instances on page 7-5; 3 instances on page 7-6; 3 instances on page 7-7; 3 instances on page 7-8), I would replace the word "predicted" with either the word "projected" or "estimated".

5 Further work since preparation of the Economic Impact Assessment

5.1 Supplementary Report

Since the Economic Impact Assessment was finalised, on May 2024, I was requested to review the Marinus Link Information Update #1 – timing of Stage 2, and prepare a supplementary report which:

- identifies whether a change to the timing for delivery of stages 1 and 2 in accordance with the Information Update would have any material implications for the assessment described in, or conclusions of, the Assessment;
- consider whether any additional mitigation measures or Environmental Performance Requirements (EPRs) would be recommended; and
- consider whether any changes to any mitigation measures and EPR/EPRs recommended in the Assessment would be required.

My supplementary report, Supplemental Report to Economic Impact Assessment of Marinus Link, dated August 2024, are summarised in Section 6.6 below.

5.2 Other further work

I have not supervised and/or coordinated any further work in relation to the Economic Impact Assessment except for the Supplemental SGS Report as referenced above and discussed below in Section 6.6.

6 Economic Impact Assessment

6.1 Methodology

The methodology was completed in accordance with industry best practice for economic analysis and, furthermore, in alignment with the scoping requirements. The methodology includes, as noted above, both quantitative and qualitative components.

- **Modelling framework**: Central to the quantitative component is the technical methodology employing a Computable General Equilibrium (CGE) model, which is a detailed mathematical representation of Australia's regions, the economic inter-relationships, covering the behaviour of regional agents, interstate and international trade, with explicit modelling of demand for each regional economy's production (i.e., for its interstate and international exports) and of supply into the economy (i.e., of its interstate and international imports).
- **Modelling geography**: The modelling estimates impacts associated with the capital and operational expenditure of the Marinus Link, as well as the induced capital and operational expenditure of six (6) induced renewable energy projects. Outputs, particularly those reported for operational phase of the Marinus Link, are reported for a timeframe restricted to 25 years from 2025-2050. The outputs are furthermore reported across four geographies: 1) the regions where Marinus Link is situated, North West Tasmania and 2) Gippsland; as well as the broader state economies of 3) Tasmania and 4) Victoria.
- **Inputs:** To derive estimates of impact, the CGE modelling incorporates: a) Capital investment for construction of the Marinus Link, b) Ongoing operations of the Marinus Link, c) Capital investment related to development of induced windfarm and pumped hydro investments (i.e., representative of upstream economic activity), and d) Ongoing operation related to the induced windfarm and pumped hydro projects.
- **Outputs:** To reflect the extent of the impact, the modelling provides quantifications of the following layers of impact: a) Total impacts, characterised as direct and indirect economic impacts from construction and operations across the spectrum of industries regionally and across each state, b) Induced impacts, characterised as the direct and indirect economic impacts related to construction and investment in projects that were determined, with information given and available at the time of report preparation, to proceed only under the circumstances that investment in Marinus Link will be made.
- **Metrics of Impact**: Specifically, the economic impacts related to Marinus Link and the induced renewable energy projects are reported in terms of the following key impact metrics, including: a) Regional and state value added (equivalent to Gross Regional Product, GRP) and b) Regional and state employment (in full-time equivalencies, FTE).
- **Upstream/Downstream Industry Activity**: Upstream industry activity refers to the activities and outputs from industries that are farther away from the end-user than that of the direct economic activity, e.g., power generation. Downstream industry activity refers to the activities and outputs of industries closer to the end-user, e.g., household or commercial consumption of power for any number of individual or industrial applications. In this EIA, information was available regarding upstream activities – specifically the induced renewable energy power generation projects. However, with regard to the quantification of downstream industry activities, no data or information about customer usage and applications of such power transmitted through Marinus Link was provided to SGS such that consideration of positive and/or negative impacts could be made.
- **Qualitative Assessment and Considerations**: The upstream and downstream industry activities and the following non-quantifiable economic considerations were made to address specific aspects of the scoping requirements. Each section of this EIA provides a discussion based upon the extent to which the negative and positive elements of such socio-economic

considerations could be made with the information made available to SGS. As such, SGS has provided additional qualitative insights into other socioeconomic considerations and economic opportunities, impacts and externalities, including: a) First Nations employment and procurement opportunities, b) Skills and training opportunities, c) Impacts on agriculture, forestry, shipping and fisheries industries, d) Impacts on tourism industry, e) The extent to which raw materials, equipment, goods, and services may be sourced locally, f) Impacts on local social amenity and community infrastructure, g) Community demographic impacts, h) Impacts on land values, and demand for land and housing, i) Local, State and Federal Government rate, taxation, and royalty revenues, as well as consideration of public subsidies for construction or operations. Note that The analysis of non-quantifiable economic impacts was supported by other technical assessments and studies outlined in Table 7 of the May 2024 EIA.

6.2 Economic Impacts

The economic modelling shows considerable economic value-added from Marinus Link in the regional economies of North West Tasmania and Gippsland, and the states of Tasmania and Victoria, as reported in Table 1.

Table 1: Value-Added of Marinus Link ($), 2025-2050

Geography	Construction Phase (2025-2029)[1]	Operational Phase (2029-2050)[2]
North West Tasmania	$352 million	$306 million
Gippsland	$642 million	$361 million
Tasmania (including North West Tasmania)	$681 million	$679 million
Victoria (including Gippsland)	$1.4 billion	$981 million
Total (both states)	**$2.1 billion**	**$1.7 billion**

Source: SGS Economics & Planning, CoPS (2024)

As shown in Table 2, the Project is estimated to generate demand for significant local and state employment across construction and operations (reported in job-years below). These employment opportunities span construction, professional services, retail, manufacturing and accommodation and food services, etc.

Table 2: Employment Generated by Marinus Link (FTE Job-Years), 2025-2050

Geography	Construction Phase (2025-2029)	Operational Phase (2029-2050)
North West Tasmania	297 FTE	306 FTE
Gippsland	2,159 FTE	388 FTE
Tasmania (including North West Tasmania)	2,661 FTE	494 FTE

[1] The construction phase includes the first half year of operations as the project comes online in the second half of 2029.

[2] The operational phase includes half of 2029 through 2050 in the modelling.

Geography	Construction Phase (2025-2029)	Operational Phase (2029-2050)
Victoria (including Gippsland)	5,247 FTE	592 FTE
Total (both states)	**7,908 FTE**	**1,086 FTE**

Source: SGS Economics & Planning, CoPS (2024)

6.3 Economic Opportunities

SGS provided additional qualitative insights into other socioeconomic considerations and economic opportunities, impacts and externalities. Reflecting the scoping requirements and information available at the time of EIA preparation, SGS made the following considerations regarding following impacts and opportunities related to Marinus Link to regional economies to ensure that part of economic opportunities can be realised by local communities. As such, MLPL is exploring strategies aimed at maximising benefits to local communities, which include:

- **First Nations employment and procurement opportunities**: labour force participation rates among Aboriginal and Torres Strait Islanders are lower than those across the broader population in the project study area. MLPL is committed to putting in place S05 industry participation and social inclusion plan to identify efforts and actions to increase the economic opportunities for First Nations communities in North West Tasmania and Gippsland, which include taking advantage of the estimated employment resulting from the one-time (construction-related) and ongoing (operational) job impacts.
- **Skills and training opportunities**: concerns were raised through engagement conducted as a part of the Social Impact Assessments that included lack of capacity and skillsets that align with job opportunities stemming from the construction or operation of the Marinus Link project. MLPL is committed to increasing the workforce participation of socially vulnerable populations, including but not limited to First Nations people, women and youth, through the S05 industry participation and social inclusion plan.

6.4 Externalities and other socio-economic impacts

Given the scale of Marinus Link and its potential to have a significant impact on the environment, it is important to recognise other socio-economic impacts, both positive and negative. Reflective also of various scoping requirements, the following considerations were also made with information that was made available to SGS in preparation of this EIA:

- **Impacts on agriculture, forestry and fisheries**: Construction of the Marinus Link will likely disrupt commercial fishing, shipping operations and agricultural activities in the short term. As reflected in the economic modelling, demand for labour during construction creates direct competition with existing labour needs of the region's agriculture, forestry and fishing sectors. In the long term however, these impacts were determined to have very low to low significance. Six environmental performance requirements were identified to enhance outcomes for agriculture and forestry during construction and operation of Marinus Link. In addition, MLPL is committed to putting in place a Marine Communications Plan to alert marine users of construction activities.
- **Impacts on tourism**: Construction of the Marinus Link may result in temporary changes to the natural amenity and character. Short-term accommodation could be constrained as a result of demand for temporary construction workforce accommodation, which could result in negative impacts to the tourism sector. To address such impacts on the sector, MLPL is committed to putting in place an S02 workforce and accommodation strategy.

- **The extent to which raw materials, equipment, goods and services will be sourced locally**: Issues related to the sourcing of local materials, equipment, goods and services are broadly related to economic development efforts, such as represented by Economic Development Strategies (as discussed in Section 3.1 of the May 2024 EIA). At issue is the extent to which these EDSs and other direct efforts may be able to augment or enhance local sourcing opportunities. MLPL is committed to procuring goods and services in accordance with an S05 industry participation and social inclusion plan to support local businesses, including compliance by suppliers and contractors.
- **Impacts on local social amenity and community infrastructure**: Influx of construction and/or ongoing workforce from Marinus Link into Gippsland and North West Tasmania could place pressure on the existing system of already-constrained community infrastructure, amenity and social services. The relevant issue related to provision of social amenity and community infrastructure is whether and to what extent existing policies and funding mechanisms are sufficient for building schools, child care, health services and sports facilities. EPRs were recommended in the Social Impact Assessments to mitigate this impact.
- **Community demographic impacts**: In the absence of any affirmative action undertaken by the industry sector or state government, First Nations people, women and youth may continue experiencing high levels of unemployment in the region, despite the significant opportunities presented by demand for skilled labour from Marinus Link or other energy-related infrastructure projects. Through both the S05 industry participation and social inclusion plan and the S04 community benefits sharing scheme, MLPL seeks to enhance employment and social benefits for the local demographics, particularly those facing high levels of unemployment such as First Nations, women and youth.
- **Impacts on land values, and demand for land and housing**: Increased pressure on the housing markets in North West Tasmania and Gippsland is likely to occur. Increased housing demand is likely to place upward pressure on prices and rents in an already supply-constrained market. To address such issues - in particular, the increased pressure on housing markets caused by the influx of workers during construction phase, an internal MLPL working group commenced and a housing strategy on MLPL's role and actions will be developed for Tasmania and Victoria. Specifically, MLPL is committed to putting in place an S02 workforce and accommodation strategy to reduce pressure on local housing markets through the direct provision of worker housing.
- **Local, state and federal government rate, taxation and royalty revenue**: There is expected to be large taxation receipts ($762 million in total from 2025 to 2050) from the economic activity generated by Marinus Link, which will flow to local, state and the Australian Government.

While not all aspects of negative impact mitigation will be within MLPL's control, all stakeholders may benefit from MLPL proactively engaging in a coordinated approach (i.e., among other relevant stakeholders) to ensure successful implementation of its construction and development. This will give assurances to stakeholders that negative impacts are acknowledged, understood and being proactively addressed.

This characterisation of mitigation measures should be cross-referenced and incorporated with other identified mitigation measures in other reports listed in Table 7 of the May 2024 EIA.

6.5 Conclusion

Overall, from an economic perspective, Marinus Link will deliver significant outcomes to the regional economies of North West Tasmania and Gippsland, and Tasmania and Victoria. The mitigation of any potential negative externalities will also result in greater possible economic and social benefits to local communities.

6.6 Key amendments arising from Supplementary Report

This Supplemental SGS Report is provided in response to questions of impact arising from updated information regarding the proposed timing and updated capital investment estimates for the Project. SGS' key findings with regard to such questions are as follows:

Whether a change to the timing for delivery of Stages 1 and 2 would have any material implications for the assessment of economic impacts or conclusions, as described in SGS's EIA (May 2024)?

- **Gross-Value Added (GVA)** – across construction and operations (2025-2050), GVA increases over previous estimates are as follows: approximately 50% increase in NW Tasmania, 40% increase across Tasmania, approximately 20% in Gippsland, and 14% across Victoria
- **Employment** – across construction and operations (2025-2050), employment (in job-years) increases over previous estimates are as follows: approximately 52% increase in NW Tasmania, 18% increase across Tasmania, approximately 12% in Gippsland, and 6% across Victoria

Provide a review of the extent to which Commonwealth, Victorian or Tasmanian scoping requirements might be impacted by such changes and updated conclusions

- Following a re-examination of the scoping requirements, SGS believes the following scoping requirements are most impacted: impacts on local labour market, impacts on land value and land for housing (Tasmanian EPA and Victorian EES).
- SGS believes that the substance of the impact will remain the same; however, given the protracted construction/delivery timing, such impacts may be protracted.

Provide commentary on the extent to which SGS's considerations of other economic opportunities or externalities and other socioeconomic impacts would be impacted

- SGS believes the substance of our previous considerations remains the same; however, the protracted construction timeline prolongs the relevancy of a few considerations.
- For example, the protracted construction period and estimated increase in employment impacts imply 1) a net positive in creating more economic opportunities for First Nations people and others in the community, and 2) a net positive for creating skills and training opportunities.
- Also, the protracted construction period could have a prolonged effect on: 1) tourism impacts previously identified, 2) previously-identified impacts on land value and demand for housing.

Whether any additional mitigation measures or Environmental Performance Requirements (EPRs) would be recommended

- The identified mitigation and EPRs remain appropriate upon re-examination following the updated economic impact modelling.

7 Submissions

I have been requested to review the public submissions provided to me by Herbert Smith Freehills as relevant to my area of expertise. Those submissions have been grouped and responded to below.

7.1 Submissions received

I have read the public submissions and identified those that are relevant to the Economic Impact Assessment and my area of expertise. These include submissions as enumerated in the left-hand column of **Table 3** below.

7.2 Summary of issues raised

The submissions have raised the following issues relevant to my area of expertise, as summarised in under the “Relevant Text” heading in **Table 3** below.

7.3 Response to issues raised

Set out below are my comments and response, in the right-hand column of **Table 3** below, to the issues raised by the written submissions relevant to the area of my expertise.

Table 3: Excerpts of Submissions, Paraphrase of Key Issues, SGS Response

Submission #	Relevant Text	Key Issues	Response
7	"…we view this plan as detrimental to our property because of the lack of knowledge on electromagnetic fields…"	• Property impacts from construction and/or operations • Lack of knowledge of electromagnetic fields	Regarding the first issue, • It is unclear what the property's land use is, whether vacant, residential, agricultural, commercial or industrial, i.e., whether an occupied primary residence or an income-producing property. • It is also unclear whether the submission is expressing concern over the temporary or permanent nature of the impact to property from construction and/or operations • It is also unclear whether the property is directly or indirectly impacted by the proposed alignment and easements related to construction and/or operations of the Project. • To provide relevant commentary on potential economic impacts on property, more information is needed • Technical Appendix K (Agriculture and Forestry) refers to key issues, mitigation measures and EPRs related to loss of productive use of agricultural, forestry or fishing lands. Regarding the second issue, • Neither SGS nor I am qualified to comment on the extent to which electromagnetic fields may be present, the extent to which they may have detrimental impacts in general or specifically regarding the subject property and its use. • Technical Appendix A deals with Electromagnetic Fields and Electromagnetic Interference Impacts
8	"Of particular concern is the paucity in knowledge regarding potential impacts of electromagnetic fields (EMFs) associated with transmission cables to the behaviour, migration and recruitment of species…" "Thes behavioural impacts hold implications not only for natural migration processes, but also for commercial fishing yields reliant on decades of experience that has led to a more efficient catch…"	• Lack of knowledge of electromagnetic fields (EMF) • Potential impacts on behaviour, migration and recruitment of species • Potential long-term impacts of EMF on commercial fishing viability	Regarding the first issue, • Neither SGS nor I am qualified to comment on the extent to which electromagnetic fields may be present, the extent to which they may have detrimental impacts in general or specifically regarding the subject property and its use. • Technical Appendix A deals with Electromagnetic Fields and Electromagnetic Interference Impacts Regarding the second issue, • Neither SGS nor I am qualified to comment on the extent to which electromagnetic fields may be present, the extent to which they may have detrimental impacts in general or specifically regarding the subject property and its use. • Technical Appendix A deals with Electromagnetic Fields and Electromagnetic Interference Impacts • Technical Appendix H deals with Marine Ecology and Resource Use Impacts Regarding the third issue, • While this is a relevant economic consideration, neither SGS nor I am qualified to comment on the extent to which electromagnetic fields may be present, the extent to which they may

Submission #	Relevant Text	Key Issues	Response
			have detrimental impacts on species behaviour in general or specifically and how such impacts may or may not result in challenges to commercial fishing operation viability. • Technical Appendix H deals with Marine Ecology and Resource Use Impacts
9	"Now the Marinus link will cost $5.1b or more of taxpayers money. It's not fair that the developer gets all the benefits, while we all just keep paying more and more for electricity."	• Increased cost of Project construction • Perception that the taxpayer is the source of Project funding • Perceived developer benefits • Increased cost of electricity to community	Regarding the first issue, • As identified in Supplemental SGS Report, the primary driver of the Project's capital investment value (cost) escalation is attributable mainly to the cost of imported materials and equipment, given global demand conditions for such inputs to construction. Regarding the second issue, • Neither SGS nor I have been given sufficient information on the Project's sources of funding to provide meaningful comment on this point. Regarding the third issue, • It is relevant to consider the point above regarding the primary driver of the Project's cost escalation. • Generally, in development feasibility, the potential increase of such construction costs represent a risk to a project and have a negative impact on any benefits. However, in this instance, neither SGS nor I have sufficient information regarding the Project's funding and financing structure to comment on the extent to which the developer of this Project is benefitting at all on such an increase in its cost. Regarding the fourth issue, • Based on the Marinus Link Volume 1, Chapter 1 (Introduction), it is my understanding that the delivery and operation of Marinus Link will facilitate and expand opportunities for Tasmania to generate and export additional energy, which, based on the cost-benefit analysis test required as a part of the Regulatory Investment Test for Transmission, demonstrated that "it will put downward pressure on wholesale electricity prices…".
10	"We trust the Minister's final decision will achieve a measured outcome that balances the need to transition electricity generation to a renewable future while minimising the impacts on those communities where new energy generation facilities and infrastructure are located."	• Project outcome reflecting measured decision-making in regard to need for energy transition against impacts on communities where the Project is being constructed and operated	• The May 2024 EIA and Supplemental SGS Report have been produced with regard to the relevant scoping requirements from the Commonwealth, Victoria and Tasmania. • It is my opinion that the scoping requirements deal quite broadly and specifically with consideration for a full range of impacts to the environment and communities impacted by the Project's construction and operations.
13	"NTAG contends that despite the equity and geographic footprint of Marinus Link being shared between the Federal, Victorian and Tasmanian governments, this environmental impact statement and economic effects	• Potentially detrimental impacts on the Tasmanian landscape • Potentially detrimental impacts on the Tasmanian economy	Regarding the first issue, • Technical Appendix R deals with Landscape and Visual Impacts Regarding the second issue,

Submission #	Relevant Text	Key Issues	Response
	statement (EIS/EES) imposes potentially detrimental impacts on the Tasmanian landscape and its economy." "This raises the central question of why an EIS/EES for Tasmania is being treated separately. No reason is evident or explained. This approach invites scepticism as to the professed "social licence" goals of Project Marinus, with the whole project subjected to piecemeal assessment." "Another area of concern is the use of terms like Full Time Equivalents and FTE job-years to quantify the amount of employment which will be generated by Marinus Link." "While the consultant Ernst Young (EY) is careful to provide an explainer as to how the calculations were made, this seems to be lost on politicians and Marinus supporters who spruik the thousands of new jobs which will be created during the stage 1 build. The word "potential", which occurs in many documents concerning Project Marinus, is carefully omitted when hard hat and hi-viz footage is being filmed." "Which means that these are not all new jobs." "There are notable inconsistencies. Section 7.1 (Victoria and Tasmania) of the Summary Report states: 'In Victoria, project construction is expected to generate 5,247 FTE job-years over the assumed five-year construction period. In Tasmania, project construction is expected to generate 2,661 FTE job-years over the assumed five-year construction period. That totals 7,908 FTE job-years. Spread over five years, this equals 1,581 jobs per year. This, from EY report Overview of Project Marinus' construction and operating profile	• Reasons for a separate EIS/EES process in Tasmania • Scepticism of the "professed 'social licence' goals" of the Project • Approach to Project a piecemeal assessment • Usage of terms Full-Time Equivalents (FTE) and FTE job-years • Usage of word potential in the context of the EIA and other technical documents • Comment seeking greater clarity on whether jobs are new or not • Apparent inconsistencies between employment estimates reported in Section 7.1 Economics and EY's Overview of Project Marinus	• The May 2024 EIA and Supplemental SGS Report have directly assessed the impacts of the proposed Project to the Tasmanian economy and to the economy of Northwest Tasmania. • The economic impact modelling, SGS's findings and conclusions do not indicate that there is a net negative or detrimental impact to the state or region's economy when considering the metrics of Gross Value-Added or employment Regarding the third issue, • Neither SGS nor I am qualified to comment on the procedural elements or perceptions of separate state processes for the EIS/EES. Regarding the fourth issue, • It is unclear what social licence goals are being referred to. • Neither SGS nor I am qualified, however, to comment on this issue. Regarding the fifth issue, • Neither SGS nor I am qualified to comment on the procedural elements of the EIS/EES. Regarding the sixth issue, • Usage of the term Full-Time Equivalents or the acronym FTE is standard practice in economic impact analysis. • Usage of the term FTE job-years is also standard practice in economic impact analysis and a necessary distinction to provide for drawing a reader's attention to the difference between job generation metrics related to a single year versus job generation metrics related to multiple years. • My appreciation is that the author of the submission is not concerned with the use but rather the misuse of such metrics by politicians and advocates. And while this comment was made in reference to EY's Overview, SGS and I claim responsibility for accurately describing the Project's impact using proper terminology in our reports. We cannot be responsible for use or misuse by any other party, including politicians or advocates. Regarding the seventh issue, • The author points out a natural limitation of the analysis of economic impacts. • Economic impact analysis can only estimate the labour "demand" generated by such a project. • Economic impact modelling does not and cannot estimate the supply side of the labour demand, however: for example, it cannot estimate how many jobs will be fly-in fly-out; it cannot estimate how many jobs will be taken by workers already employed; and it cannot estimate how many jobs will be taken by workers who are currently un- or under-employed. Regarding the eighth issue,

Submission #	Relevant Text	Key Issues	Response
	(p.16&17) 'Between 2025 and 2032, construction of Marinus Link Stage 1 is expected to support 3,134 FTE job-years, while Stage 2 is expected to support 2,275 FTE job-years. Overall, the construction of marinus Link in Tasmania is expected to support 1,456 direct and 3,953 indirect and induced FTE job-years.' What does that mean? There is a seven-year period, during which all jobs – i.e., direct employment, indirect employment and induced employment – are totalled year by year. It is not unreasonable, then, to divide the 3,134 + 2,275 FTE job-years by seven for an average jobs tally of 772. So is it 1,581 or 772 FTEs that Project Marinus is generating?"		• The May 2024 EIA and Supplemental SGS Report provide explanations and links to other materials that characterise the methodology, inputs and assumptions of economic impact modelling. As such, this and other econometric models are spatial representations of the economy built upon observed mathematical relationships quantifying production, consumption, imports, exports, etc. The mathematical relationships on which such models are built, and therefore their outputs, are fundamentally grounded in past (i.e., documented and observed) economic activity and cannot be completely relied upon to accurately (i.e., without error) predict or guarantee economic outcomes in the future. They are, however, in practice the best tools for reasonably estimating outcomes (i.e., economic impacts) grounded in documented and observed patterns of economic activity. • Usage of the word 'potential' is from time-to-time necessary to draw a reader's attention to the reality that such modelling outputs should not be relied upon as completely accurate predictions of market outcomes, rather reasonable estimates of impacts. Regarding the eighth issue, • The author of the submission is comparing the total FTE job-years for both Victoria and Tasmania (in Section 7.1 Economics, which are SGS's estimates) against the FTE job-years for Tasmania alone (EY's Overview pages 16 and 17). The author overlooks the reporting of FTE job-years for Victoria in EY's Overview on pages 20 and 21). • When accounting for EY's Stage 1 and Stage 2 FTE job-years estimates for Victoria (3,987 and 2,894 respectively), the grand total FTE job-years for construction of the Project is 12,290 over 7 years is 1,755 jobs per year. As such, the point of comparison is between 1,581 jobs (Section 7.1, SGS's EIA) and 1,755 jobs per year.
15	"Based on current restrictions on replanting the corridor with native vegetation which is essential Strzelecki Koala habitat, and the subsequent loss of endangered EVCs required for construction of the Marinus Link, we feel that we cannot support this project especially as analysis by a leading energy market expert Dr. Bruce Mountain shows that it is deemed not necessary." [citation to https://reneweconomy.com.au/big-batteries-will-render-marinus-link-obsolete-new-analysis-suggests/] *I reviewed the attached submission and determined that the content and issues do not relate to the Economic Impact Assessment.*	• Reference to Victoria Energy Policy Centre analysis, authored by Dr. Bruce Mountain's, which concludes that it would be cheaper to construct big battery storage projects on mainland Australia, particularly in Victoria, than trying to store and send the power from Tasmania.	Regarding the first issue, • Neither SGS nor I have the technical capacity or expertise to model or comment on the modelling completed for that Victoria Energy Policy Centre study. Specifically, neither SGS nor I can comment on how realistic the alternative of a scaled storage solution on the mainland is. • Furthermore, SGS has not completed an analysis of economic impacts related to such an alternative and, therefore, cannot comment on the economic differences between them.

Submission #	Relevant Text	Key Issues	Response
20	“In the documentation the proponent for the Marinus Link has advanced the proposition that the proposal will ‘induce’ other projects (Volume 1 Chapter 7 Economics, page 7-9). However, in the EPBC Act Referrals for: the Bell Bay Wind Farm (EPBC 2024/09868), and, the Northern Midlands Solar Farm (2024/09775), there is no mention of Marinus. The claim of “induced” projects because of Marinus Link cannot be sustained.”	• Reference to Marinus Link inducing other projects • EPBC Act Referrals for Bell Bay Wind Farm and Northern Midlands Solar Farm do not reference Marinus Link • Claim of Marinus Link inducing other projects cannot be sustained	Regarding the first issue, • SGS’s EIA (May 2024) provides clarification and distinction regarding the selection of induced projects for analysis. Induced investments are defined as those projects that would not proceed without delivery of the Marinus Link project. Such projects were identified by Marinus Link Pty Ltd and included in analysis. At the time, capital investment information was not available for similarly-positioned projects in Victoria. It should be noted that impact estimates and outputs for such induced projects are presented separately. Regarding the second issue, • Neither SGS nor I am responsible for authoring the EPBC Act Referrals for these projects and cannot take responsibility for any omission of reference to Marinus Link or any omission in clarifying any linkage between Marinus Link and the other projects in those documents. • It is my understanding, however, that these other projects fit the definition of induced because they, in part, intend to generate power for the purpose of exporting to the mainland in excess of existing transmission capacity between Tasmania and the mainland. • As referenced detailed in the Marinus Link Volume 1, Chapter 2 (Project Rationale), Tasmania and the mainland are currently connected only by Basslink, which has capacity of 600 MW. Page 2-2 of that Chapter states “Available capacity on Basslink is often highly utilised, restricting the amount of energy transmission between Tasmania and other NEM regions.” • Regarding the Bell Bay Wind Farm, the proponent’s “Major Project Proposal”, available online states: “The Project will generate investment and support the continued expansion of renewable energy generation in Tasmania to meet the TRET. It will help to realise the benefits of the Marinus Link…” (p.4) Major Project Proposal 1 May 2024 (planning.tas.gov.au) • Regarding the Northern Midlands Solar Farm, the proponent’s Planning Application Report Update 2.0, available online, references Marinus Link (p.1208), and paraphrasing: *The Tasmanian Renewable Energy Coordination Framework contains the specific directions for achieving the … REAP’s goals and vision. Action 6 of the Framework is to “Establish Tasmania’s First Renewable Energy Zone (REZ)*. The document states that “Action 6, of the Framework’s third ‘pillar’, in particular represents a significant opportunity for the Proposal.” Furthermore, *that Action refers to establishing Tasmania’s first Renewable Energy Zone (REZ)*. “The Framework further specifies that ‘it is envisaged that there will need to be more than one REZ to deliver on all of the State’s renewable energy objectives,’ and that there will be a ‘rolling approach to establishing additional REZ, dependent on variables like the commitment and construction of Marinus Link’ and ‘organic load growth in the State.” Regarding the third issue,

Submission #	Relevant Text	Key Issues	Response
			• Neither SGS nor I am qualified to comment on the primary motivations or ultimate decision-making that led to pursuit of these other projects. • However, by definition, if the projects are being undertaken in part for export purposes, which require the completion and operational transmission capacity of Marinus Link, then they fit the definition of induced projects for the purpose of estimating economic impacts.
22	"Again, just like the dodgy wind turbines that foreign interests want to put all over Tasmania, the only ones who will benefit from Marinus are the foreign investors and the local, State and Federal government who set this up behind closed doors without consulting their constituents first and ensuring that their NO! to this ridiculously expensive, dangerous high voltage project was heard and respected so as to actually benefit Tasmanians, not foreign interests or the local, State and Federal government."	• Perception regarding foreign interests in installing wind turbines across Tasmania • Perception regarding the beneficiaries of the Project being foreign interests, the (Australian) local, state and federal governments • Perception regarding setting up the Project without consulting constituents	Regarding the first issue, • Neither SGS nor I am qualified to respond to this comment. Regarding the second issue, • While neither SGS nor I can comment on the foreign interests or the perception that only the (Australian) local, state and federal governments, presumably to the exclusion of the community or residents, will benefit from the Project. • The May 2024 EIA and Supplemental SGS Report point to the economic contributions to the local and regional labour force, as well as to the generation of local, state and federal public tax revenues, which are, in part, used to fund essential and community infrastructure. Regarding the third issue, • It is my understanding that the consultation of constituents took place as a part of other technical assessments, including but not limited to, the Social Impact Assessments for Victoria and Tasmania (Technical Appendix F)
25	"Moreover, the financial impact of these renewable schemes is devastating. The cost of renewable electricity is spiralling, burdening consumers with sky-high bills for energy that is pathetically unreliable - both weather-dependent and intermittent. This is a far cry from the reliability and affordability of Australian coal power, which remains a robust and secure energy source"	• Perceived financial impact of renewable schemes as devastating • Perceived cost of renewable electricity burdening consumers • Perception of comparably more reliable and affordable electricity from coal power.	Regarding the first issue, • Neither SGS nor I am qualified to speak to the generalisation that all renewable schemes are detrimental. • Regarding the Project, however, the May 2024 EIA and Supplemental SGS Report identify that it has a net positive impact on the economy from a construction and operations perspective. Regarding the second issue, • It is my understanding that the delivery and operation of Marinus Link will facilitate and expand opportunities for Tasmania to generate and export additional energy. The bi-directional nature of the capacity introduced via the Project implies that Tasmania will also have access to variable renewable energy generation from the mainland that may assist in balancing supply and demand for Tasmanian users, placing downward pressure on wholesale energy prices. Regarding the third issue, • Neither SGS nor I am qualified to speak to the perception that coal-fired power is more reliable or more affordable than renewables.

Submission #	Relevant Text	Key Issues	Response
27	"While [author] acknowledges and appreciates the work completed to date, we believe the impacts may be more substantial than reported in the EES. The permanent removal of trees within the easement area, which cannot be replanted due to operational limits, along with other risks and constraints, poses a threat to [author's] operations and the sustainability of these plantations. We are particularly concerned about the potential construction impacts and biosecurity risks that could further exacerbate the negative effects on [author's] operations." "Our primary concern during the construction phase is the anticipated loss of wood stock and productive land along the current route, along with operational restrictions. While the EES has acknowledged potential construction impacts and categorised them as moderately high, [author] believes these impacts necessitate serious consideration of an alternative route to effectively mitigate disruption to our operations." "In addition to the direct impacts on wood supply and land use, these construction activities also present significant secondary risks. The creation of temporary infrastructure and increased human activity heightens the risk of fire, posing a substantial threat to our plantations and potentially disrupting the flow of harvested timber. Fire, in particular, is a major risk to forestry, and there is a long history of plantations across Victoria being destroyed by fire. Furthermore, the disturbance caused by construction activities introduces a heightened risk of introducing diseases to the plantations, which could have long-term impacts on future yields." "Unlike other forms of agriculture that can adapt their structure and maintain land use	• Concern regarding more serious impact on direct operations through construction and operations than identified by the EES. • Concern for loss of stock and productive land during construction • Concern regarding temporary infrastructure and increased human activity heightening the risk of fire • Concern regarding permanent loss of productive land above installed cables	Regarding the first issue, • While this implies a relevant economic consideration, neither SGS nor I am qualified to comment on the extent to which such impacts may be permanent and, as such, may or may not result in challenges to continued commercial use of property. • Technical Appendix K (Agriculture and Forestry) refers to key issues, mitigation measures and EPRs related to loss of productive use of agricultural, forestry or fishing lands. Regarding the second issue, • While Technical Appendix K refers to key issues, mitigation measures and EPRs related to loss of productive use of agricultural, forestry or fishing lands, the submission refers to an issue with economic issues related to continued viability of operations that should be considered if not already. Regarding the third issue, • This issue raises the same considerations as above, for which consideration to mitigation measures and EPRs related to loss of productive use of agricultural, forestry or fishing lands could be considered with respect to this property if not already done. Regarding the fourth issue, • This issue also raises the same considerations for the extent to which mitigation measures and EPRs listed in Technical Appendix K account for the impacts described here.

Submission #	Relevant Text	Key Issues	Response
	for specific purposes, the Marinus Link would permanently restrict the use of affected land for future timber production, as trees cannot be replanted over the installed cables.”		

Source: SGS Economics & Planning (2024)

8 Environmental Performance Requirements

As described at section 6 above, the Economic Impact Assessment referenced numerous EPRs recommended by other technical consultants as relevant to mitigating the socioeconomic considerations of Economic Impacts.

I have reviewed EPRs recommended by 1) the Victorian Social Impact Assessment (Appendix U), 2) the Tasmanian Social Impact Assessment (Appendix F), 3) the Agricultural and Forestry Technical Report (Appendix K), 4) the Land Use and Planning and Impact Assessment Report (Appendix S), as well as 5) the Supplemental Reports relevant to these areas of technical expertise, and, to the extent they are relevant to the issues in SGS's EIA (May 2024) and the Supplemental SGS Report, I have no recommended changes.

9 Declarations

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

If I am presenting evidence from a different location by video conference, I confirm that:

(a) I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel.

(b) I will inform the Panel immediately should another person enter the room from which I am giving evidence.

(c) during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel.

(d) I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

Signed by David T. Schwartz

Signed David T Schwartz

Date 28 August 2024

Marinus Link Environment Effects Statement and draft Planning Scheme Amendment

Inquiry and Advisory Committee hearing

Expert Witness Statement of Craig Mickle

1 Introduction

My name is Craig Mickle and I am a Partner of Ernst & Young (EY) at 200 George Street, Sydney, New South Wales, 2000.

I have undertaken a peer review of the economic impact assessment (**Economic Impact Peer Review**) report prepared by SGS Economics & Planning (**SGS**) dated May 2024 (the **SGS EIA**) and the Supplemental Report to Economic Impact Assessment of Marinus Link (the **Supplemental SGS Report**) dated August 2024 (collectively the **SGS Reports**), being a technical appendix to the consolidated Environment Effects Statement (**EES**) under the *Environment Effects Act 1978* (Vic) and the draft Environmental Impact Statement under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (**EIS**) for the Marinus Link Project.

Table 1 provides a summary of my opinion on the methodologies and approaches of the SGS Reports, having regard to the purpose and scope of those reports.

Table 1: Opinion Summary

Background and Approach

This Economic Impact Peer Review has involved reviewing the SGS Reports and documents prepared by EY (identified in Section 4, being Documents A to G) relating to the Marinus Link Project to inform my opinion on whether the methodologies and approaches of the SGS Reports are fit for purpose and reasonable having regard to the purpose and scope of those reports.

The purpose of the reports I consider is a function of the specific economic issues the analysis and outputs are intended to inform. Some have been prepared to meet a regulatory requirement; while others have been prepared for information purposes.

The scope of the reports I consider is defined by:

- the boundary of the economic analysis undertaken, and the outputs produced (i.e. what economic issues are in and out of scope), which is largely a function of the purpose of the relevant report; and
- the physical perimeter of the Project and the potential impacts that are considered.

The methodology of the reports I consider refers to the economic model used to undertake the analysis and convert the model inputs (e.g. capital and operating expenditure) into the model outputs (e.g. value add and employment).

The approach of the reports I consider refers to the how that model has been applied, including the key assumptions used as relevant.

The material differences between the most relevant EY Reports and the SGS Reports is assessed both qualitatively (in respect of methodology and approach) and quantitively in respect of the key outputs they produce.

Scope of the SGS Reports

The SGS EIA estimates the economic impact of the construction and operation of the Project and induced investments in energy generation and storage assets. The EIA:

- provides outputs that summarise the economic impacts of the Project for:
  - the whole of Tasmania and the whole of Victoria; and
  - at a regional level for North West Tasmania and Gippsland in Victoria;

- estimates those impacts in those geographic regions in terms of:
  - gross value added (**value add**) for construction and operation for 2025-2050; and
  - employment (FTE job years) for construction and operation for 2025-2050; and
- estimates the economic impacts of induced investment (i.e. for energy generation and storage) from 2028-2050 in Tasmania and North West Tasmania.

The SGS EIA concludes that from an overall economic perspective, Marinus Link will deliver significant outcomes to the regional and economies of North West Tasmania and Gippsland, and Tasmania and Victoria. In my opinion, SGS's conclusion is reasonable.

The scope of the Supplemental SGS Report is, from an economic perspective, identical to the SGS EIA and the results in it does not change SGS's key conclusions.

Purpose and Scope of the EY Reports

Documents A and E have a similar purpose to the SGS Reports in the economic issues they seek to inform. They, however, use a different methodology (see Table 6) and below.

The purposes of Documents B, C, D, F and G are to:

- inform the Regulatory Investment Test for Transmission (the **RIT-T**) included in the National Electricity Rules **(NER)**; and
- consider related issues that pertain to the market benefits of the Marinus Link Project.

The RIT-T is a cost benefit analysis which is used to determine whether any transmission investment is prudent and, if so, what type of investment might be most prudent.

Documents B, C, D, F and G do have part of the necessary scope and therefore analysis to assess whether the Marinus Link Project might deliver a net economic benefit to those who produce, consume and transport electricity in the market. Thus, these documents address one half of the cost benefit analysis equation (i.e. the gross market benefits). The assessment of whether the Project might deliver a net economic benefit is assessed outside of those documents (i.e. in the Project Assessment Draft Report (**PADR**) and Project Assessment Conclusions Report (**PACR**).

The acceptance of the PACR's findings signifies that the Marinus Link Project has passed the RIT-T cost benefit analysis and is therefore a prudent investment.

Given the purposes of Documents B, C, D, F and G, they are not relevant to informing my assessment of the material differences between the EY Reports and the SGS Reports.

Documents A and E are the most relevant EY Reports to informing my assessment of the material differences between the EY Reports and the SGS reports. Document E is the most relevant report to inform that assessment because it is more recent than Document A and more contemporaneous with the SGS Reports.

Opinions

Methodologies and approaches of the SGS Reports

In my opinion, the methodologies and approaches of the SGS Reports are fit for purpose and reasonable having regard to the purpose and scope of those reports.

The SGS Reports:

- use a well-known and widely accepted methodology to estimate the economic impacts of the Marinus Link Project and the investment it induces;
- use a well-known and widely accepted Computable General Equilibrium (**CGE**) model to apply that methodology; and

- generally adopt a reasonable approach and key assumptions in the modelling of the economic impacts of the Marinus Link Project and the investment it induces.

The methodology used in the SGS Reports is considerably more sophisticated than that used in Document E and, as a result, might be expected to produce a more accurate assessment of the economic impact / contribution of the Project and of the investment it might induce / enable.

In respect of the quantitative outputs produced, there are fourteen implied multipliers that can be compared across the SGS Reports and Document E. Eleven of those implied multipliers are materially similar. In the three cases where they are not, there appears to be a reasonable explanation for the material differences in those implied multipliers.

The residual impact assessment and proposed EPRs

The SGS EIA identifies a number of potentially negative impacts of the Marinus Link Project on the environment, including socio-economic impacts.

It also identifies ten EPRs to mitigate those impacts.

In my opinion, those EPRs would appear to address the issues identified and provide an adequate basis on which to do so.

Recommendations for changes to the draft Planning Scheme Amendment and Environmental Performance Requirements (EPRs)

Nil.

2 Qualifications, experience and expertise

My qualifications are as follows:

- F. Fin – Fellow of the FINSIA
- MBA (Honours) Middlesex University, United Kingdom;
- Graduate Diploma in Applied Finance and Investment, FINSIA
- B. Bus, Curtin University, Perth, Western Australia.

I lead EY Oceania's Power and Utilities (P&U) commercial advisory practice. I previously led EY Oceania's Economics Practice. Prior to professional services, I was Chief Economist at TXU Australia (now AusNet and Energy Australia) and, prior to that, Senior Economist at Melbourne Water Corporation.

I have over 25 years of experience in the P&U sector working on industry reforms and regulatory issues, transactions and major projects. My key clients include energy and water market participants, including developers, investors and energy users, and governments.

My areas of expertise include: economics; commerce and finance; and energy and water industry knowledge and experience.

A statement setting out my qualifications and experience is provided as Annexure A.

3 Instructions

I have been instructed by Herbert Smith Freehills on behalf of Marinus Link Pty Ltd to give evidence on the environmental effects of the Project relevant to Victoria and relevant to my area of expertise and prepare an expert witness statement that summarises the Economic Impact Peer Review. A copy of my instructions is included as Annexure B.

4 Statements in relation to the Economic Impact Peer Review

The role that I had in preparing the Economic Impact Peer Review was as the Expert Witness. This involved reviewing the SGS Reports and the following EY documents relating to the Marinus Link Project:[1]

(a) an economic contribution to Tasmania report dated 20 November 2019 **(Document A)**;

(b) an economic modelling report dated 27 November 2019 for the Project Marinus Project Assessment Draft Report **(Document B)**;

(c) an addendum to that economic modelling report dated 9 November 2020 **(Document C)**;

(d) a further economic modelling report dated 22 June 2021 for the Project Marinus Project Assessment Conclusions Report **(Document D)**;

(e) an economic contribution report dated October 2023 **(Document E)**;

(f) a gross market benefit assessment report dated 28 March 2024 **(Document F)**; and

(g) modelling to inform those assessments **(Document G)**, (collectively, the **EY Reports**).

I was the lead EY Partner on the development of Documents A, B, C, D and the relevant parts of Document G that relate to those documents. I was not the lead EY Partner on Document E but was involved in the peer review of it. I had no role in the preparation of Document F, nor the relevant parts of Document G that relate to Document F. I also have overall responsibility for all EY's work on the Marinus Link Project.

To arrive at my opinions in this matter, I have selected colleagues to assist me. My colleagues carried out the work that I decided they should perform. I have reviewed their work and the original documents to the extent I considered necessary to form my opinions. The opinions expressed in this report are mine.

I had support from the following EY employees to undertake this Economic Impact Peer Review:

Name of contributor and details of position	Contribution / role in peer review
Amber Shergis, Director	• Review of SGS Report and EY Reports • Contributions to drafting of the Economic Impact Peer Review
Kirill Sidorenko, Senior Consultant	• Review of SGS Report and EY Reports • Contributions to drafting of the Economic Impact Peer Review
Megan Gross, Senior Consultant	• Review of SGS Report and EY Reports • Contributions to drafting of the Economic Impact Peer Review
Jordan Morse, Manager	• Review of EY Reports • Contributions to drafting of the Economic Impact Peer Review

I adopt the Economic Impact Peer Review in Section 6, in combination with this statement, as my written expert evidence for the purposes of the Panel's inquiry into the environmental effects of the Marinus Link Project. I confirm that the Economic Impact Peer Review, to the best of my knowledge, is complete and accurate. I confirm that I have adopted the key assumptions included in the Economic Impact Peer Review to the EES for the Marinus Link Project.

[1] The term Marinus Link and Project Marinus are sometimes used interchangeably in some of the EY Reports (e.g. Document E). Documents B, C, D and F note that, unless otherwise stated in the respective reports, any reference to Marinus Link implicitly includes the AC transmission augmentations (e.g. the NWTD) required to support energy flows across Marinus Link.

5 Further work since preparation of the Economic Impact Peer Review

Not applicable.

6 Economic Impact Peer Review

1. This Economic Impact Peer Review is structured as follows.
    a. Section 6.1 provides some relevant background and definitions to support this Economic Impact Peer Review;
    b. Section 6.2 explains the purpose and scope of the SGS Reports;
    c. Section 6.3 explains the purpose and scope of the EY Reports;
    d. Section 6.4 explains the methodology and approach of the SGS Reports;
    e. Section 6.5 explains the methodology and approach of the most relevant EY Report; and
    f. Section 6.6 describes the material differences between the most relevant EY Report and the SGS Reports, including any reasons for those differences.

6.1 Background and definitions

2. Marinus Link (**Marinus Link**) refers the proposed 1500 MW HVDC (comprised of two 750 MW cables) electricity interconnector between Heybridge in North-East Tasmania and the La Trobe Valley in Victoria and the voltage converter stations at each end of the cables. Project Marinus (**Project Marinus**) refers to Marinus Link and the North West Transmission Development (**NWTD**) in Tasmania which will provide transmission capacity between energy generation and storage assets and Marinus Link.[2]

1. TasNetworks Pty Ltd (**TasNetworks**) was the original proponent of Marinus Link and Project Marinus. It established a wholly owned subsidiary Marinus Link Pty Ltd (**Marinus Link Pty Ltd**) to develop Marinus Link.[3] TasNetworks sold the business to the Commonwealth, Tasmanian and Victorian State governments in March 2024.

2. I use the term "the Project" generically but note where it is a reference to Marinus Link or Project Marinus where the distinction is relevant to this Economic Impact Peer Review.

3. In this Economic Impact Peer Review I adopt the following definitions:
    a. The purpose of the reports I consider is a function of the specific economic issues the analysis and outputs are intended to inform. Some have been prepared to meet a regulatory requirement; while others have been prepared for information purposes.
    b. The scope of the reports I consider is defined by:
        i the boundary of the economic analysis undertaken, and the outputs produced (i.e. what economic issues are in and out of scope), which is largely a function of the purpose of the relevant report; and

[2] The term Marinus Link and Project Marinus are sometimes used interchangeably in some of the EY Reports (e.g. Document E). Documents B, C, D and F note that, unless otherwise stated in the respective reports, any reference to Marinus Link implicitly includes the AC transmission augmentations (e.g. the NWTD) required to support energy flows across Marinus Link.

[3] Marinus Link Pty Ltd was established in 2018 but operationalised in December 2021.

ii the physical perimeter of the Project and the potential impacts that are considered;

c. The methodology of the reports I consider refers to the economic model used to undertake the analysis and convert the model inputs (e.g. capital and operating expenditure) into the model outputs (e.g. value add and employment);

d. The approach of the report I consider refers to the how that model has been applied, including the key assumptions used as relevant; and

e. The material differences between the most relevant EY Reports and the SGS Reports is assessed both qualitatively (in respect of methodology and approach) and quantitively in respect of the key outputs they produce (paragraphs 28-31 describe how that quantitative analysis is undertaken, and how I have defined the implied multipliers used).

6.2 The purpose and scope of the SGS Reports

4. Table 2 summarises the purpose and scope of the SGS Reports.

Table 2: The purpose and scope of the SGS Reports

SGS Reports	Purpose	Scope

SGS EIA:
 	
Economic Impact Assessment (**EIA**) of Marinus Link
 	
May 2024
	The EIA is intended to inform part of the Environmental Impact Statement (**EIS**) or Environmental Effects Statement (**EES**) that the Commonwealth, Victorian and Tasmanian Governments are preparing for the Project to facilitate the required environmental approval processes.
	
	The Commonwealth EIS requires an overview of the economic and social impacts of the Project to be analysed, including the employment opportunities expected to be generated (including in the construction and operational phases).
	
	The Victorian EES, in the context of assessing the agricultural, land use and socioeconomic impacts of the Project, identifies key issues for assessment including the potential economic and social benefits from the Project. It also notes likely effects for assessment including the economic effects of the Project, considering direct and indirect consequences on employment, the
		The SGS EIA defines the Project to be Marinus Link and does not include the NWTD in Tasmania. For the purposes of the SGS EIA, the Project includes both cables 1 and 2 and assumes they are developed over a 5-year construction period 2025-2029.
		
		The SGS EIA estimates the economic impact of the construction and operation of the Project and induced investments in energy generation and storage assets. The induced investments include two wind farms and four pumped hydro projects, all located in North West Tasmania. These were determined by SGS and Marinus Link Pty Ltd as a suitable sample of generation and storage projects that also had the necessary data available to support the analysis.
		
		The EIA:
		• provides outputs that summarise the economic impacts of the Project for:
		  ◦ the whole of Tasmania and the whole of Victoria; and
		  ◦ at a regional level for North West Tasmania and Gippsland in Victoria;
		• estimates those impacts in those geographic regions in terms of:
		  ◦ gross value added (**value add**) for construction and operation for 2025-2050; and
		  ◦ employment (FTE job years) for construction and operation for 2025-2050; and
		• estimates the economic impacts of induced investment (i.e. for energy generation and storage) from 2028-2050 in Tasmania and North West Tasmania.
		
		The EIA quantifies the impact on local, state and federal rate, taxation and royalty revenues.
		
		The EIA quantifies the electricity market impacts of the Project and of the energy generation and storage investment it induces, by assuming that the increased electricity supply arising from the Project is used across the NEM with the price of electricity remaining unaffected.
		
		The EIA also provides high level commentary on considerations such as impacts on agricultural industries, land values, demand for housing and the extent to which goods and services can be sourced locally for the Project.

	local and regional economy and the industries in the area. The Tasmanian EIS requires most relevantly, and amongst other things, an assessment of the Project's capital investment, operating expenditures and impacts on local and State labour markets and tax revenues.	The EIA does not consider: • downstream industry impacts associated with the Project; • any induced investments in Victoria because, with the Project, energy would typically flow from Tasmania to Victoria; nor • any investments that might not proceed in Victoria because of the Project. The SGS EIA states that the EIA: *"does not assess the merits of a project in terms of it costs compared to its benefits (such as the findings of a cost-benefit analysis). An EIA is also not a replacement for a business case in which other metrics can be calculated, such as net present value of an investment and/or return on investment (ROI). An EIA is not an assessment of whether a project is beneficial from a community welfare perspective."*[4]
Supplemental SGS Report – August 2024	The purpose of the Supplemental SGS Report is to provide responses to questions of economic impact arising from updated information regarding the proposed timing and capital investment for the Project.	The scope of the Supplemental SGS Report is, from an economic perspective, identical to the SGS EIA. Within that context, the Supplemental SGS Report is limited to addressing the following: • Whether a change to the timing for delivery of Stages 1 and 2 would have material implications for the assessment of economic impacts or conclusions, as described in the EIA? In this regard, the Supplemental SGS Report provides updated estimates of value add and employment across construction and operations (and across the relevant geographies) that in some cases are materially higher than those estimate in the SGS EIA. • Reviews the extent to which Commonwealth, Victorian or Tasmanian scoping requirements might be impacted by such changes and updated conclusions: In this regard, the Supplemental SGS Report notes the scoping requirements most impacted (e.g. local labour market) but concludes that the substance of the impact will remain the same just be more protracted given the updated timing of the Project. • Commenting on the extent to which SGS's considerations of other economic opportunities or externalities and other socio-economic impacts would be impacted: In this regard, the Supplemental SGS Report concludes that the substance of its previous considerations remain the same, however, the protracted construction timelines prolongs the relevance of a few considerations.

[4] SGS, Economic Impact Assessment of Marinus Link, May 2024, page 18.

		• Whether any additional mitigation measures of EPRs would be recommended: In this regard, the Supplemental SGS Report concludes that the identified mitigation and EPRs in the SGS EIA remain appropriate upon re-examination following the update economic impact modelling.

5. Table 2 shows that the SGS Reports focus on the economic impacts of:

   a. the Project's construction and ongoing operation and maintenance; and

   b. the energy generation and storage investment that the Project induces in Tasmania.

6. The SGS Reports do not consider whether the economic benefits of the Project are likely to outweigh its economic costs. The SGS Reports only estimate the economic impacts of the Project on parts of the Australian economy if the Project proceeded.

6.3 The purpose and scope of the EY Reports

7. Focussing first on the purpose and scope of each EY Report serves to distinguish between the reports that are most relevant to my assessment of the material differences between those reports and the SGS Reports, including any reasons for those differences.

8. Table 3 and Table 4 set out the purpose and scope of each EY Report.

9. I consider the purpose and scope of Documents A and E first because, for the reasons outlined below, these are the most relevant to inform my assessment of the material differences with the SGS reports. I then consider the purpose and scope of Documents B, C, D, F and G.

Table 3: The purpose and scope of Documents A and E

EY Report	Purpose	Scope

Document A:
 	
The economic contribution of Marinus Link and Supporting Transmission
 	
20 November 2019
	Document A was prepared for TasNetworks to consider the economic contribution of the Project to the Tasmanian and Victorian economies.
	
	It assists in quantifying the potential wider economic benefits of the Project beyond the electricity market.
		Document A defines the Project to be Marinus Link (both cables) and the supporting Tasmanian AC transmission investment, which subsequently evolved into the NWTD. It estimates the economic contribution of the construction and operation of the Project and the enabled investment in generation and energy storage assets.
		
		Document A:
		
		• provides outputs that summarise the economic contribution of the Project: for the whole of Tasmania and the whole of Victoria; and at a regional level for North West Tasmania, North East Tasmania, the Tasmanian Midlands and the Rest of Tasmania;
		• estimates the economic contribution of the Project in terms of:
		    • value add for the construction and operation phases of the Project; and
		    • employment (FTE job years) for the construction and operation phases of the Project; and
		• estimates the economic contribution of investment in generation and storage assets in Tasmania enabled by the Project.
		
		Document A does not consider the electricity market impacts of the Project nor of the energy generation and storage investment it enables. Document A states that: *"Economic contribution is a gross measure rather than a net measure of the contribution of an industry or a project to the economy. Economic contribution studies do not consider substitution impacts, or*

		what would happen if the relevant industry did not exist, or the relevant project did not occur. The value add estimates are therefore gross measures, as are the employment impacts."[5]
Document E: The economic contribution of Project Marinus October 2023	Document E has the same purpose as Document A. It re-executes the analysis considering the further development of the Project.	Document E has a similar but somewhat broader scope to Document A. It more explicitly assesses the economic contribution of the NWTD. It also expands the economic contribution analysis to the potential development of new data centres in Tasmania. Those data centres would leverage the communications equipment that is necessarily a part of Marinus Link, and the surplus capacity that can be incorporated into that equipment at low incremental cost and can be used for other purposes. In all other respects, the scope of Document E is essentially the same as Document A (i.e. it focuses on reporting the value add and employment of the construction and operation of the Project and the investment the Project enables). Document E provides the same qualifications as Document A regarding how to interpret the outputs.

10. Document A:
    a. focuses on the economic contribution of the Project's construction and ongoing operation and maintenance (in this case including the NWTD); and
    b. addresses the same types of economic contribution for the energy generation and storage investments that the Project enables in Tasmania.

11. Document A does not consider:
    a. the electricity market impacts of the Project nor of the energy generation and storage investment that is enabled (i.e. it does not consider the implications for electricity wholesale market costs); nor
    b. whether the economic benefits of the Project are likely to outweigh its economic costs. It only estimates the economic contribution of the Project on parts of the Australian economy if it proceeded.

12. Document E has essentially the same purpose as Document A.

13. Document E has a similar scope as Document A but also considers the economic contribution of the construction of data centres that might be enabled by the Project.

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[5] EY, The economic contribution of Marinus Link and Supporting Transmission, November 2019, page 14.

14. Documents A and E have a similar:

a. purpose to the SGS Reports in the economic issues they seek to inform. They do, however, use a different methodology (see Table 6), which likely leads to the different terminology adopted between SGS and EY (i.e. economic impact in the SGS Reports and economic contribution analysis in Documents A and E);

b. scope to the SGS Reports, save for some differences in:

   i the breadth of the economic issues analysed in the SGS Reports, which is largely a function of differences in the purpose and thus methodology adopted (see Table 2); and

   ii the outputs produced. The SGS Reports includes the impact on the electricity market, and local, state and federal rate, taxation and royalty revenues (whereas Documents A and E do not);

   iii the definition of the Project. Documents A and E focus on Project Marinus; the SGS Reports consider only Marinus Link; and

   iv the type of induced / enabled investment that was assessed and how its quantum was determined. Documents A and E use a different approach to determine enabled energy generation and storage investment (see Table 6), including data centres.

15. Table 4 sets out the purpose and scope of Documents B, C, D, F and G.

Table 4: The purpose and scope of Documents B, C D, F and G

EY Report	Purpose	Scope
Document B: Project Marinus Project Assessment Draft Report **(PADR)** economic modelling report 27 November 2019	The purpose of Document B is to inform the PADR prepared by TasNetworks, which is stage two of the Regulatory Investment Test for Transmission (the **RIT-T**) included in the National Electricity Rules (**NER**).[6] The purpose of the RIT-T is to *"...identify the credible option that maximises the present value of net economic benefit to*	Document B describes the key methodologies, assumptions and input data sources used in the gross market benefits modelling required to inform the RIT-T. Document B applies the RIT-T cost benefit analysis framework to compute the gross market benefits of the Project based on the change in the least-cost generation dispatch and capacity development plan it enables (i.e. the change in wholesale electricity market costs it enables). Document B uses linear programming techniques to compute a least-cost, whole of National Electricity Market (**NEM**), hourly time-sequential dispatch and development plan spanning 30 years from 2020-21 to 2049-50.

[6] NER s. 5.15A. It does not apply to all transmission projects or only applies in part to some transmission projects.

	all those who produce, consume and transport electricity in the market…"[7] The RIT-T is a cost benefit analysis which is used to determine whether any transmission investment is prudent and, if so, what type of investment might be most prudent. The RIT-T also informs a decision about the costs that can reasonably be imposed on transmission system users to recover the costs of that investment. The NER set out the process that a project proponent must follow in complying with the RIT-T. This process, amongst other things, includes: • Stage one: preparing a project specification consultation report (**PSCR**); • Stage two: preparing a PADR; • Stage three: preparing a Project Assessment Conclusions Report (**PACR**); and • requirements in respect of the cost benefit analysis that must be undertaken including the classes of costs and market benefits to be considered. This includes the quantification of the market benefits which in the proponent's reasonable opinion are determined to be material. The rules in the NER are also supported by	Document B refers to "gross" market benefits to distinguish between the "net" economic benefits that are estimated under the PADR by TasNetworks (e.g. where those gross market benefits are reduced to net market benefits by deducting the cost of the Project). Document B notes in several places (i.e. pages 2, 14 and 18) what would be required to estimate the net market benefits and that TasNetworks has separately estimated those benefits in the PADR.

[7] The net economic benefit is assessed from the perspective of electricity market participants. This is broadly consistent with the National Electricity Objective set out in the National Electricity Law, which focuses on the long term interests of electricity consumers (i.e. the former is assumed to be consistent with the latter and the methodology of estimating gross market benefits is consistent with the latter). This perspective is, however, not necessarily consistent with the net economic benefit to society. Some of the issues that might lead to a difference from applying these different perspectives are addressed in Section 7 of this Economic Impact Peer Review which addresses Environmental Performance Requirements.

	Australian Energy Regulator's (**AER**'s) cost benefit analysis guidelines.[8] The PADR and the PACR must set out, amongst other things, the cost benefit analysis that has been undertaken.	
Document C: Appendix to the TasNetworks Supplementary Analysis Report - Addendum to Project Marinus PADR economic modelling report 9 November 2020	Document C has a similar purpose to Document B but updates the analysis in Document B. In December 2018, the RIT-T guidelines were updated to include a statement that RIT-T proponents should have regard to information in the Australian Energy Market Operator's (**AEMO's**) Integrated System Plan (**ISP**) when developing reasonable scenarios for the RIT-T process.[9] Since the first stage of the Project Marinus RIT-T (the PSCR) had been published prior to the RIT-T update, the previous RIT-T rules still applied. However, TasNetworks noted[10] a key theme raised in stakeholder submissions to the PADR was that the Project Marinus RIT-T scenario assumptions should be aligned with AEMO's 2020 ISP.[11] Given this feedback, TasNetworks paused its work on the RIT-T process to produce supplementary analysis outside of the normal RIT-T process, which aligned more closely to the AEMO ISP scenarios and assumptions. Document C is an	Document C has a similar scope to Document B but updates the scenarios and various input assumptions to align with more recent AEMO ISP data. Most relevantly: • The modelling underpinning Document C uses a 21 year study period to incorporate the half-hourly demand forecast from AEMO's 2020 Electricity Statement of Opportunities **(ESOO)**. This half-hourly data is only forecast to 2041-42. As such, the end date of the modelling period is 8 years prior to that of the study period used for the Project Marinus RIT-T PADR, which finished in 2049-2050. • Document C notes that on the 3rd of March 2020 the Tasmanian Government announced a new state based renewable energy target of 200% renewable generation by 2040 relative to Tasmania's existing electricity demand (the **TRET**).[12] AEMO's 2020 ISP, released July 2020, included the TRET in two of its five scenarios: The High DER (Distributed Energy Resources) and Step Change scenarios. In Document C, the TRET is included as a constraint in the modelling based on instructions received and input provided by TasNetworks.

[8] TasNetworks had completed the first stage of the RIT-T (the PSCR) in July 2018, meaning the Marinus Link PADR could be grandfathered to use the September 2017 version of the RIT-T application guidelines rather than the more recent December 2018 version, as per Clause 5.16.2(f) of the NER. See Australian Energy Regulator, 18 September 2017, Regulatory investment test for transmission application guidelines, available at: https://www.aer.gov.au/system/files/AER%20-%20Final%20RIT-T%20application%20guidelines%20-%20September%202017.pdf. Accessed 24 June 2024.
[9] Section 3.4.1, AER, Final RIT-T application guidelines, 14 December 2018. Available at: https://www.aer.gov.au/system/files/AER%20-%20Final%20RIT-T%20application%20guidelines%20-%2014%20December%202018_0.pdf. Accessed 21 June 2024.
[10] TasNetworks, Marinus Link Supplementary Analysis Report, November 2020. Available at: https://www.marinuslink.com.au/wp-content/uploads/2020/11/Marinus-Link-Supplementary-Analysis-Report.pdf. Accessed 21 June 2024.
[11] AEMO, 2020 Integrated System Plan, July 2020. Available at: https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en. Accessed 21 June 2024
[12] Legislation to formalise the TRET passed both Houses of Parliament on 18 November 2020 in the week following the publication of Document C.

	appendix to the TasNetworks supplementary analysis report to Document B. Document C primarily describes the key changes in scenario assumptions, input data sources and methodologies that were applied in the gross market benefits modelling.	
Document D: Project Marinus PACR economic modelling report 22 June 2021	Document D forms a supplementary report to the PACR published by TasNetworks; otherwise, it has a similar purpose to Documents B and C. Document D describes the key assumptions, input data sources and methodologies that have been applied in the gross market benefits modelling, as well as the outcomes of the analysis and its key conclusions.	Document D updates and expands on the modelling performed in Documents B and C. Most relevantly, it notes that: • TasNetworks selected input assumptions for EY to apply based on those defined in AEMO's 2020 ISP released in July 2020, with some updates to reflect more recent information provided in AEMO's Draft 2021 Input and Assumptions Workbook, released in December 2020. Document D also includes a more detailed representation of Tasmanian generators and inertia constraints. • Consistent with the application of all federal and state based renewable energy schemes, the TRET is assumed to be committed, since it is a legislated target. This is consistent with AEMO's Draft 2021 Input and Assumptions Workbook, released in December 2020.[13] • Incorporating the TRET into the modelling means that the capital and operating costs associated the generation necessary to achieving the TRET are incurred in both the "with" and "without" Marinus Link cases. Document D therefore models the gross market benefits of the Project with and without TRET in sensitivity analysis under key scenarios. • Document D notes that, under the assumptions applied, the full benefit of the TRET is only enabled if the Project proceeds. It also notes that roughly 400-600 MW of new entrant wind capacity is forecast to be installed without Marinus Link and the TRET.

[13] AEMO, 2021 Input and Assumptions Workbook, 11 December 2020. Available at: https://aemo.com.au/en/consultations/current-and-closed-consultations/2021-planning-and-forecasting-consultation-on-inputs-assumptions-and-scenarios. Accessed 24 June 2024.

Document F: Gross market benefit assessment of Marinus Link 28 March 2024	Document F undertakes further market modelling of system costs to forecast the gross market benefits to the NEM of the Project. an additional interconnector between Tasmania and Victoria. The NER include provisions that require the RIT-T to be reapplied for certain projects if there has been a material change in circumstances. Marinus Link Pty Ltd note that following the conclusion of the RIT-T for Project Marinus in June 2021, the electricity sector in Australia has continued to experience an unprecedented period of change as it transitions towards a net zero economy.[14] Document F updates the assessment of gross market benefits in June 2021 (as per Document D) due to this continued period of change in policy settings, and project and cost outlooks over the intervening period.	Document F computes the least-cost generation dispatch and capacity development plan for the NEM for the three scenarios in AEMO's Draft 2024 ISP;[15] being: the Step Change, Progressive Change and Green Energy Exports scenarios, as well as several sensitivities. The modelling methodology also follows the AER's guidelines,[16] which contain the applicable RIT-T guidelines for actionable ISP projects including Marinus Link. As with Documents B, C and D, Document F forecasts gross market benefits. The evaluation against the cost of the Project is performed by Marinus Link Pty Ltd to estimate the net economic benefit.[17]
Document G: Modelling to inform the assessments of Documents A to F Various dates, aligned to the production of reports B, C, D and F	Document G refers to a series of Excel worksheets that contain calculations and outputs of the market modelling performed and scenarios analysed in relation to the Project and enabled energy generation and storage projects. Document G contains all the economic modelling performed to develop Documents B, C, D and F.	Document G relates specifically to the modelling performed to produce Documents B, C, D and F, although some of the material they contain was also used to inform the work in Documents A and E (i.e. in respect of enabled investment). Document G excludes the technical and financial inputs and assumptions spreadsheets that were applied in the modelling. Inputs and assumptions were provided by TasNetworks and may be copied into Document G spreadsheets for the purpose of facilitating calculations required to perform analysis.

[14] Marinus Link Pty Ltd, Available at: https://www.marinuslink.com.au/rit-t-process/. Accessed 24 June 2024.
[15] AEMO, Draft 2024 Integrated System Plan (ISP), 17 January 2024. Available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/draft-2024-isp-consultation/draft-2024-isp.pdf?la=en. Accessed 24 June 2024.
[16] AER, Cost benefit analysis guidelines. 25 August 2020, Available at: https://www.aer.gov.au/documents/aer-cost-benefit-analysis-guidelines-25-august-2020. Accessed 24 June 2024.
[17] AER-letter_RIT-T-update_16-April-2024.pdf (marinuslink.com.au). Accessed 2 July 2024.

16. Table 4 shows that Documents B, C, D, F and G all have a similar purpose and scope in terms of the economic issues they are intended to inform (i.e. the RIT-T). The key differences are:

    a. Documents B, D and G were prepared for a regulatory purpose at different stages of the RIT-T process. Document C was not prepared as part of a formal step in the RIT-T process but provided updated analysis in response to changed requirements in that process and market developments. Document F was prepared to provide information on changes in the gross market benefits modelling considering market developments. It was not produced to meet a formal re-application of the RIT-T as the NER require in certain circumstances;[18]

    b. Document C notes that the gross market benefits presented should not be directly compared to those in Document B due to changes in the modelling horizon, as Document C is the only report to use the earlier end year of 2041-42, rather than 2049-50;

    c. Document D provides more description of the outcomes of the analysis and its key conclusions. In particular, Document D notes that the gross market (or system) benefits are primarily a function of:

        i Lowering the cost of energy supply to the mainland; and

        ii Lowering the cost of capacity supplied to the mainland.

17. Table 3 and Table 4 show that:

    a. Documents A and E have essentially the same purpose and scope as the SGS Reports, although the SGS Reports have a somewhat broader scope (i.e. they include the impact on the electricity market, and local, state and federal rate, taxation and royalty revenues; whereas Documents A and E do not).

    b. Documents B, C, D, F and G have a substantially different purpose and scope both to Documents A and E and the SGS Reports. Documents B, C, D, F and G focus on the impacts of the Project on the electricity market by measuring its gross market benefits. These benefits are a function of the different generation dispatch and generation and storage investment the Project enables, and the relative costs of developing, operating and maintaining those assets. The SGS Reports include the impact on the electricity market, but do so in a quite different way from Documents B, C, D, F and G.

    c. Documents A and E do not have the necessary scope and analysis to assess whether the Project might deliver a net economic benefit to those who produce, consume and transport electricity in the market; and

    d. Documents B, C, D, F and G do have part of the necessary scope and therefore analysis to assess whether the Project might deliver a net economic benefit to those who produce, consume and transport electricity in the market. Those documents address one half of the cost benefit analysis equation (i.e. the

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[18] The NER include provisions that require the RIT-T to be reapplied if there has been a material change in circumstances which, in the reasonable opinion of the RIT-T proponent, means that the preferred option identified in the RIT-T is no longer preferred. Document F was used to support Marinus Link Pty Ltd's submission that the preferred option had not changed.

gross market benefits). The assessment of whether the Project might deliver a net economic benefit is assessed outside of those documents (i.e. in the PADR and PACR).

18. Documents B, C, D, F and G are therefore not relevant to informing my assessment of the material differences between the EY Reports and the SGS reports, as these EY documents have a substantially different purpose and scope.

19. Documents A and E are the most relevant EY Reports to informing my assessment of the material differences between the EY Reports and the SGS reports. Document E is the most relevant report to inform my assessment of the material differences with the SGS reports because it is more recent than Document A and more contemporaneous with the SGS Reports.

20. The remainder of this Economic Impact Peer Review therefore focuses on the methodology and approach of Document E and the SGS Reports.

6.4 The methodology and approach of the SGS Reports

21. Table 5 summarises the methodology and approach of the SGS Reports.

Table 5: The methodology and approach of the SGS Reports

SGS Reports	Methodology	Approach
SGS EIA of Marinus Link May 2024	The SGS EIA quantifies the economic impact of Marinus Link and the induced energy generation and storage investment using a CGE model. CGE models are a class of economic models that are often used to assess how an economy reacts to exogenous changes in policy, technology or through other external factors. CGE models are whole of economy, theory-driven economic models. CGE models contain assumptions and variables (e.g. the factors of production, demand, and supply elasticities in relation to those factors of production, prices and quantities) that can forecast dynamically how all aspects of an economy react to a change. This allows supply-side constraints (e.g. labour, capital) and other 'second round' impacts of the change to be incorporated into the model and forecast the new equilibrium. The starting database for CGE models is often built using national economic accounting frameworks. Australian focused CGE models often use Australian Bureau of Statistics (**ABS**) data, or international databases that are compiled based on ABS data (e.g. the Global Trade Analysis Project database).	The CGE modelling for the EIA was undertaken by the Centre of Policy Studies (**CoPS**), part of Victoria University. The CoPS used its in-house CGE model, the Victoria University Regional Model (**VURM**). The VURM is a CGE model of Australia's states and territories. Each region is treated as a separate economy, with individual prices and includes the ability to model interstate and international trade. The starting database used for the modelling was built using 2005-06 as a reference year. It was constructed by CoPS using ABS datasets. The main dataset used was the Australian National Accounts: Input – Output Tables for 2020-21. However, there were multiple other sources used to transform the raw datasets into a starting CGE database disaggregated by state.[19] The starting database was also modified to exclude COVID-19 impacts, the main structural components of the economy grown according to the previous 5-year trend. The CGE modelling assumes: • *Timelines:* Construction of Marinus Link occurs from 2025-2030 (5 years) and operations are modelled from 2030 – 2050 (20 years). • *Inputs:* Capital expenditure related to construction and development of Marinus Link is estimated to be $3.1 billion (2021 dollars, provided by Marinus Link Pty Ltd). This was apportioned as $1.25 billion in North-west Tasmania and $1.85b in Gippsland. Operational expenditure is estimated to be $26 million per annum (2021 dollars, provided by Marinus Link Pty Ltd). This was

[19] The full list of sources is available in the CoPS methodology paper, here: g-254.pdf (copsmodels.com)

	Determining the economic impact of a project using a CGE model involves the construction of a 'baseline' scenario, under which the economy grows according to economic and demographic projections. The baseline scenario is then compared to a 'policy' scenario, which includes the additional investment and output from the project being considered. The difference between the two scenarios is the economic impact. This aspect of CGE models is no different to most other economic models; the difference relates to what is reflected in the comparison.	apportioned evenly between North-west Tasmania and Gippsland ($13m pa each). • *Induced Investments:* $4.4b of additional capital expenditure and $788m of operational expenditure (total from 2029 – 2050) that was modelled related to energy projects enabled by Marinus Link in North-west Tasmania. Capital and operational expenditure was sourced from the AEMO 2022 ISP. The investments themselves were identified by Marinus Link Pty Ltd. The outputs estimate the impacts of the investments in Tasmania and Victoria in terms of: • value add (real 2021 dollars); and • employment (in FTE job years).
Supplemental SGS Report August 2024	The Supplemental SGS Report applies the same methodology as the SGS EIA.	The Supplemental SGS Report applies the same approach as the SGS EIA and produces the same types of outputs, but a more limited range of them (see paragraph 45). However, it relies on several materially different assumptions, particularly in relation to key inputs. The materially different key assumptions include: • *Timelines:* Construction of Marinus Link occurs in two stages: Stage 1 occurs between 2025-2030; and Stage 2 between 2031-2033. • *Inputs ($2023):* Higher capital costs of $6.615 billion (an overall increase of 112%), with this time split 50/50 between Victoria and Tasmania. Operational expenditure is estimated to be $33.6 million per annum (an increase of 29%). The Supplemental SGS Report notes that the updated timelines and costs required some refinements to estimates to align the values on a consistent (e.g. nominal) basis. The Supplemental SGS Report also notes that most of the increased capital value of the Project relates to imported materials costs, but that the underlying inputs to the CGE model are grounded in observed data representative of mathematical relationships between capital investment and demand for labour and materials.

		Given this, and in the absence of further information, SGS made the determination to reflect known circumstances of the capital value escalation (i.e., that is mainly attributable to imported materials and not labour) by employing two iterations of economic impact modelling to isolate estimates of employment and value and reflect the higher imported material costs are unlikely to drive higher employment and value add. A reasonable representation of employment was estimated using the capex costs in the SGS EIA. Value add was estimated off the employment outputs.[20]

22. The Supplemental SGS Report relies on updated and materially different project cost and timing assumptions compared to the SGS EIA. It has also altered its approach to reflect further information about the nature of the additional costs.

[20] SGS, Supplemental Report to Economic Impact Assessment of Marinus Link, August 2024, pages 17-18.

6.5 The methodology and approach of Document E

23. Table 6 outlines the methodology and approach of Document E.

Table 6: The methodology and approach of Document E

EY Report	Methodology	Approach
Document E: The economic contribution of Project Marinus October 2023	Document E quantifies the economic contribution of the Project Marinus and the energy generation and storage investments it enables using an Input-Output **(I/O)** model. I/O models are built using point in time economic datasets, often using national economic accounting frameworks. Australian I/O models often use the ABS Australian National Accounts data. An I/O model produces static multipliers which represent the effects on the economy of an exogenous change in final demand on output, value add and employment of a given industry. To estimate the economic contribution of a project using	The I/O models used in Document E were built by EY. EY used the 2020-21 Australian National Accounts and ABS employment data to build I/O tables for Victoria and Tasmania and then estimate state specific multipliers. The I/O modelling assumes: • *Timelines:* Construction of Marinus Link occurs from 2025-2030 (5 years) and operations are modelled from 2030 – 2050 (20 years). • *Inputs:* Capital expenditure related to construction and development of Marinus Link was estimated to be $5.9b (real 2023 dollars). This was apportioned evenly between Victoria and Tasmania. The total capital expenditure value was adjusted to exclude the cost of the undersea cable and the voltage converter stations (see below), resulting in an estimated total capital expenditure of $1.5b each for Tasmania and Victoria (real, FY2023). Operational expenditure of Marinus Link was estimated to be $33.5m pa, apportioned evenly to Victoria and Tasmania ($16.8m pa each). • *North-West Transmission Developments (NWTD):* Project Marinus includes the NWTD, which was also included in the I/O modelling. Capital expenditure associated with NWTD was estimated to be $717m in Tasmania. Operational expenditure was estimated to be $4.6m pa in Tasmania. • *Enabled Investments:* $1.7b of additional capital expenditure and $134m of operational expenditure (total from 2022 – 2050) was modelled related to energy generation and storage projects enabled by Marinus Link in Tasmania. A further $2.2b of capital expenditure was modelled related to data centre capacity potentially enabled by Marinus Link. Capital and operational expenditure for energy projects was sourced from the PACR modelling submission (under the central scenario). The additional data centre capacity assumptions were provided by Marinus Link Pty Ltd. • *Sector multipliers:* The economic contribution for the construction phase of Project Marinus and enabled investments was estimated using multipliers calculated for the Heavy and Civil Engineering Construction sector, with different multipliers used for value add and employment. The economic contribution for the operational

	an I/O model, the multipliers are applied to the construction and operations costs of the project to produce an estimate of the project's contribution to value add and employment.	phase of Project Marinus was estimated using Electricity transmission, distribution, on selling and electricity market operation sector multipliers. The economic contribution for the operations of the enabled energy generation projects was estimated using Electricity Generation sector multipliers. The outputs estimate the economic contribution of Project Marinus in Tasmania and Victoria and enabled investments in Tasmania in terms of: • value add (real 2023 dollars); and • employment (FTE job years). For each output variable, the estimates are comprised of three components: • Direct effects – total revenue generated by an industry plus value add taxes; • Indirect effects – flow-on contribution generated by an industry purchasing inputs; and • Induced effects – flow-on contribution generated by an industry's employees purchasing goods and services with their income. These induced effects are distinct from induced effects that the SGS Reports describes in respect of induced energy generation and storage assets. *Modification of Marinus Link Capital Expenditure:* Document E reduces the capital expenditure estimate of the Project by 29% to which the multipliers are applied. This does not affect the multipliers used but does impact on the absolute estimated value add and employment. This assumption was applied because Marinus Link: • is comprised of two key highly specialised equipment components (i.e. the undersea / land DC cables and the voltage converters); • those two pieces of equipment make up a considerable proportion of the total capital costs of the Project; and • will be imported to Australia. EY's I/O model already takes into account the extent to which the 'typical' construction project involves imported items. The SGS EIA notes that its model already takes this into account too.[21]

[21] SGS, Economic Impact Assessment of Marinus Link, May 2024, page 38 footnote 19.

		Marinus Link is, however, not a typical construction project. The construction activity of Marinus Link in Australia nevertheless remains substantial and principally involves: laying the DC cables; developing the voltage converter stations (e.g. assembling the voltage converters or parts thereof and installing them); developing the necessary connections between the DC cables and the voltage converter stations, and between Marinus Link and the AC networks on either side of the voltage converters stations; and developing the balance of plant. Document E adopts a pragmatic approach to reduce Marinus Link's capital expenditure to avoid potentially artificially inflating the absolute value add and employment from the construction of Marinus Link.[22]

[22] This adjustment was not made to the enabled energy generation and storage investment, as the situation in terms of the proportion of costs that are key equipment related and the extent to which it is known that the key equipment will be sourced from overseas, varies by energy generation and storage asset. Although some of these generation asserts (e.g. wind) also have costs that are relatively dependent on key equipment components that are also typically imported.

6.6 The material differences between Document E and the SGS Reports, including any reasons for those differences.

24. To assess any material differences between Document E and the SGS Reports, I focus on comparing Document E with the SGS EIA and the Supplemental SGS Report. The latter is the more recent report and relies on more similar key inputs to Document E, however, it provides less detail on which to compare the material differences (see paragraph 46).

25. I focus:

    a. first, on the key inputs they use and outputs they produce;

    b. then, on the key differences in methodology and approach between the reports; and

    c. last, on the reasons for the differences in outputs the reports produce.

26. I take this approach to identify whether any material differences in outputs are likely to be a function of differences:

    a. in inputs (i.e. capital and operating expenditure) and how they are used; and / or

    b. in methodology and approach.

27. I take this approach because:

    a. there are inevitably differences in inputs for a variety of reasons (e.g. being provided with different data to use, from different times along the Project's development cycle);

    b. there are, as a result, inevitably differences in the absolute outputs produced and those differences can be expected to be larger than for the inputs, given the differences in inputs are magnified by the multipliers applied to them;

    c. any material differences that are a function of different inputs are less relevant to my opinion on the methodology and approach of the SGS Reports having regard to the purpose and scope of those reports. In other words, to the extent that any material differences in outputs are not a function of differences in methodology and approach, then it is likely that using the same inputs would yield materially similar outputs;

    d. the extent to which the outputs are a function of differences in methodology and approach can be tested at a high level, by focusing on the multipliers that are implied (**implied multipliers**) by the relationship between the inputs and outputs (e.g. how much value add is estimated per dollar of capital expenditure); and

    e. to the extent those implied multipliers are materially similar, then it implies that the material differences in the outputs are primarily a function of differences in the inputs used.

28. I test the materiality of differences between Document E and the SGS Reports from a quantitative perspective by:

 a. identifying where like-for-like implied multipliers can be inferred from the available data;

 b. estimating those implied multipliers; and

 c. comparing those implied multipliers and assessing the materiality of any differences in them.

29. I have estimated the implied multipliers using the direct and indirect results for Document E as defined in Table 6 and the total results included in the SGS Report. This approach excludes the induced effects in the economic contribution analysis in Document E (i.e. the third component of the economic contribution identified in Table 6 that relates to the employee income effect). This approach to comparing the outputs produced by the different methodologies adopted in Document E and the SGS Reports (i.e. input-output modelling and CGE modelling) is generally considered to provide a more accurate comparison between.[23] If I consider only the direct and indirect outputs when estimating implied multipliers for Document E, I would expect them to be more similar to those estimated as part of the CGE modelling undertaken for the SGS Reports.

30. There are ten implied multipliers that can be compared between Document E and the SGS EIA:

 a. the value add multipliers for the construction of the Project for Tasmania (1) and Victoria (2);

 b. the value add multipliers for the operation of the Project for Tasmania (3) and Victoria (4);

 c. the implied employment multipliers for the construction of the Project for Tasmania (5) and Victoria (6);

 d. the implied employment multipliers for the operations of the Project for Tasmania (7) and Victoria (8);

 e. the implied value add multipliers of the enabled / induced investment, collectively for both construction and operation, and only for Tasmania (9); and

 f. the implied employment multipliers of the enabled / induced investment, collectively for both construction and operation, and only for Tasmania (10).

31. I consider that a difference of 20% or more in any of these implied multipliers to be a material difference.

[23] Excluding the induced income effect from the outputs of Document E is consistent with the NSW treasury's application of I/O multipliers: "[Our I/O model] incorporates direct and indirect industry employment impacts but excludes consumption effects. This methodology is, therefore, fit for purpose —especially when comparing projects— and has been commonly applied across jurisdictions." The methodology used in the SGS Reports implicitly captures these effects, but they tend to be much smaller in CGE models because of the assumptions used in respect of employment and its mobility (i.e. if labour is not deployed in relation to this Project, it will eventually be deployed in other areas of the economy), and harder to separately identify compared to the direct and indirect impacts.

Differences in methodology and approach

32. As Table 5 and Table 6 show, there are differences between the methodologies used in Document E and the SGS Reports.

33. Both rely on similar base information to generate the multipliers that drive the relationship between capital and operating expenditure, and value add and employment; and produce the same key outputs. The key methodological difference is that:

    a. Document E uses static multipliers that are implicit in the raw data; while

    b. the SGS Reports use dynamic multipliers that are inferred from the data and how the CGE model represents the whole economy.

34. The methodology used in Document E simpler than the methodology used in the SGS Reports, which is considerably more sophisticated. As a result, the SGS Reports might be expected to produce a more accurate assessment of the economic impact / contribution of the Project and of the investment it might induce / enable. This is the likely reason that Document E refers to "economic contribution", whereas the SGS Reports refer to "economic impacts". The SGS Reports take into account at least some of the dynamic impacts on the economy of the Project, whereas Document E does not. Document E will therefore tend to overstate the economic contribution / impact of the Project compared to the SGS Reports.

35. There are also differences in the approach used in Document E and the SGS Reports, but these are largely a function of the different methodology used.

Differences in inputs and outputs Document E and the SGS EIA

36. There are differences between the inputs used and outputs produced in Document E and the SGS EIA.

37. Table 7 illustrates those differences for the most relevant comparison in the outputs presented in Document E and the SGS EIA (i.e. the data that relates to the implied multipliers tested).

Table 7: Key inputs used and outputs produced in Document E and the SGS EIA (FY2023, real)

Economic contribution / impact of the Project							
Report		Inputs		Outputs			
		Costs		Value add		Employment	
	State	Capex ($M)	Opex ($M)	Construction ($M)	Operations ($M)	Construction (FTE)	Operations (FTE)
Document E	Tasmania	$1,527	$352	$959	$213	3,752	546
	Victoria	$1,527	$352	$1,078	$245	4,436	662
SGS EIA	Tasmania	$1,250	$260	$681	$679	2,661	494
	Victoria	$1,850	$260	$1,400	$981	5,247	592
Difference ($M)	Tasmania	$277	$92	$278	$-466	1,091	52
	Victoria	$-323	$92	$-322	$-736	-811	70
Difference (%)	Tasmania	22%	35%	41%	-69%	41%	11%
	Victoria	-17%	35%	-23%	-75%	-15%	12%
Economic contribution / impact of enabled / induced energy generation and storage investment (construction and operations combined)							
Document E	Tasmania	$1,744	$134	$1,113		4,248	
SGS EIA	Tasmania	$4,409	$788	$4,400		11,705	
Difference ($M)	Tasmania	$-2,665	$-654	$-3,287		-7,457	
Difference (%)	Tasmania	-60%	-83%	-75%		-64%	

38. *Table 7* shows differences in the inputs used and of the outputs produced. In particular:

a. The percentage of costs apportioned to Victoria and Tasmania for Marinus Link is split evenly for the Document E modelling but is more concentrated in Victoria in the SGS EIA, resulting in relatively lower costs in Tasmania and higher in Victoria. This is also illustrated in the SGS and EY outputs, where there are similar differences at a state level in construction value add and FTE.

b. The Marinus Link operations value add show the largest differential. The SGS EIA's values are 69% and 75% larger for Tasmania and Victoria respectively than those in Document E.

c. The assumptions pertaining to enabled / induced energy projects differ between Document E and the SGS EIA. The SGS EIA uses construction and operations costs that are 60% and 83% higher than Document E. This is replicated in the outputs, which are 75% and 64% higher for construction and operations value add.

Differences in implied multipliers

39. Table 8 presents the differences in the ten implied multipliers in the SGS EIA and Document E that can be readily compared, as paragraph 27 defines.

Table 8: The implied multipliers in Document E and the SGS EIA

For the Project					
Report	**State**	**Implied value add multiplier per $ of unit cost**		**Implied employment multiplier per $ of unit cost**	
		Construction	**Operations**	**Construction**	**Operations**
Document E	Tasmania	0.63	0.61	2.46	1.55
	Victoria	0.71	0.70	2.90	1.88
SGS EIA	Tasmania	0.54	2.61	2.13	1.90
	Victoria	0.76	3.77	2.84	2.28
Absolute difference	Tasmania	0.08	-2.01	0.33	-0.35
	Victoria	-0.05	-3.08	0.07	-0.40
Percentage difference (%)	Tasmania	15%	-77%	15%	-18%
	Victoria	-7%	-82%	2%	-17%
Material difference		No	**Yes**	No	No
For enabled / induced investment (construction and operations combined)					
Document E	Tasmania	0.59		2.26	
SGS EIA	Tasmania	0.85		2.25	
Absolute difference	Tasmania	-0.25		0.01	
Percentage difference (%)	Tasmania	-30%		0%	
Material difference		**Yes**		No	

40. In respect of the outputs produced, the SGS EIA produces implied multipliers for seven of the ten multipliers on which a comparison can be made with Document E, which are materially similar to Document E. In particular:

   a. the implied value add multipliers for the construction of the Project for Tasmania and Victoria;

   b. the implied employment multipliers for the construction of the Project for Tasmania and Victoria;

   c. the implied employment multipliers for the operations of the Project for Tasmania and Victoria; and

   d. the implied employment multipliers (for both construction and operation) of the enabled / induced investment in Tasmania only.

41. The SGS EIA produces implied value add multipliers for three of the ten multipliers that are relatively high compared to Document E:

   a. the implied value add multipliers for the operation of the Project for Tasmania and Victoria; and

   b. the implied value add multiplier (for both construction and operation) of the enabled / induced investment in Tasmania only.

42. The SGS EIA's higher implied value add multipliers for the operation of the Project for Tasmania and Victoria are likely to be a function of the modelling capturing the value add associated with increasing electricity supply arising from the Project.

43. The SGS EIA's higher implied value add multiplier for the enabled / induced investment in Tasmania (for both construction and operation) is likely to be a function of the same issue as for the operation of the Project, as outlined above.

Differences in inputs and outputs between Document E and the Supplemental SGS Report

44. There are differences between the inputs used, modelling assumptions and outputs produced in Document E and the Supplemental SGS Report.

45. There are also differences in the outputs produced in the Supplemental SGS Report and the SGS EIA. In particular, the Supplemental Report:

   a. only produces value add outputs for construction and operations combined;

   b. only produces employment outputs for construction and operations combined; and

   c. does not re-produce the economic impact of induced energy generation and storage investment, presumably because the questions on which clarification was sought do not relate to these broader impacts.

46. This reduces the implied multipliers that can be compared between Document E and the Supplemental SGS Report to four data points.

47. Table 9 illustrates those differences for the most relevant comparison in the outputs presented in Document E and the Supplemental SGS Report (i.e. the data that relates to the implied multipliers tested).

Table 9: Key inputs used and outputs produced in Document E and the Supplemental SGS Report (FY2023, real)

Economic contribution / impact of the Project					
Report		Inputs		Outputs	
		Costs		Value add	Employment
	State	Capex ($M)	Opex ($M)	Construction & Operation ($M)	Construction and Operations (FTE)
Document E	Tasmania	$1,527	$352	$1,173	4,298
	Victoria	$1,527	$352	$1,323	5,098
SGS Supplemental Report	Tasmania	$3,308	$336	$2,356	4,110
	Victoria	$3,308	$336	$3,002	6,093
Difference ($M)	Tasmania	-$1,780	$16	-$1,184	118
	Victoria	-$1,780	$16	-$1,679	-995
Difference (%)	Tasmania	-54%	-5%	-50%	5%
	Victoria	-54%	-5%	-56%	-16%

- The Supplemental SGS Report uses the same opex estimate as in Document E but it is expressed in slightly different present value terms due to its approach used. We retain the slight discrepancy for consistency with other data, notwithstanding that the underlying data is the same.

48. Table 9 shows differences in the inputs used and of the outputs produced. In particular, the significantly higher capex in the Supplemental SGS Report and the similar difference in absolute value add.

Differences in implied multipliers

49. Table 10 presents the differences in the four implied multipliers in the Supplemental SGS Report and Document E that can be readily compared.

50. Note that the implied multipliers for employment are estimated over the capex costs used in the SGS EIA, consistent with the approach outlined in the Supplemental SGS Report (Table 5).

51. The implied multipliers for value add rely on the capex costs used in the Supplemental SGS Report (Table 5).

Table 10: The implied multipliers in Document E and the Supplemental SGS Report

For the Project			
Report	State	Implied value add multiplier per $ of unit cost	Implied employment multiplier per $ of unit cost
		Construction & Operations	Construction & Operations
Document E	Tasmania	0.62	2.29
	Victoria	0.70	2.71
Supplemental SGS Report	Tasmania	0.65	2.59
	Victoria	0.82	2.79
Absolute difference	Tasmania	-0.02	-0.30
	Victoria	-0.12	-0.07
Percentage difference (%)	Tasmania	-3%	-12%
	Victoria	-15%	-3%
Material difference		No	No

52. Table 10 shows that there are no material differences between Document E and the Supplemental SGS Report for the four data points.

53. I infer from this that if Document E and the Supplemental SGS Reports used similar inputs they would produce similar absolute outputs.

7 Environmental Performance Requirements

54. As described in Section 6 above, the SGS EIA recommended Environmental Performance Requirements (**EPRs**).

55. A key conclusion of the SGS EIA is that *"the economic modelling shows considerable economic value-added from Marinus Link in the regional economies of North West Tasmania and Gippsland, and the states of Tasmania and Victoria…"*[24]

56. The SGS EIA also notes that, particularly given the scale of the Project, it has the potential to have a significant impact on the environment and it is important to recognise that and the other socio-economic impacts the Project might have, both positive and negative. The SGS Reports identify several relevant impacts covering:

    a. agriculture, forestry and fisheries;

    b. tourism;

    c. the extent to which raw materials, equipment, goods and serves will be sourced locally;

    d. local social amenity and community infrastructure;

    e. community demographic impacts;

    f. land values, and demand for land and housing; and

    g. local, state and federal government rate, taxation and royalty revenue.

57. The SGS EIA also notes that while not all aspects of negative impact mitigation will be within the Project proponent's control, proactive engagement with stakeholders will provide assurance that the negative impacts are acknowledged, understood and being addressed.

58. The SGS EIA identifies ten EPRs that are relevant to mitigating the negative impacts on the environment, including socio-economic impacts.

59. Those ten EPRs would appear to address the issues identified. I note that they do not specifically address any impacts on fisheries (and the rights that industry might have via any licences or similar) and on tourism. Regarding the former, the SGS EIA notes that the Project proponent has plans in place to address the impacts on fisheries in part by developing a Marine Communications Plan. Regarding the latter, the SGS EIA notes that the tourism impacts will be addressed under the first two EPRs.

60. The SGS EIA concludes that: *"Overall from an economic perspective, Marinus Link will deliver significant outcomes to the regional and economies of North West Tasmania and Gippsland, and Tasmania and Victoria. The mitigation of any potential negative externalities will also result in greater possible economic and social benefits to local communities."*[25]

61. I infer from this that the SGS EIA concludes that, if the ten EPRs are met, the potential negative externalities from the Project (in this case Marinus Link only) will be mitigated.

62. I conclude that the EPRs would appear:

    a. to address the issues identified; and

    b. provide an adequate basis on which to do so.

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[24] SGS, Economic Impact Assessment of Marinus Link, May 2024, page 8
[25] SGS, Economic Impact Assessment of Marinus Link, May 2024, page 10.

8 Declarations

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

If I am presenting evidence from a different location by video conference, I confirm that:

(a) I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel.

(b) I will inform the Panel immediately should another person enter the room from which I am giving evidence.

(c) during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel.

(d) I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

Signed by Craig Mickle

Signed ______________________________

Date 29 August 2024

Marinus Link Environment Effects Statement and draft Planning Scheme Amendment

Inquiry and Advisory Committee hearing

Expert Witness Statement of Nicole Sommerville

1 Summary

Key issues

The Social Impact Assessment identified seven major negative social impacts and 12 high negative impacts before the implementation of mitigation and enhancement measures. These would mainly be associated with the construction phase of the Project (i.e., all but four major or high negative social impacts are expected to occur during construction) and would generally affect social values for communities closest to construction works.

The implementation of the Environmental Performance Requirements (EPRs) identified in the Social Impact Assessment and other technical studies are anticipated to reduce the negative social impacts to low or moderate. The exception to this is potential impact on rental housing during the construction phase due to demand by the Project's workforce. While it is considered that the implementation of a workforce and accommodation strategy would reduce the magnitude of this impact to 'moderate', the sensitivity of this value is rated as 'very sensitive', due to the importance placed on housing affordability and availability by people in the study area during consultation. Consequently, the overall level of impact is assessed as high following the implementation of the EPRs.

Opinions

The Social Impact Assessment provides an assessment of potential impacts on local and regional communities and social values of the Project's construction and operation. Based on my review of the Social Impact Assessment, I consider that it presents a conservative assessment, in that some of the pre-mitigation and residual impacts are higher than I would anticipate based on the findings of other technical studies and experience of other projects (e.g., residual construction noise and vibration impacts, temporary access changes, effects of construction on the road network). Some of the factors that have contributed to this include:

- Assignment of the sensitivity ratings for social values, based mainly on the outcomes of engagement and SIA consultation, rather than other factors such as resilience to change, uniqueness, importance, and replacement potential.
- The aggregation of some social values and impacts, which adopts the 'worst case' scenario for one element and applies this across the social aspect.

While a more disaggregated approach would likely reduce the level of potential impact on some social values, it would not change the overall conclusions of the Social Impact Assessment or the EPRs identified in the Social Impact Assessment to manage social impacts.

Recommendations for changes to the draft Planning Scheme Amendment and Environmental Performance Requirements

I recommend the following changes to the EPRs:

EPR S01 – Develop and implement a social impact management plan

For this Project, I question the necessity of a standalone SIMP given that most of the social impacts during the construction phase will be managed through plans and strategies proposed in other Social Impact Assessment EPRs, or management plans identified in other assessments. It is recommended that EPR S01 be removed and replaced with a new EPR(s) that provided for the development and implementation of a worker health and safety plan, and emergency response plan and procedures.

EPR S02 – Develop and implement a workforce and accommodation strategy

I would recommend clarifying in this EPR that the workforce and accommodation strategy is to be prepared prior to the commencement of project works.

EPR S03 – Develop and implement a community and stakeholder engagement framework

The community and stakeholder engagement framework should be prepared with consideration of relevant engagement principles and guidelines, such as the International Association for Public Participation (IAP2) principles, and the Department of Climate Change, Energy, the Environment and Water National guidelines – Community engagement and benefits for electricity transmission projects. I recommend, inclusion of further detail either in this EPR regarding:

- Specific stakeholders identified through this Social Impact Assessment (e.g., commercial and recreational marine users, users of the Great Southern and Grand Ridge Rail Trails, etc).
- Facilities or areas identified as important to communities for which communication and engagement will be important in managing social impacts (e.g., rail trails, regional reserves, beaches and marine areas).
- Issues identified as community concerns and potential cause of social impacts (e.g., concerns about EMF, construction noise and vibration, traffic and access changes).

I have provided my recommendations for inclusion as appropriate in the Day 1 version of the EPRs.

2 Introduction

My name is Nicole Sommerville and I am Principal Consultant with Tetra Tech Coffey at Level 5, 120 Edward Street, Brisbane City.

3 Qualifications, experience and expertise

I hold a Bachelor of Planning and Associate Diploma in built environment from the University of South Australia and a Graduate Certificate in legal studies from the Northern Territory University.

I have more than 25 years' experience in government and private consulting. I joined Tetra Tech Coffey in May 2023, and currently hold the role of Principal Consultant with Tetra Tech Coffey's Environmental and Social Management and Advisory team, focusing on social impact assessment.

I specialise in the areas of social impact assessment, environmental assessment, and community engagement. I have delivered social impact assessments and social impact management plans to support environmental approvals for infrastructure projects across Australia and the Asia Pacific. These include social impact assessments and management plans for energy generation and transmission projects, and various linear infrastructure projects.

A statement setting out my qualifications and experience is provided as Annexure A.

4 Instructions

I have been instructed by Herbert Smith Freehills on behalf of **MLPL** to give evidence on the environmental effects of the Project relevant to Victoria and relevant to my area of expertise, and prepare an expert witness statement that summarises the Social Impact Assessment and responds to the submissions on the EES. A copy of my instructions is included as Annexure B.

I was not involved in the preparation of the Marinus Link Social Impact Assessment, which is a technical appendix to the consolidated Environment Effects Statement (**EES**) under the *Environment Effects Act 1978* (Vic) and the draft Environmental Impact Statement under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EIS/EES**) for the Marinus Link Project (**Project**). In preparing this witness statement, I have undertaken the review of:

- The EES Chapter (Volume 4, Chapter 16) and the technical appendix (Appendix U) for the Social Impact Assessment as exhibited.
- EES Chapters relevant to the Social Impact Assessment include Economics (Volume 1, Chapter 7), Community and stakeholder engagement (Volume 1, Chapter 8), Agriculture and forestry (Volume 4, Chapter 6), Landscape and visual (Volume 4, Chapter 7), Traffic and transport (Volume 4, Chapter 8), Noise and vibration (Volume 4, Chapter 10), Land use and planning (Volume 4, Chapter 15), and Environmental management framework (Volume 5, Chapter 2).
- Marinus Link Information Update #1 – Timing of Stage 2.
- Supplementary technical reports addressing timing of Stage 2 (Information Update #2) relevant to the Social Impact Assessment, including EMF (June 2024); Aboriginal and historical cultural heritage (4 July 2024); Agricultural and forestry (9 July 2024); Landscape and visual (26 June 2024); Land use and planning (27 June 2024); Noise and vibration (28 June 2024); Traffic and transport (27 June 2024); Terrestrial ecology (28 June 2024); Air quality (26 June 2024); Marine ecology and resource use (26 June 2024); and Economics (August 2024).

5 Statements in relation to Social Impact Assessment

5.1 Background

The Social Impact Assessment was jointly prepared by Tetra Tech Coffey and RPS.

Preparation of the social baseline, preliminary impact assessment, and social impact assessment engagement was undertaken by Tetra Tech Coffey's social impact assessment team during 2023. RPS was engaged by Tetra Tech Coffey to complete the impact assessment. This work was led by Gary Cox, who was formerly with RPS in the position of Executive Advisor, Social Advisory and Research, with the support of Trudie Parsons, who holds the position of Communications and Engagement Lead with RPS.

Where I disagree or depart from the findings or opinions expressed in the Social Impact Assessment, these are identified in Section 5.2 and Section 9 of this witness statement, along with reasons for these departures.

I confirm that I have read Chapter 16 of the EES corresponding to my area of expertise and to the best of my knowledge consider the chapter to be consistent with the Social Impact Assessment Report presented in Appendix U with the following exception. Table 16-13 of Volume 4, Chapter 16 identifies the residual impact of amenity impacts from operational noise and vibration as a 'moderate' impact, whereas this is identified as a 'low' impact in Appendix U. This does not change the overall outcomes of this assessment.

5.2 Findings

Methodology

The assessment method used for the Social Impact Assessment is appropriate for a project of this nature and scale and is consistent with methodologies used on other social impact assessments, including those I have applied for social impact assessments whilst with Tetra Tech Coffey. Specifically, the methodology:

- Has been informed by social impact assessment guidance from the International Association for Impact Assessment (IAIA), and New South Wales and Queensland governments.
- Adopts a social wellbeing framework for defining social values and reporting on potential social impacts.
- Uses a ‘significance based’ approach for evaluating potential impacts, which was adapted by Tetra Tech Coffey to align with significance assessments for environmental impact assessments.

I note the assumptions adopted for the Social Impact Assessment, particularly:

- The residual impact assessment presented in the Social Impact Assessment assumes the implementation of management measures to comply with EPRs.
- The Social Impact Assessment is precautionary in nature, as it uses a conservative approach or assumes that impacts will be experienced as a worst-case scenario and where impacts or sensitivity may be classified between two levels, the higher or greater level of sensitivity or magnitude has been selected.
- Social impact assessment and the sensitivity and magnitude rating assignment are subjective and a matter of professional judgment. Similarly, the technical studies that are used to inform the SIA apply a range of techniques to support an assessment of the significance of impacts within their disciplinary area.

In relation to the approach to the significance assessment (dot point two above), my review of the Social Impact Assessment indicates a conservative or worst-case scenario has been adopted particularly in the assessment of sensitivity. However, it appears that the assessment of magnitude applies professional judgement on the relative contribution of each aspect (i.e., severity, affected population, and duration) to determine an overall level of magnitude. For example, the magnitude of impacts on landscape and amenity due to views of the converter station are assessed as ‘minor’ although the duration of this impact is ‘long term’, which would result in a major level of magnitude if the higher or greater aspect of magnitude is selected. The approach of using professional judgement to assess the magnitude of identified impacts is appropriate and consistent with other social impact assessments.

The assumption relating to the assessment of residual impacts is also considered appropriate for this assessment and consistent with current practice.

The Social Impact Assessment also identifies a range of limitations to the assessment. Specifically, the Social Impact Assessment notes that the assessment was undertaken at a point in time, and views about the project and baseline conditions may change over time. Again, this limitation is considered appropriate and would be addressed through ongoing community and stakeholder engagement through the future planning, construction and operation of the Project.

Community consultation

Consistent with other social impact assessments, this Social Impact Assessment has been informed by consultation undertaken by MLPL and EES technical specialists, as well as engagement undertaken specifically for the Social Impact Assessment.

Section 6.1.4, Appendix U – Social identifies that more than 200 stakeholders were invited to participate in the Social Impact Assessment engagement, including landowners, community groups and local government, and marine and fisheries industry stakeholders. However, it is noted for each of the various stakeholder groups that only a *"small number of stakeholders responded to the opportunity to participate"*. Any reasons for the small response rate to the Social Impact Assessment engagement are not noted in the report. Further, it is also noted that a limited number of public submissions were received on the EIS/EES overall.

In relation to the adequacy of engagement to inform the Social Impact Assessment, I provide the following:

- Based on my review of Section 3.3 of the Consultation report (Attachment 4), there were a broad range of opportunities for people to participate in engagement for the Project and provide feedback on their concerns. This included on-line webinars, in-person drop-in sessions, landowner meetings, stakeholder meetings, information stalls, email and the project hotline.
- Based on my review of the outcomes of SIA engagement (Table 6-3 in Appendix U) and engagement for the Project more broadly (Section 4.1, Attachment 4 – Consultation report), feedback from the SIA engagement is consistent with the feedback on social and community issues from broader community and stakeholder engagement undertaken for the Project.

It is noted in Volume 1, Chapter 8 (Community and stakeholder engagement) that the process of engagement with stakeholders and the community will be ongoing through the construction, operation and decommissioning of the Project, with this helping to inform the final design and the development of measures to avoid and minimise impacts as part of the project approvals and EPRs compliance. Further, Volume 5, Chapter 2 (Environmental Management Framework) also notes that consultation is required by the EPRs, for example in the development of various management plans, and in the implementation of measures to comply with the EPRs.

Given the comments above, and the voluntary nature of engagement for the Social Impact Assessment, I believe that the engagement undertaken directly for, and considered as part of, this Social Impact Assessment has been appropriate to assess potential social impacts and identify EPRs for the Project.

Impact assessment

The social impacts identified in the Social Impact Assessment are consistent with those identified through social impact assessments for other energy transmission projects.

Based on my review of the Social Impact Assessment, I consider that the assessment of impacts is broadly consistent with the findings of social impact assessments for projects of a similar nature and scale. However, I consider that it presents a conservative assessment for some social impacts, in that the pre-mitigation and residual impact are higher than I would anticipate based on the findings of other technical studies and experience of other projects (e.g., residual construction noise and vibration impacts, temporary access changes, effects of construction on the road network).

Some of the factors that have contributed to this include:

- Assignment of the sensitivity ratings for social values, based mainly on the outcomes of engagement and SIA consultation, rather than other factors such as resilience to change, uniqueness, importance, and replacement potential (i.e., availability of alternate services or places).
- The aggregation of some social values and impacts, which adopts the 'worst case' scenario for one element and applies this across the social aspect. For example, the social value of 'landscape and amenity' considers town character and landscapes in agricultural

areas, conservation reserves, national bushlands and beaches, and recreational fishing. While these areas may have been identified as important by community members, it is expected that the level of sensitivity would vary between these areas due to the factors outlined above. This does not allow for differences in the sensitivity of the different landscapes or magnitude of impacts to be presented (e.g., due to the duration of impacts, severity of change, or population affected).

While a more disaggregated approach would likely reduce the level of potential impact on some social values, it would not change the overall conclusions of the Social Impact Assessment (i.e., that negative social impacts would mainly be associated with the construction phase and generally affect social values for communities closest to construction works) or the EPRs identified in the Social Impact Assessment to manage social impacts.

6 Social Impact Assessment

The Social Impact Assessment provides an assessment of potential impacts on local and regional communities and social values of the Project's construction and operation. The following provides a summary of the findings of the Social Impact Assessment.

Construction phase impacts

Prior to the implementation of mitigation and management measures, the construction phase of the Project would have:

- Positive impacts relating to:
  - Creation of short-term employment.
  - Local business opportunities due to goods and services required.
  - Creation of new opportunities for First Peoples' businesses.
  - Local and regional training and development of the construction workforce.
  - Use of short-term accommodation for construction workers.
  - Employment opportunities for First Peoples, women, youth and socially vulnerable groups.
- Major negative social impacts relating to:
  - Impacts on flora and fauna due to injury or fatality through vehicle strikes, disturbance of habitat through vegetation clearing and fire risk.
  - Loss of Aboriginal cultural heritage values.
  - Demand for rental housing by the Project's workforce, exacerbating existing rental availability and affordability, particular for very low and low income households.
  - Biosecurity risks to agriculture and forestry due to the introduction of weeds, pests, pathogens, diseases and contaminants from the movement of people, equipment, machinery and vehicles.
  - Impacts on forestry due to permanent clearing of trees or premature harvesting.
- High negative social impacts relating to:
  - Amenity impacts from construction-related noise, vibration, visual disturbances, and dust.
  - Temporary access changes to regional reserves, rail trails, marine areas and beaches.

  - Impacts on the marine environment from offshore and nearshore construction activities.
  - Disruption to agricultural and forestry activities and reduced productivity due to restricted access to onsite infrastructure and damage to natural assets (e.g., water, soil) from construction activities.
  - Construction traffic impacts resulting in disruption to public transport services and infrastructure, impacts on the safety and capacity of the road network, and reduced road safety, including from children and school buses.
  - Increased stress, anxiety and frustration of landholders due to the Project's planning and construction and for residents and communities about potential impacts from electromagnetic fields.
- Moderate negative social impacts relating to:
  - Impacts on commercial fishing and shipping operations due to construction access to areas within Bass Strait.
  - Effects on regional tourism and constraints on tourism accommodation due to use of short-term accommodation by the construction workforce.
  - Demand for construction workers and attraction of employees away from local businesses.
  - Increased demand by the construction workforce for health and emergency services.
  - Delays for existing road users due to reduced efficiency of the rural road network.

The implementation of EPRs identified in the Social Impact Assessment and other technical studies is likely to reduce the negative social impacts to low or moderate. The exception to this is potential impacts on rental housing due to demand by the Project's workforce.

Operation phase impacts

The operation phase of the Project is anticipated to result in two major negative social impacts and two high negative social impacts, prior to the implementation of mitigation and management measures. These include:

- Potential impacts on First Peoples values, cultural diversity and heritage due to vegetation removal and disturbance of ground surfaces and/or subsurface deposits from operational activities (major).
- Biosecurity risks to agricultural and forestry activities due to the potential introduction of weeds, pests, pathogens, diseases and contaminants from the movement of people, equipment, machinery and vehicles, leading to reduced yields, quality and marketability of farm produce (major).
- Reduced economic and environmental viability of the agricultural, forestry and farming enterprises from damage caused by changed agricultural practices, and impacts on soil and water quality due to operation and maintenance activities (high).
- Increased stress, anxiety and frustration for residents and communities about potential impacts from EMF (high).

The negative social impacts are expected to be reduced to low to moderate following the implementation of EPRs identified in the Social Impact Assessment and other technical studies.

Management of impacts

Identified social impacts are proposed to be managed through the implementation of EPRs identified through other technical investigations (e.g., noise and vibration, construction traffic, landscape and visual, cultural heritage, flora and fauna, etc) as well as the development and implementation of various management plans identified in the Social Impact Assessment, including:

- Social Impact Management Plan.
- Workforce and accommodation strategy.
- Community and stakeholder engagement framework.
- Community benefits sharing scheme.
- Industry participation plan.

Discussion on the EPRs proposed in the Social Impact Assessment is provided in Section 9.

7 Further work since preparation of the Social Impact Assessment

7.1 Revised timing of stage 2

MLPL have proposed a change to the timing of the two stages of the project that is different to that assessed in the technical appendix (Appendix U) and EES Chapter (Volume 4, Chapter 16) for the Social Impact Assessment as exhibited. Specifically, Stage 1 works will include works as assessed in the Social Impact Assessment, with a possible delay of two years in the installation of the cables for the Stage 2 circuit (i.e., commissioning in 2033 rather than 2031 as proposed in the EES/ EIS).

The following provides an overview of potential social impacts of the proposed change in timing of Stage 2. In preparing this assessment, I have reviewed the publicly exhibited supplementary assessments on the proposed change relevant to the Social Impact Assessment, including:

- Electromagnetic fields – June 2024.
- Aboriginal and historical cultural heritage – 4 July 2024.
- Agricultural and forestry – 9 July 2024.
- Landscape and visual – 26 June 2024.
- Land use and planning – 27 June 2024.
- Noise and vibration – 28 June 2024.
- Traffic and transport – 27 June 2024.
- Terrestrial ecology – 28 June 2024.
- Air quality – 26 June 2024.
- Marine ecology and resource use – 26 June 2024
- Economics – August 2024.

With the exception of the Agricultural and forestry assessment and Economic impact assessment, the above supplementary assessments found that the proposed change in timing did not impact on the findings of the technical assessments presented in the EIS/ EES. The Agricultural and forestry assessment determined that there would be no additional impacts to those previously identified or changes required to the EPRs, although noted that changes in land ownership, agricultural land use, and farm management practices could be expected with extending the construction time.

There would be no change to the types of social impacts identified due to changes in the timing of Stage 2. Further, change to the timing of Stage 2 is not anticipated to result in a material change to the significance of identified impacts or require changes to the EPRs. Specifically, it is noted that:

- While the proposed change to the timing of Stage 2 would increase the timeframe for construction, it is noted that Stage 1 works on each property will include temporary reinstatement works, including temporary infrastructure necessary to comply with Property Management Plans and to facilitate efficient use of the land in the period prior to Stage 2 works. The Agriculture and forestry assessment (Volume 4, Chapter 6) notes that disturbances to farming practices, and reduced productivity and yields of agriculture and forestry resulting from construction activities will be covered by financial arrangements to compensate landowners for use of their land during construction.
- The supplementary report for the Economic impact assessment found that while the substance of previous impacts identified would remain unchanged, changes to the timing of Stage 2 could prolong potential impacts on tourism associated with demand for temporary construction workforce accommodation, land value and demand for housing. Further, changes to the timing of Stage 2 would increase employment estimates by about 295 FTE job in Gippsland and 326 FTE jobs across Victoria, supporting increased economic opportunities for First Nations people and others, and skills and training opportunities. Potential impacts on tourism and local business and industry associated with the extended construction timeframes and increase in jobs are expected to be consistent with those described in the Social Impact Assessment. Specifically, the magnitude of these impacts are expected to remain as ‘moderate’ based on the severity of the impact (moderate), affected population (minor), and duration (major). Impact on the availability of rental housing due to demand for worker housing would remain as a ‘major’ negative social impact.

7.2 Workforce and Accommodation Guidelines

EPR S02 provides for the development and implementation of a workforce and accommodation strategy. I have reviewed the draft Workforce and Accommodation Guidelines (as at 4 June 2024) prepared by MLPL, which will be used to develop the approach to managing workforce and accommodation for the Project. The approach outlined in the guidelines is consistent with the requirements of EPR S02. It includes:

- Developing the guidelines and identifying contractor requirements relating to workforce and accommodation (e.g., conditions placed on the Project as part of the planning and approvals process).
- Supporting contractors to develop effective approaches to workforce and accommodation, including engagement with relevant stakeholder (e.g., councils, accommodation providers, other projects).
- Refining the proposed approach based on the outcomes of stakeholder engagement and endorsement by MLPL.
- Implementing the endorsed approach to workforce and accommodation.

7.3 Industry Participation Strategy

EPR S05 provides for the development and implementation of an industry participation plan. I have reviewed the draft Marinus Link – Industry Participation Strategy. The strategy is consistent with the requirements of EPR S05 and provides:

- An overview of objectives and priorities for industry participation.
- Targets relating to social procurement businesses (e.g., disability enterprises), women, skills development (e.g., apprentices, trainees), First Nations owned businesses, and First Peoples' employment.
- Implementation plan including targeted actions, outputs and timing.

8 Submissions and recommendations

I have been requested to review the public submissions and recommendations provided to me by Herbert Smith Freehills as relevant to my area of expertise. Those submissions have been grouped and responded to below.

8.1 Submissions and recommendations received

I have read the public submissions and recommendations received on the EES/EIS and identified those that are relevant to the Social Impact Assessment and my area of expertise. These include submissions and recommendations 5, 10, 13, and 28.

8.2 Summary of issues raised

The submissions and recommendations have raised the following issues relevant to my area of expertise:

(a) Potential traffic impacts on organic farming due to trucks using local roads (e.g., truck exhaust pollution).

(b) Noise impacts from use of local roads and compensation/ assistance for people with medical problems or who may need to sleep during the day.

(c) Interest in community benefit scheme and need to ensure benefits are being returned to impacted community.

(d) Encourage continuing communication with community members as the IAC process and Minister's assessment of the Project progresses.

(e) Question the amount of employment that will be generated by the Project, noting that these are not all new jobs.

(f) Recommendations to support and protect cultural values, including tangible and intangible cultural heritage values, such as development of employment opportunities for First Peoples, cultural awareness and cultural values training, consultation about tangible cultural heritage matters, and ongoing communication with First Peoples.

8.3 Response to issues and recommendations raised

Set out below are my comments and response to the issues raised by the written submissions and recommendations relevant to the area of my expertise:

(a) Potential impacts on organic farming are noted in the Social Impact Assessment. Specifically, the assessment notes that impacts on organic certification were identified during consultation for the Project and assesses potential biosecurity risks to agriculture, including for organic farming. The Social Impact Assessment includes reference to the EPR A05 outlined in the Agriculture and forestry assessment to “avoid impacts on organic farming certification”. Further assessment of impacts on organic farming is included in the Agricultural and forestry assessment. Construction traffic impacts are addressed in the Traffic and transport assessment.

(b) Compensation would be undertaken in accordance with the Marinus Link *Landholder Information Pack* (April 2024). EPR NV02 includes development and implementation of a construction noise and vibration management plan, which describes measures to be implemented to minimise the risk of harm from construction noise and vibration. Consultation with local communities near construction activities about the timing, duration, potential impacts and management of construction noise impacts would assist in avoiding or managing impacts on people sensitive to noise impacts. Construction noise impacts are addressed in the Noise and vibration assessment.

(c) In accordance with EPR S04, the Community Benefits Sharing Scheme would be developed prior to the commencement of project works, in consultation with communities and First Peoples in the local area.

(d) Consultation and communication with community members and stakeholder will be ongoing through the Project planning, construction, operation and decommissioning.

(e) Comments relating to Project employment are noted. The Project will support a range of direct and indirect employment opportunities during the construction phase. This would include employment for people who may already be employed in the construction or energy sectors.

(f) Recommendations relating to the support and protection of cultural heritage values will be addressed through existing EPRs outlined in the Social Impact Assessment, such as EPR S03 (community and stakeholder engagement framework), EPR 04 (community benefits sharing scheme), EPR S05 (industry participation plan), along with measures outlined in other EIS/EES assessment (e.g., EPR CH01).

9 Environmental Performance Requirements

As described at section 6 above, the Social Impact Assessment recommended EPRs as relevant to the management of social impacts.

The Social Impact Assessment recognises that potential social impacts will be addressed through EPRs identified for other technical assessments. I have reviewed the EPRs that have been included from other relevant assessments to manage the identified social impacts and have no recommendations for amendments.

I have also reviewed the EPRs recommended for the Social Impact Assessment and provide the following observations and recommendations about specific EPRs.

EPR S01 – Develop and implement a social impact management plan

As noted in Section 16.1.3, Volume 4, Chapter 16 – Social, the requirement and content of the social impact management plan (SIMPs) has been informed by NSW and Queensland social impact assessment guidelines, and IAIA social impact assessment guidance. For this Project however, I question the necessity of a standalone SIMP, given that most of the social impacts during the construction phase will be managed through:

- Plans and strategies proposed in other Social Impact Assessment EPRs (e.g., workforce and accommodation strategy, stakeholder engagement management plan, community benefits sharing scheme, and industry participation plan).
- Management plans identified for other assessments, including agriculture and forestry, air quality, marine and ecology resource use, terrestrial noise and vibration, traffic and transport, and Aboriginal and historical cultural heritage.

The remaining social impacts identified to be addressed by EPR S01 relate to first response medical capabilities and local emergency response. This requirement could be effectively addressed through specific EPRs rather than a whole SIMP.

EPR S02 – Develop and implement a workforce and accommodation strategy

This EPR is consistent with EPRs or management strategies identified for other recent major projects in regional locations across Australia and is an appropriate measure for managing impacts of the Project on housing and accommodation. I would recommend clarifying in this EPR that the workforce and accommodation strategy is to be prepared prior to the commencement of project works. Comments relating to the Workforce and Accommodation Guidelines prepared by MLPL in response to this EPR are included in Section 7.2.

EPR S03 – Develop and implement a community and stakeholder engagement framework

This EPR is consistent with EPRs, or strategies identified for other recent major projects in urban and regional areas of Victoria and elsewhere in Australia and is an appropriate measure for the management the Project's social impacts. The community and stakeholder engagement framework should be prepared with consideration of relevant engagement principles and guidelines, such as the International Association for Public Participation (IAP2) principles, and the Department of Climate Change, Energy, the Environment and Water National guidelines – Community engagement and benefits for electricity transmission projects.

I recommend, inclusion of further detail either in this EPR or a separate EPR regarding:

- Specific stakeholders identified through this Social Impact Assessment (e.g., commercial and recreational marine users, users of the Great Southern and Grand Ridge Rail Trails, etc).
- Facilities or areas identified as important to communities for which communication and engagement will be important in managing social impacts (e.g., rail trails, regional reserves, beaches and marine areas).
- Issues identified as community concerns and potential cause of social impacts (e.g., concerns about EMF, construction noise and vibration, traffic and access changes).

EPR S04 – Develop and implement a community benefits sharing scheme

This EPR is consistent with EPRs or strategies identified for other energy recent projects in Victoria and elsewhere and is an appropriate measure for projects of this scale. No changes to the EPR are recommended.

EPR S05 Develop and implement an industry participation plan

This EPR is consistent with EPRs identified for other recent major projects in Victoria and elsewhere and is an appropriate measure for projects of this scale. It is noted that this EPR includes consideration of employment training and employment opportunities, which is also noted in EPR S01. Comments relating to EPR S01 are addressed above, while comments relating to EPR S05 are included in Section 7.3.

10 Declarations

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

If I am presenting evidence from a different location by video conference, I confirm that:

(a) I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel.

(b) I will inform the Panel immediately should another person enter the room from which I am giving evidence.

(c) during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel.

(d) I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

Signed by Nicole Sommerville

Signed NSommerville

Date 28 August 2024

Marinus Link Environment Effects Statement and draft Planning Scheme Amendment

Inquiry and Advisory Committee hearing

Expert Witness Statement of James Garden

1 Introduction

My name is James Garden and I am the Principal Ecologist and Director at Ecology Systems Pty Ltd ([redacted] Fitzroy Victoria).

Prior to my departure from Eco Logical Australia in October 2023, I was the Project Manager and Principal Ecologist for the Terrestrial Ecology Impact Assessment, dated 17 May 2024 (**Terrestrial Ecology Assessment**) which was a technical appendix to the consolidated Environment Effects Statement (**EES**) under the *Environment Effects Act 1978* (Vic) and the draft Environmental Impact Statement under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (**EIS/EES**) for the Marinus Link Project (**Project**).

1 Summary

Key issues

The key issues identified in this submission include:

- The presence and extent of ecological values, and in particular native vegetation and threatened species, in land that has not been assessed on-ground due to access constraints.
- The potential impacts to, and management of, waterways which support, or may support, sensitive ecological values.

Opinions

The key opinions presented in this submission include:

- The findings of the Terrestrial Ecology Assessment are robust, including the assessment of impacts on ecological values, despite the limitations associated with land access.
- The alignment traverses a highly modified and degraded landscape, due to extensive past clearing and significant ongoing disturbance associated with intensive agricultural and industrial practices and threatening process such as weeds and pests. These factors have resulted in a highly fragmented landscape with poor habitat function and limited connectivity, and one which has already lost many species which would have previously been prevalent
- As a result, there is a low likelihood of any significant biodiversity value occurring within the properties that have not been surveyed, due to the extensively cleared and modified nature of the landscape. This is further reinforced by the relatively small number of threatened species recorded in the highest quality habitats that were surveyed extensively.
- In reviewing impacts associated with the project, stakeholders should focus on the post-mitigation scenario presented in the Terrestrial Ecology Assessment. These take into account the implementation of measures which are standard across many large construction projects. The likely impacts associated with the project will therefore be close to the post-mitigation impact scenario and, may well be lower than this due to the precautionary approach in determining the extent and quality of native vegetation and

habitat in land that was not assessed on-ground (i.e. in some instances values assumed to be present will be absent).

- It should also be recognised that the relatively low impact of this project is reflective of more than five years of planning and design refinement which has resulted in substantial avoidance and minimisation of impacts to biodiversity prior to the finalisation of the Terrestrial Ecology Assessment.
- In considering the key impacts of this project, that being the post-mitigation direct removal of 6.2ha of native vegetation and associated habitat, in what is an already heavily degraded or modified locations spread across a 90 kilometer alignment, and limited impacts on threatened species, the project has a relatively minimal footprint.
- Despite the impacts of this project being relatively negligible, particularly given its scale, there do remain a small number of locations or values which should be at the forefront of mind as planning, approvals and construction progress. These include:
  - The unsurveyed section of alignment in low hills surrounding Waratah Bay, between KP3.5-KP6.4.
  - The unsurveyed section of plantation land between KP58.5 and KP61.1.
  - A small number of waterways which may support sensitive ecological values and are yet to be surveyed. It should be noted the vast majority of mapped waterways are ‘drainage lines’ in paddocks which do not support ecological values.
  - Locations which support, or may support, the FFG Act listed Bog Gum.

Recommendations for changes to the draft Planning Scheme Amendment and Environmental Performance Requirements

I support the proposed amendments to EPR EC03 which include:

- adopting a preference for trenchless construction, so far as reasonable practicable at the listed waterway crossings, including inclusion of the Little Morwell River.
- insert a cross-reference to EPR GM09 to ensure the planning and management of waterway crossing considers fluvial geomorphology and, as such, minimises the risk of direct and indirect impacts to ecological values both at the crossing and downstream.

I have also reviewed EPRs recommended by the associated technical assessments, including the proposed amendments as a result of the constructability workshop, and have no further recommendations.

Based on this, I believe the measures to avoid and minimise impacts will be strengthened and the risk and consequence of impacts reduced based on the post-mitigation impact scenario.

2 Qualifications, experience and expertise

I am a principal consultant with over 15 years’ experience in the environmental sector, including 12 years based in Victoria as an ecological consultant. I have extensive experience conducting ecological assessments across the state (including vegetation quality assessments and surveys for threatened ecological communities and species), analysing environmental impacts and preparing the required plans and reports to obtain regulatory approval.

I have assisted both public and private clients on infrastructure, mining and development projects, as well as biodiversity monitoring and research for local and state governments. This work has occurred across Victoria, from the Wimmera in the west to far East Gippsland.

I am also a founding committee member of the Ecological Consultants Association of Victoria and was the treasurer of the organisation until stepping down in August 2024.

My qualifications include:

- Master of Environment (Natural Resource Management), Australian National University (2011).
- Bachelor of Science (Botany), University of Otago, New Zealand, 2006.
- Bachelor of Commerce (Management), University of Otago, New Zealand, 2006.

Relevant project experience includes:

- Terrestrial ecology impact assessment for the GREZ transmission line (AusNet).
- Ecology impact assessment for Bairnsdale Solar Farm (Urbis).
- Biodiversity impact assessment for Boundary Creek stock pipeline (Barwon Water).
- Environmental assessments of service areas for the National Broadband Network roll-out (Telstra/nbn co).
- Ecological assessments, targeted surveys and approvals for the Victorian Interconnect Network Expansion (APA Group).
- Flora and fauna assessment for the proposed Seymour Levee, Seymour, Victoria (Mitchell Shire Council).

A statement setting out my qualifications and experience is provided as Annexure A.

3 Instructions

I have been instructed by Herbert Smith Freehills on behalf of Marinus Link Pty Ltd to give evidence on the environmental effects of the Project relevant to Victoria and relevant to my area of expertise and prepare an expert witness statement that summarises the Terrestrial Ecology Assessment and responds to the submissions on the EES. A copy of my instructions is included as Annexure B.

4 Statements in relation to Terrestrial Ecology Assessment

The role that I had in preparing the Terrestrial Ecology Assessment was as the Project Manager and Principal Ecologist for the ecology technical studies. This involved:

- Preliminary desktop assessments and field surveys to inform the preliminary route analysis of three separate alignments within Victoria.
- Preparation of a detailed baseline study of the preferred Waratah Bay to Hazelwood alignment. This study involved a comprehensive biodiversity desktop assessment to characterise terrestrial biodiversity values and inform a preliminary impact assessment of values considered likely to occur within the survey area. Some limited field surveys were also undertaken to address specific environmental sensitivities and refine likelihood and impact assessments. The baseline study informed further refinement of the alignment and potential approval requirements.
- Management of the detailed terrestrial ecology assessment program and associated report preparation. This included: an update of the desktop assessment conducted in the baseline study, based on revised project alignments; managing and conducting vegetation and habitat condition assessments and targeted surveys for threatened flora and fauna species; and determination of the significance of impacts on ecological values present in

the survey area based on multiple project designs, with consideration for state and national impact assessment guidelines and policies.
- Additional services included drafting of an offset strategy, provision of advice regarding technical ecological matters, attendance at community engagement sessions and presentation to regulators and stakeholders.

I had support from ecological consultants within Eco Logical Australia, including Danielle Woodhams, Griffin Taylor Dalton, Elise Keane, Marcus Kratzat, Julia Ryeland and Ellie Madden-Hallet, and sub-consultants Paul Gannon and Karl Just.

I adopt the Terrestrial Ecology Assessment, in combination with this statement, as my written expert evidence for the purposes of the Panel's inquiry into the environmental effects of the Project.

A submission raised concerns relating to the potential impacts on wildlife associated with electromagnetic fields. There is limited research on this topic, particularly within the Australian context, and is beyond my expertise to provide comment. It is noted that impacts of electromagnetic fields on wildlife are discussed in Appendix A. EMF & EMI Impact Assessment.

I confirm that the Terrestrial Ecology Assessment, to the best of my knowledge, is complete and accurate.

I confirm that I have adopted the key assumptions included in the Terrestrial Ecology Assessment appended to the EES for the Project.

I was involved in the project extensively since its inception in 2018 whilst in employ of Eco Logical Australia until October 2023. After departing Eco Logical Australia to start my own business, I did not have any further contact with the project until my engagement as an expert witness in May 2024. Despite this, I have reviewed the final assessment report in detail and been made aware of the minor changes that have occurred since I last worked on and reviewed it in October 2023. It is my understanding the report has changed little since I was last directly involved in the project, and no additional desktop reviews or field surveys were conducted since, nor has the impact assessment changed materially as a result of additional information or design changes. I am therefore confident the report presented is representative of the work I conducted and oversaw whilst at Eco Logical Australia.

I confirm that I have read Chapter 11 of the EES corresponding to my area of expertise and consider the chapter is consistent with the Terrestrial Ecology Assessment.

5 Further work since preparation of the Terrestrial Ecology Assessment

5.1 Supplementary Report

Since the Terrestrial Ecology Assessment was finalised, on 17 May 2024 I was requested to review the Marinus Link Information Update #1 – timing of Stage 2, and prepare a supplementary report which:

- identifies whether a change to the timing for delivery of stages 1 and 2 in accordance with the Information Update would have any material implications for the assessment described in, or conclusions of, the Assessment;
- consider whether any additional mitigation measures or Environmental Performance Requirements (EPRs) would be recommended; and
- consider whether any changes to any mitigation measures and EPRs recommended in the Assessment would be required.

My supplementary report (letter addressed to TetraTech Coffey, 28 June 2024) found no further impacts are considered likely as a result of the change in timing for delivery of stage 2, beyond that which is already outlined in the Terrestrial Ecology Assessment. As a result, no further changes to mitigation measures and EPRs are recommended, noting however that the development of management plans and the associated implementation of mitigation measures need to consider the potential for temporal impacts at all stages of the project (i.e. both stage 1 and the later stage 2) and work scheduling should take this into account.

6 Terrestrial Ecology Assessment

The purpose of the Terrestrial Ecology Impact Assessment report is to present the findings of the detailed ecological investigations, and associated impact assessment, for the Victorian section of the proposed Marinus Link project. A summary of the key methods and findings are presented below.

6.1 Methods

The terrestrial ecology impact assessment involved the following steps:

- A desktop review to identify ecological values which may occur within the 'study area' (a 10km buffer along the alignment), drawing information from biological databases, spatial datasets, aerial imagery, and relevant reports, guidelines, standards and scientific literature.
- Detailed field surveys involving vegetation quality and habitat condition assessments, and targeted surveys for threatened flora and fauna species, where access was available within the 'survey area' (a 220m buffer along the alignment).
- An analysis of direct impacts to ecological values based on the current Area of Disturbance (AoD) and associated construction approach. This analysis involved a 'significance of impact' approach and included the development of Environmental Performance Requirements to avoid and mitigate impacts identified as part of the analysis.

Access agreements for some land parcels were not in place during the field survey program (ending December 2022). As a result, sections of the survey area were not able to be assessed in detail on ground, with the presence of potential values, and the resulting impacts, established based on observations from adjoining land parcels, and extrapolation from aerial imagery and desktop review. To ensure potential impacts to threatened species and native vegetation are not misrepresented, where any doubt remains, the relevant values have been assumed to be present and impacts assessed under the relevant Commonwealth and state guidelines.

6.2 Findings

The region through which the Victorian section of the alignment runs is dominated by productive agricultural landscapes, comprised primarily of intensive pastoral or horticultural operations, with higher elevation sections in the Strzelecki Ranges supporting dense softwood plantations. As a result, the vast majority of native vegetation (scrubs, woodlands and forests) and associated habitat that would have once covered South Gippsland has been cleared, leaving small, fragmented patches remaining along road reserves, property boundaries and creek lines, and scattered trees in paddocks. Furthermore, many wetlands have been drained, being replaced in some instances with farm dams, and drainage lines cleared of vegetation and debris to minimise flooding. In some sections, such as the hills around Waratah Bay, the Great Southern Rail Reserve and the Strzelecki Ranges, larger patches of native vegetation persist in the landscape in private and public land, representing important areas of priority habitat for flora and fauna species.

Taking into account the desktop review, field surveys involving vegetation quality and habitat condition assessments, and the additional targeted surveys for threatened species in suitable habitats, key ecological values that are considered to be present within the survey area and used to inform the impact assessment, are summarised in Table A.

As shown in the Terrestrial Ecology Assessment (Appendix 1: Figure 5 and Figure 6) locations supporting high-quality native remnants and habitats include:

- Coastal scrub vegetation restricted to the foreshore and coastal dunes of Waratah Bay (KP 0).
- Lowland forests between Waratah Road and Fish-Creek Walkerville Road (KP 2.3 – 6.4) and within private land north of Fish-Creek Walkerville Road (KP 8.0 – 8.9).
- Swamp scrubs, swampy woodlands and lowland forest in the Great Southern Rail Trail reserve and intersecting waterways, including stony creek and adjoining private land (KP 21.4-30.1).
- Lowland forests between Mirboo North and Stony Creek (KP57-57.5, 58.5-59.8, 60.5-61.1, 61.3-62.0, 62.2-63.7).
- Tall forests along Ten Mile Creek Road and Strzelecki Highway (KP64.6-71.8).
- Floodplain and grassy woodlands associated with Morwell River and nearby terraces (KP77.9-78.4).
- Grassy woodlands within McFarlane Road reserve at (KP 79.7).

Table A. Ecological values considered present within the survey area for the purpose of the impact assessment

Value	**Species and Communities**
Native vegetation	A total of 201.90 ha of native vegetation was recorded within the survey area, including of 102.85 ha with a bioregional conservation status of endangered and 1084 large trees (scattered and in patches) (Appendix 1: Figure 6 of the Technical Appendix V: Terrestrial Ecology Assessment).
Nationally significant threatened species	Fauna: Australasian bittern, blue-winged parrot, Caspian tern, cattle egret, crested tern, doublebanded plover, dwarf galaxias, eastern curlew, gang-gang cockatoo, grey-headed flying-fox, growling grass frog, hooded plover, Latham's snipe, red-capped plover, red-necked stint, rufous fantail, sanderling, satin flycatcher, swamp antechinus, swamp skink, white-bellied sea-eagle, white-throated needletail. Flora: Eastern spider orchid, river swamp wallaby-grass, thick-lipped spider-orchid, Strzelecki gum, dense leek-orchid, green-striped greenhood, leafy greenhood. Priority habitats for these species are shown in Appendix 1: Figure 5 for the Technical Appendix V: Terrestrial Ecology Assessment.
State significant threatened species	Fauna: Grey goshawk, Narracan burrowing crayfish, South Gippsland spiny crayfish, glossy grass skink, southern toadlet, lace monitor, hardhead, little eagle, flinders pygmy perch, powerful owl, platypus, white-footed dunnart. Flora: Coast wirilda, coast bitter-bush, silver everlasting, lizard orchid, orange-tip finger-orchid, slender pink-fingers, coast colobanth, spurred helmet-orchid, fringed helmet-orchid, bog gum, Yarra gum, currant-wood, dune wood-sorrel, coast fescue, cobra greenhood, rush lily, alpine sunorchid, slender fork-fern, oval fork-fern, small fork-fern. Priority habitats for these species are shown in Appendix 1: Figure 5 of the Technical Appendix V: Terrestrial Ecology Assessment.
Threatened ecological communities	A single patch of the EPBC Act listed Gippsland Red Gum (*Eucalyptus tereticornis* subsp. *mediana*) Grassy Woodland and Associated Native Grassland community and equivalent FFG Act listed Forest Red Gum Grassy Woodland community was identified within the McFarlane Road, road reserve at (KP 79.7; Appendix 1: Figure 5 of the Technical Appendix V: Terrestrial Ecology Assessment).

6.3 Impacts

A ‘significance of impact’ approach has been used to assess impacts to ecological values within the survey area, which considers the sensitivity of the value and magnitude of the impact. This approach takes into account pre-mitigation impacts, based on the current design and construction approach, along with post-mitigation impacts which assume implementation of the EPRs developed to avoid and minimise impacts to ecological values.

The recommended Environmental Performance Requirements are detailed in Section 8.2 of the Terrestrial Ecology Assessment report. In summary, the EPRs include:

- Measures to confirm the presence or absence of values in unsurveyed locations and refine the design and construction approach to further avoid or minimise impacts to native vegetation and habitat (EC01).
- Measures to avoid or otherwise minimise impacts to flora and fauna values during construction, through the development and implementation of a biodiversity management plan (EC02).
- Measures to avoid or minimise impacts to aquatic values through additional surveys to confirm the presence or absence of values, use of the appropriate construction approaches (e.g. trenched vs. trenchless) and development and implementation of controls to manage risks (such as erosion or pollution) (EC03).

Prior to adopting any mitigation measures a total of 10.56 ha of native vegetation, containing 49 large trees, will be directly impacted (removed) through construction, and a further 10.69 ha of native vegetation may be consequentially lost over time, including 135 large trees. Through applying mitigation measures to comply with EPRs, it is expected that the impact on native vegetation and habitats will be significantly reduced, and in particular indirect impacts associated with construction activities. The post-mitigation impacts to ecological values are presented in Section 8.3 of the Terrestrial Ecology Assessment report, and summarised in Table C below.

In some instances, the impacts to threatened species could not be mitigated fully due to uncertainty remaining with regards to their presence within the study area. In these instances, further on-ground assessments are required to inform the impact assessment, and a precautionary approach has been adopted for this report.

Table C. Summary of the significance of impacts to ecological values within the survey area

Post-mit. impact	Values
High	• Bog gum
Moderate	• Ground-dwelling fauna • Waratah Bay woodland flora • Shorebirds • River swamp wallaby-grass • Threatened ecological communities
Low	• Native vegetation • Owls, raptors and other fauna with large ranges • Aquatic fauna • Waterbirds and waders • Woodland birds • Coastal flora • Strzelecki Ranges damp forest flora • Strzelecki gum and Yarra gum

6.4 Discussion

I am of the opinion the Terrestrial Ecology Assessment is robust and extensive, despite the limitations associated with land access. In the majority of instances there is a low likelihood of any significant biodiversity value occurring within the properties that have not been surveyed, due to the extensively cleared and modified nature of the landscape. Furthermore, many high-priority locations that were surveyed extensively, such as the Great Southern Rail Trail reserve or remnant roadsides within the Strzelecki Ranges, revealed a relative lack of diversity and absence of threatened species and therefore further reduce the chances of species occurring in nearby locations.

When considered critically, this is unsurprising given the long history of degradation within this landscape as a result of European colonisation, resulting in extensive clearing, significant ongoing disturbance due to intensive agricultural and industrial practices and impacts associated with weeds (particularly Blackberry which is prevalent throughout the landscape) and pests (including foxes and cats which were observed regularly during surveys). These factors have resulted in a highly fragmented landscape with poor habitat function and limited connectivity, and one which has already lost many species which would have previously been prevalent. In light of this, the presence of native vegetation should not be considered a proxy for significance, and in particular threatened species habitat, and the findings of the assessment indicate that in almost all situations, threatened species and their ability to occupy this landscape have already been lost.

In light of this, it is my opinion that very few areas of concern remain, and when considering that the EPRs were developed with these locations in mind (both surveyed and unsurveyed), the likelihood for additional impacts beyond those described in the report is low, and in some cases likely to be less than that which has been proposed (i.e. in instances where presence has been assumed and the species does not occur).

I would also like to highlight that the proposed impacts of the project pale in comparison, in my opinion, to ongoing actions by other parties (both regulated and unregulated) which were observed frequently during surveys. In particular, the extensive and likely illegal harvesting of native trees for firewood within remnant patches adjoining the Strzelecki Highway, in what is a busy and visible location, is alone resulting in the direct removal and degradation of many hectares of habitat. In comparison, the project alignment is proposed to be located outside of these same patches in the adjacent plantation land, and that impacts to remnant vegetation and habitat is largely limited to ‘consequential losses’ of trees as a result of excavation works within tree protection zones, which may or may not lead to the decline of the associated trees over many years. The offsets generated by this consequential loss, which in many instances will have a negligible impact on biodiversity, will help to protect and conserve native vegetation and habitat elsewhere, an outcome which will not occur as a result of illegal timber harvesting, which is preventable and having a far greater impact on biodiversity at this location.

In reviewing impacts associated with the project, stakeholders should focus on the post-mitigation scenario presented in the Terrestrial Ecology Assessment. As required under relevant legislation and associated policies and guidelines, proponents are required to show evidence of avoidance and minimisation through project planning, design and construction. The development of a pre-mitigation impact scenario is designed to facilitate this process, and direct Marinus Link to locations and sensitive values which require further consideration. The EPRs have been developed with this in mind specifically and take into account the significance of impacts and the uncertainties remaining as a result of assessment limitations, such as land access. This approach is consistent with all major projects which have undergone an EES/EIS approval. Therefore, the pre-mitigation impact scenario should not be misrepresented as the likely impacts associated with the project. In my opinion, the likely impacts associated with the project will be close to the post-mitigation impact scenario and, may well be lower than this due to the precautionary approach in determining the extent and quality of native vegetation and habitat in land that was not assessed on-ground (as is discussed extensively elsewhere in this EWS).

In considering the key impacts of this project, that being the post-mitigation direct removal of 6.2ha of native vegetation and habitat, in what are already heavily degraded or modified locations with limited value, and limited impacts on threatened species, the project has a relatively minimal footprint. Given the impact of this multi-billion-dollar project will be spread across a 90km alignment, spanning three bioregions and two regional municipalities, the overall magnitude of these impacts is further reduced as it is spread across such a large area. Furthermore, the temporal nature of the project, in which very limited above ground infrastructure will remain, coupled with a commitment to both offset impacts and undertake improvement works, such as erosion control and revegetation of stream crossings, will largely mitigate ongoing impacts into the future.

It should also be recognised that the relatively low impact of this project is reflective of more than five years of planning and design refinement which has resulted in substantial avoidance and minimisation of impacts to biodiversity prior to the finalisation of the Terrestrial Ecology Assessment. The iterative nature of large projects such as Marinus Link means this is difficult to articulate comprehensively, however in summary the following should be recognised:

- The location for the current alignment was selected from a number of potential options at various locations in Victoria, based on an analysis of potential ecological values and impacts, in addition to a range of other considerations.
- The current alignment has undergone numerous reviews and refinements, particularly as a result of the detailed baseline ecology study completed in 2020, and subsequent on ground surveys confirming the presence or absence of values over the past four years.
- The EPRs provide a mechanism for further avoidance and minimisation should future on-ground surveys in locations of concern identify matters of significance, particularly through the use of micro-sitting and trenchless construction.

Despite the impacts of this project being relatively negligible, particularly given its scale, there do remain a small number of locations or values which should be at the forefront of mind as planning, approvals and construction progress. Whilst I believe these are adequately covered in the Technical Report and the EPRs, and have discussed in detail in the response to submission below, in summary these include:

- The unsurveyed section of alignment in low hills surrounding Waratah Bay, between KP3.5-KP6.4.
- The unsurveyed section of plantation land between KP58.5 and KP61.1.
- A small number of waterways which may support sensitive ecological values and are yet to be surveyed, as summarised in Annexure D. It should be noted the vast majority of mapped waterways are in reality ‘drainage lines’ which do not support ecological values.
- Locations which support, or may support, the FFG Act listed Bog Gum.

Where impacts may occur as a result of unplanned events, such as the loss of HDD bore heads or frac-outs, the likelihood of the event occurring, and it occurring in a location that would impact on an ecological value, and that that impact would be significant, is considered low for all the reasons detailed above. Therefore, whilst the risk should not be discounted, it is not considered to materially affect the overall assessment of impacts for the project. Furthermore, appropriate controls for such events are encapsulated in the EPRs developed in other technical studies (such as the Groundwater and Surface Water technical reports).

Finally, since the release of the Terrestrial Ecology Assessment report, Marinus Link have confirmed that McFarlane Road and the associated patch of *Gippsland Red Gum (Eucalyptus tereticornis subsp. mediana) Grassy Woodland and Associated Native Grassland* and equivalent FFG Act listed *Forest Red Gum Grassy Woodland Community and/or Central Gippsland Plains Grassland* will be avoided through use of trenchless construction techniques (e.g. HDD). As a result, it can be confirmed that this community will not be impacted by the project and the significance of impacts is considered ‘low’.

7 Submissions

I have been requested to review the public submissions provided to me by Herbert Smith Freehills as relevant to my area of expertise. Those submissions have been grouped and responded to below.

7.1 Submissions received

I have read the public submissions and identified those that are relevant to the Terrestrial Ecology Assessment and my area of expertise. These include submissions 1, 2, 4, 6, 7, 10, 11, 12, 14, 15, 19, 21, 23, 24 and 25.

7.2 Summary of issues raised

The submissions received varied in their detail and concerns, with issues raised primarily focused on the assessment approach, the presence and extent of biodiversity values or the nature of the impacts.

A number of the submissions raised concerns more broadly around the viability of the project, and in particular social and economic outcomes. In addition, some raised the potential for consequential impacts as a result of future developments, which may in part be enabled by completion of the Project. In particular, there was a strong focus on windfarm developments and the contribution to climate change. These concerns appear to extend well beyond the scope of the Project and, if legitimate, are a consequence of broader social and economic drivers, of which the Project is one small piece of the puzzle. As a result, I believe these to be beyond the scope of the Terrestrial Ecology Assessment and my expertise to address, and were I to do so it may misrepresent the contribution of the Project to the concerns raised.

Several submissions also raised questions around approval requirements and associated mechanisms. Unless addressed specifically, these are also largely outside my area of expertise.

The submissions have raised the following issues relevant to my area of expertise:

- Assessment approach - A small number of submissions raised concern regarding the assessment approach and reporting, including limitations around land access, the efficacy of surveys, the coverage of non-threatened/non-listed species (and in particular Koalas), the analysis of impacts to species and native vegetation, and the presentation of information (either in text or visually in figures). Questions were also raised about the application of particular policies or guidelines to the Project.
- Biodiversity values - whilst the level of detail and information varied, the submissions raised questions around the coverage of biodiversity values which they believe may occur within the survey area and have not been adequately assessed or their likelihood of occurrence determined. Specific matters included Koalas, Bent-wing Bat, Hooded Plover, Glossy Grass Skink, Swamp Skink, and aquatic species, such as Dwarf Galaxies, Platypus and various crayfish. In addition, questions were raised about the documentation of wetlands and swamps, and the assessment of the FFG Act listed Forest Red Gum Grassy Woodland Community.
- Impacts - A range of concerns were documented in the submissions relating to the assessment of impacts on biodiversity values. These included questions as to whether the following have been fully considered:
  - the impacts associated with disturbance (e.g. construction noise and vibration).
  - the full extent of the impact footprint, and in particular where trenchless construction methods are proposed.

- the nature and magnitude of impacts to habitat and threatened species, including those arising from direct removal, subsequent fragmentation and loss of key habitat features (e.g. hollows).
- the impacts associated with pollution and sedimentation, particular to aquatic ecosystems.

In addition, a number of the submissions raised questions as to whether the cumulative impacts had been fully considered, and in particular cited the Strzelecki Highway road widening and overtaking lane project and the February 2024 storm event.

■ EPRs and offsets - a small number of submissions raised questions as to the adequacy of the EPRs, and in particular their level of detail around specific matters, and the accuracy of the offset requirements and their efficacy more broadly.

7.3 Response to issues raised

Set out below are my comments and response to the issues raised by the written submissions relevant to the area of my expertise.

Threatened species

The submissions raised concerns with the adequacy of the assessment of threatened species, both in terms of their presence and/or abundance within the survey area and/or the likely impacts. In response I would state:

- The assessment of the likely occurrence of species was based on multiple, extensive desktop assessments conducted over the course of the project, both as part of the previous baseline studies and final Terrestrial Ecology Assessment. This included detailed searches of database records and literature in the broader region (primarily a 10 kilometre buffer however for coastal regions the search area was extended to Venus Bay to capture similar habitats to Waratah Bay), as well as input from relevant experts and regional stakeholders, which were then refined based on on-ground habitat condition assessments and subsequent targeted survey results. Based on a standard set of criteria, the likelihood of a threatened species occurring within the survey area was determined on a scale from present, high to low or no likelihood. Furthermore, where species were determined as being ‘present for the purpose of the impact assessment’, the specific locations (described in the report as ‘priority habitats’) were identified and described in detail. The method underpinning this determination of likely occurrence is set out in the Terrestrial Ecology Assessment Sections 5.4, 5.8, 5.9, 5.10 and 5.11. A summary of key habitats is provided in Section 6.2, a discussion on the likely presence of species is provided in Section 6.3 and those species considered present are outlined in 7.2, along with their ‘priority habitats’ which are shown on Figure 5.

- The determination of a species as ‘present for the purpose of the impact assessment’ is not confirmation that a species is present within the survey area. The extensive targeted survey regime (as detailed in the Terrestrial Ecology Assessment Sections 5.9 and 5.10) identified relatively few threatened species within the survey area. However, as there were areas of potential habitat within land that could not be accessed and surveyed, and that in some instances the targeted survey methods are less effective (due to the cryptic or mobile nature of the species in question), a conservative approach has been adopted and species assumed to be present where they may not in fact occur.

- Based on my involvement over the course of the project, including the extensive time spent in the field completing habitat assessments and targeted surveys, I am of the opinion that very few threatened species occur within the survey area and that in many instances, habitat quality on land that has not been accessed has been assessed as being much higher than it is in reality (as required by the precautionary approach). Furthermore, extensive surveys of some of the highest quality and most intact habitat remnants (such as South Gippsland Rail Trail reserve and the remnant forests along roadsides in the Strzelecki Ranges) failed to confirm the presence of almost all threatened species identified in the desktop review. To my mind this is indicative of the fact that many of these threatened species do not occur widely in this highly fragmented and already degraded landscape, and the likelihood that they will occur in private land dominated by intensive pastoral practices, which is the majority of land that was not able to be accessed, is very low. In support of this argument, of the 62 threatened species which are 'considered present within the survey area for the purpose of the impact assessment' (Terrestrial Ecology Assessment Section 7.2) only 14 were detected during targeted surveys (Terrestrial Ecology Assessment Appendix 2), with the majority of these being highly mobile bird or mammal species, such as Grey Goshawk, Hard Head, Cattle Egret, Grey-headed Flying Fox or Lace Monitor. The likelihood that 'unrecorded' threatened species will occur in lower quality, more fragmented remnants, or in sections of waterways which may provide habitat for threatened species some distance downstream, is in my opinion, low, and therefore disagree with assertions made in the submissions to the contrary. A precautionary approach has been taken at all stages of the Terrestrial Ecology Assessment and, in my opinion, is only likely to inflate the significance of impacts. Where access is granted prior to construction, and surveys completed as per the EPRs, the actual quantum of species 'considered present', and the associated impacts, is likely to decrease.

- Concerns were raised over the documentation of 'protected flora' under the FFG Act, and the number of individuals identified. These are flora species which are not considered rare or threatened, but which are identified under the Act to prevent their unrestricted removal on public land. Where observed, protected flora have been recorded in the species list for each habitat zone assessed within the survey area. Where impacts to protected flora are likely to occur on public land, an FFG Act permit will be obtained as a secondary consent in accordance with the Environmental Management Framework. If required, additional surveys to confirm the extent of any populations can be undertaken at this time.

- Management measures to minimise direct and indirect impacts to fauna (including individuals and populations of threatened species) will be encapsulated in the proposed Biodiversity Management Plan, as outlined in EPR EC02.
- The potential for indirect impacts, and particularly those associated with construction activities and the resulting noise and vibrations, are described in Section 8.1 of the Terrestrial Ecology Assessment. For the majority of the construction, it is expected that this activity will occur for a period of 1-2 weeks at any given location (trenching is expected to progress between 100 m to 300 m in a 10-hour working day), the primary exceptions being the:
  - construction of the Hazelwood converter station, which is expected to take up to 36 months to construct.

  - the Victorian shore crossing via trenchless construction, which is expected to take approximately eight to 12 months. Each HDD will be drilled continuously up to 24 hours per day, 7 days per week to ensure borehole stability. The final duration of the drilling will be finalised during detailed design prior to construction.

- With regards to impacts at the shore crossing, the report states: "*The removal or degradation of habitat will be avoided through HDD of the dunes and beach from the adjoining farmland out past the low water-mark in the bay. Impacts associated with noise and light pollution may disturb nesting or foraging activities, however the elevated nature of the dunes means this is only likely to impact individuals using habitat on the inland side of* *the dunes closest to the HDD works area in the adjoining paddock (Figure 6).*" As shown in Photos 3 and 4 (Annexure C), the dunes are extremely high and substantial at the crossing point and are not considered optimal nesting habitat for many shorebird species, including hooded plover, particularly on the inland side. The dunes are therefore considered a physical barrier to potential disturbance, such as noise and light.

- As per the Noise Technical Report (Table 17), the predicted noise levels at the dunes and beach associated with Waratah Bay is 55 - 60 dB, and acknowledges the screening effect of the tall dunes at this location. Studies of the behavioural response of shorebirds to noise from the United Kingdom (Wright *et al*. 2010), which include a number of species similar to those identified as likely to occur at Waratah Bay, indicate that a behavioural change response was not observed at dBs less than 62.4, with median values for the different responses ranging from 70.3 - 76.85. Furthermore, the study indicated that the median dB value of 'no observable behavioural response' was 63.1dB. Given the predicted noise levels will not exceed 60dB along the shoreline, there is a low likelihood construction would result in disturbance that would elicit a behavioural change in species likely to inhabit the foreshore and dunes immediately adjacent to the construction site at Waratah Bay. Despite this, EPR EC02 proposes that appropriate work restrictions during sensitive life-stages be implemented within 100 metres of priority habitats, which includes a very small portion of the foreshore at Waratah Bay which is considered to be optimal habitat for shorebirds (as Shown in the Terrestrial Ecology Assessment Figure 5.1). This amounts to approximately 350 metres of the 16.1km beach, or approximately 0.02% of potential breeding and nesting habitat. Therefore, I am of the opinion that the findings of the Terrestrial Ecology Assessment are accurate and the post-mitigation impact is likely to be low for shorebirds.
- Removal of vegetation and habitat is not considered likely to increase fragmentation of remaining habitats, particularly given the relatively small areas of habitat proposed to be removed at any given location and the already heavily cleared and modified landscapes through which the alignment traverses. Furthermore, in many instances the impacts to habitat are as a result of 'consequential impacts' and therefore considered negligible, as described in the Terrestrial Ecology Assessment Section 8.1.1.
- With regards to the assessment of hollow-bearing trees, again a precautionary approach has been adopted with the Terrestrial Ecology Assessment stating in Section 8.3.2: *"As a count of tree hollows within areas of unassessed areas was not possible. As a precautionary approach, the number of large trees has been used as a proxy for the number of hollow-bearing trees (Table 30). The loss of hollow-bearing trees is considered to be relevant to cavity-dependent fauna that fall within the below groupings."* Potential hollow-bearing trees are also shown in Figure 5. EPR EC01 also requires completion of fauna utilisation surveys prior to the commencement of project works, which will identify those that are being utilised and allow for the minimisation of their removal through actions such as micro-sitting.
- Whilst the impact assessment framework is robust, a particular nuance of the assessment matrix (Terrestrial Ecology Assessment Table 16) means a value with a 'very high' sensitivity cannot have a significance of impact less than 'moderate', even if it is being completely avoided (e.g. the magnitude of impact is negligible). As a result, the significance of some impacts are presented as 'moderate' when in reality no or very negligible impacts will occur. Where this is the case a more appropriate significance rating is provided in brackets next to it (e.g. Moderate [Low]).
- When considering the magnitude of impacts associated with the project, existing land use activities and on-ground conditions must be considered. All of the land through which the alignment passes is currently used as farmland, plantations or road reserves. The alignment does not pass directly through any conservation reserves (noting the Waratah Bay Coastal Reserve will be drilled). In almost all cases, the associated habitats are currently subjected to artificial noise and light on a regular basis, be it from transport vehicles in roadsides or machinery associated with farm or plantation operations, along

with ground disturbance associated with intensive pastoral or horticultural practices (e.g. cattle grazing, cropping for hay/silage or cultivation for potatoes). The proposed impacts associated with approximately 1-2 weeks of construction activity at any given location is relatively minor within this broader context of intensive land use.

Whilst few unsurveyed locations are considered to be at risk of significant impacts, based on a review of all available information, there do remain a small number which should be front of mind as planning, approvals and construction progress. These include:

- The largely unsurveyed section of alignment in low hills surrounding Waratah Bay, between KP3.5-KP6.4. This section intersects private land and runs adjacent to extensive patches of Lowland Forests within the associated parcels. Given the extensive and interconnected nature of the forest patches, which is scarce in this landscape, they are considered significant remnants and likely to support threatened flora and fauna species. However, the specific location of the alignment falls within grazed pastures adjacent to remnant patches and impacts would be to the edges of this vegetation. Based on visual observations from nearby roadsides, the edge of the patch which may be indirectly impacted by the works appears to be heavily degraded as a result of stock access (cattle was observed entering the patch during surveys) and weed incursion. Habitat in these areas is likely to be substantially reduced and unlikely to support threatened species, however as this could not be confirmed through onsite surveys and the quality of the habitat has been considered to be higher than it likely is. Despite this, the AoD has been reduced through this section of the alignment and confirmation of the nature of this habitat and presence of threatened species is recommended in the EPRs prior to construction commencing (with further mitigation such as trenchless construction recommended where values are found). This is shown in Terrestrial Ecology Assessment Figures 6.3 - 6.6 with on-ground conditions (observed from the adjacent roadside) shown in Photos 1 and 2 (Annexure C in this EWS).
- A section of plantation land between KP58.5 and KP61.1 has not been surveyed due to land access limitations. Whilst extensive areas of remnant native vegetation persist within the survey area through this section, based on review of high-resolution aerial imagery, the AoD appears to avoid this vegetation and will only result in the removal of planted radiata pine or blue gum plantations with negligible biodiversity value. However, as per the EPRs, survey of this land prior to construction is recommended to ensure no indirect impacts to native vegetation and habitat occur (primarily as a result of works within tree protection zones).
- Waterways supporting, or considered likely to support, sensitive values that are to be trenched (discussed further below under **Waterways and aquatic values**).
- Locations which support, or may support, the FFG Act listed Bog Gum (discussed below).

To address specific concerns raised in the submissions regarding threatened species:

- Impacts to populations of Bog Gum, both in land that has and has not been surveyed, remains a key concern. Key locations for this species are listed in the Terrestrial Ecology Assessment report and exist primarily in the southern sections of the alignment between KP3.5 and KP34.2. Whilst the majority of the individuals identified within the survey area will be avoided, due to alignment placement or use of trenchless construction methods, a number will be removed where the alignment intersects patches of native vegetation. Bog Gum has also been assumed to occur within patches that will be impacted and have not yet been surveyed. Further on-ground assessments and refinement of the project design is required before a final impact assessment can be made for this species, however based on the findings of the Terrestrial Ecology Assessment, this species is likely to be more prevalent in the region than previously believed. In support of this, over 500 individuals were identified within the survey area and two major populations associated with the Great Southern Rail Trail reserve (KP 23.0 – 28.4) and the Dumbalk-Stony Creek Road reserve (KP 31.5 – 33.5) were identified which had not previously been recorded in the Victorian Biodiversity Atlas. At both these locations, the impacts to this species represent less than 10% of the local population recorded.

- As identified in the Terrestrial Ecology Assessment Section 6.3.1, Platypus has been recorded in six streams intersected by the proposed alignment. Of these only one waterway (Berrys Creek) is proposed to be trenched, with all others to be constructed via trenchless construction. Whilst this location has not been surveyed on-ground, analysis of aerial imagery suggests habitat is suboptimal as the waterway intersects open paddocks, does not support pools or riparian vegetation, and is accessible by stock (primarily cattle). As per EPR E03 further surveys of this location will occur prior to construction and appropriate measures implemented to avoid or minimise impacts if it is determined to be sensitive. Similarly, streams with potential habitat in which the species has not been recorded, such as the Little Morwell River, will also be surveyed prior to construction and appropriate controls implemented should this species be determined as being present.
- Dwarf Galaxias has only been recorded from two locations within the study area, being the lower reaches of Morwell River and Wades Creek (which is not intersected by the alignment), both of which are in the Latrobe Valley. This species has not been recorded within or south of the Strzelecki Ranges and is unlikely to occur widely in this region. As discussed in the waterways and aquatic values section below, the majority of the waterways that are considered habitat (or likely to support habitat) will be avoided via trenchless construction. Where avoidance isn't possible, additional aquatic surveys will be undertaken to determine presence or absence for this species and appropriate controls implemented based on the findings.
- Targeted surveys for Hooded Plover, along with other shorebirds, were undertaken early in the project, as detailed in the Terrestrial Ecology Assessment Section 5.9.9. Only crested tern and sanderlings were identified during the survey. Despite this presence has been assumed based on the existence of records and advice from DECCA, which is incorporated in Section 6.3.1 / Shorebirds: "*The survey area likely provides foraging, and occasional nesting opportunities for species in this group, and also functions as a movement corridor between more significant areas of habitat along this section of coastline. Targeted surveys undertaken at Waratah Bay at Sandy Point Beach identified three crested terns, as well as one large flock of sanderlings (approx. 200 birds). Whilst other species were not recorded during the surveys, Sandy Point Beach is likely to be used by a number of the species (including hooded plover), however the significance of this habitat may be reduced by high levels of human and animal disturbance (including off-leash dogs) and more limited protective seaweed/flotsam/dune sites for nesting and foraging.*"
- Southern Bent-winged Bat *Miniopterus orianae bassanii* does not occur within the Gippsland region and is restricted to south-west Victoria. It therefore has not been included in the likelihood assessment nor considered for this study.
- Submissions raised concerns regarding the survey efficacy for threatened aquatic species, including South Gippsland spiny crayfish and Narracan burrowing crayfish, particularly in the Little Morwell River. Surveys for burrowing crayfish, including Narracan burrowing crayfish, were undertaken throughout the survey area where access was available, however the locations are incorrectly labelled as 'dip netting' in the Terrestrial Ecology Assessment Figure 6 (however are correctly documented in Section 5.9.3 and Table 6). This includes surveys within Little Morwell River. The findings in the report state: *"No Narracan burrowing crayfish were captured during targeted surveys. A total of seven burrowing crayfish were captured, all were identified as the common species lowland burrowing crayfish (Engaeus quadrimanus). This common species is not known to be*

sympatric with the threatened Narracan burrowing crayfish based on a literature review, however, they have overlapping distributions and historical records of Narracan burrowing crayfish are present within 10 km of the survey area. Given this and the low capture rate, this species may still be present within the survey area.“ With regards to South Gippsland spring crayfish, the report states: *“No surveys have been undertaken to date for South Gippsland spiny crayfish within the survey area due to access limitations and the construction treatment of waterways has not been finalised. If direct impacts to waterways are likely e.g., open trenching, then aquatic surveys are recommended to determine presence/absence of these values.”.*

- Habitat for Glossy Grass Skink and Swamp Skink is limited within the survey area. As discussed in the Terrestrial Ecology Assessment Section 5.9.1 surveys for swamp skink (*Lissolepsis coventyri*) and glossy grass skink (*Pseudemoia rawlinsoni*) were conducted, with Section 6.3.1 describing the findings: *“No swamp skink or glossy grass skink were recorded during targeted surveys within the Great Southern Rail Trail. Based on the results of the targeted surveys and the highly modified nature of the adjacent habitat, including the presence of stock, there is a low likelihood of these species occurring within the survey area. Potential habitat still occurs within areas not yet accessed (KPs 2.3 - 6.4 and 8.1 - 8.9), and presence is therefore assumed for these species at these locations.”* As discussed above in this Statement (6.4), whilst this species may occur within the survey area in locations not yet accessed and assessed on-ground, it is my opinion that the likelihood of the project having a significant impact on the species is low due to efforts to avoid and minimise impacts to areas likely to support high-quality habitat (i.e. impacts are limited to the edge of patches which are already disturbed - see Photos 1 and 2 in Annexure C).

Impacts to native vegetation

Questions were raised as to whether impacts to native vegetation have been accurately determined in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation* (the ‘Guidelines’) and presented appropriately. In response I would state:

- The calculation of impacts to native vegetation have without question been done in accordance with the Guidelines, and the offset (ENSYM) scenarios generated provide a high level of accuracy of the likely pre- and post-mitigation impacts to native vegetation and associated offset requirements. I therefore refute claims the Terrestrial Ecology Assessment is not sufficient to determine impacts on the basis it is not in accordance with the Guidelines.

- The process that was followed to ensure field data was collected in accordance with the Guidelines is detailed in the Terrestrial Ecology Assessment Section 5.6, whilst the process for calculating impacts in accordance with the Guidelines is outlined in Section 5.12.2. Impacts to native vegetation are discussed in Sections 8.1.1 and 8.3.1 and shown in detail in Figure 6. Enysm scenario reports for both pre- and post-mitigation impact scenarios are presented in the Draft Offset Strategy along with the Vegetation Quality Assessment data for all habitat zones impacted in the post-mitigation scenario for which access was permitted.

- As discussed in the Terrestrial Ecology Assessment Section 5.3: “*Where access was unavailable, Eco Logical Australia (ELA) has mapped vegetation based on aerial imagery and field observations from adjoining land, and used modelled condition scores to attribute a relative value to the vegetation for use in the impact analysis. Some of this vegetation is likely exempt from requiring offsets, due to either being exotic or a planted native species, however as access was not available ELA has taken a conservative approach and assumed all impacted, non-validated vegetation is native (for further information see Section 6.2). Given the predominantly agricultural landscape through which the alignment* *passes, and the prevalence of planted exotic and non-indigenous native species along fence lines and properties boundaries, the impacts to native vegetation has [therefore] likely been overestimated. Confirmation of the nature and extent of unassessed vegetation will be done prior to construction commencing and used in the final offset analysis.*" As an example of vegetation that is likely to be planted, and therefore exempt from offsets, yet has been assumed to be remnant, see Figures 6.16.

- 2726 individual trees were recorded and measured throughout the survey area, including large and small trees both in patches or as individual scattered trees. The purpose of recording such a large number of trees was so the tree protection zones associated with patches and scattered trees could be accurately accounted for and 'consequential' impacts determined where encroachment of the AoD exceeded 10% (in accordance with the Guidelines). Where consequential loss of trees is determined to occur, the extent of the patch to be removed has taken the tree loss into account, as per guidance in DECCA's Native Vegetation Regulations Newsletter 1. This can be clearly seen in the vegetation impacts shown in the Terrestrial Ecology Assessment Figure 6 (for a pertinent example see Figure 6.56 which shows consequential impacts to native vegetation in patches which take into account the tree protection zones of trees outside the AoD). The actual tree protection zones are not shown on the figures due to the unnecessary complexity this would create in the figures.

- The Terrestrial Ecology Impact assessment report is not designed to address the application requirements specifically, but instead present a holistic impact of the project on biodiversity in accordance with the assessment guidelines for the EIS and scoping requirements for EES. That being said, all relevant information required to address the application requirements is presented in the Terrestrial Ecology Assessment and associated Draft Offset Strategy and, as per the incorporated document, will be finalised and presented in a suitable format for approval prior to construction commencing, including specification of final offset requirements (i.e. NVR Report). It is therefore unreasonable to expect that the documentation prepared for the EIS/EES to respond specifically to the application requirements, including presenting data and figures in a specific manner, when this has been identified for completion and provision at a later, more appropriate stage of the process.

- Submissions raised concerns regarding a 'significant tree' proposed for removal at the corner of the Strzelecki Highway and Smiths Road (as shown in the Terrestrial Ecology Assessment Figure 6.63). Given this location is: associated with a proposed entry point for an access track off the Strzelecki Highway, already an intersection with Smiths Road, and the tree is on the southern side of the road in the opposite direction of the proposed access track, there is a high probability this tree will be able to be avoided through finalisation of the detailed design to ensure the access point will not impact the tree (based on arborist advice as per EPR EC01).

- A submission has proposed alternative alignments for sections of the Project within plantation land in the Strzelecki Ranges at KP57.4 and KP66.8. Based on a review of these locations, I am of the opinion the proposed changes would not reduce the impacts to ecological values and, depending on the final location of the proposed alignment, may result in a small increase in the amount of native vegetation and associated habitats impacted.

Cumulative impacts

Submissions raised concerns around the analysis of cumulative impacts. In response I would state:

- Victorian Government has not to date released a comprehensive dataset identifying the extent of native vegetation gained and loss by municipality or bioregion (VAGO 2022). The only figure released is the 2020 data which provides the overall change in vegetation by habitat hectare across the state, but does provide an indication of the total extent of native vegetation nor change at a regional level.

- Without clear guidance on an approach to assessing cumulative impacts, nor provision of data to inform such an assessment (i.e. the extent of native vegetation gain and loss by region), determining cumulative impacts associated with a project of this nature cannot be completed in an objective manner and likely to misrepresent the actual cumulative impacts on biodiversity within the region, and the contribution of the project to that impact.

- Despite this, an attempt to provide an indication of the relative impact of the project within each landscape region is provided in Annexure E. A comparison of impacts to other projects is also provided.

- In summary, based on the post-mitigation impact scenario, the project is not expected to impact on more that 0.016% of total native vegetation and habitat within the broader study area (i.e. within 10km of the alignment) and will not impact more than 0.026% of native vegetation in any given landscape region.

- The proposed post-mitigation impacts of the project are significantly less than the combined estimated impacts associated with the Strzelecki Highway upgrades and proposed Delburn Windfarm. Combined, these projects have an estimated loss of native vegetation of approximately 30 hectares within the Strzelecki Ranges only, compared to the 1.87 hectares proposed for the Project (and the 6.75 ha across all four landscape regions).

- When the maximum (pre-mitigation) impacts are compared to other major projects subject to an EES in the past 10 years, the proposed loss of native vegetation is comparable to projects deemed to have an acceptable level of impact. When considering the project is spread across 90km (including three bioregions and two regional municipalities) the relative impact to native vegetation and habitat is further reduced.

- Furthermore, when compared to an analysis of native vegetation clearance within the nearby Baw Baw shire, there were over 100 instances identified, of which only nine had permits issued for (VAGO, 2022). Given similar, likely unregulated, clearance of native vegetation was observed within the survey area in the Strzelecki Ranges, and the majority of native vegetation exists within private land, the proposed post-mitigation impacts of the project are negligible compared with the regulated and unregulated removal of native vegetation within the broader landscape. The argument that the Project will make a significant contribution to the loss of native vegetation or habitat within the broader region is therefore unsupported and, as outlined in the VAGO report, greater scrutiny of unregulated or existing-use impacts would likely yield far greater conservation outcomes.

FFG Act listed Forest Red Gum Grassy Woodland Community

Submissions indicated the presence of the Victorian FFG Act listed Forest Red Gum Grassy Woodland Community was not documented accurately in the Terrestrial Ecology Assessment. In response I would state:

- Based on the surveys only a single patch of the FFG Act listed Forest Red Gum Grassy Woodland Community was identified within the survey area.
- Based on the FFG listed community descriptions (DECCA 2022) 'the community is characteristically dominated by Forest Red Gum *Eucalyptus tereticornis*', and whilst acknowledging this community may also occur in instances where derived grasslands persist without an overstorey, no additional patches meeting these descriptions were identified. All other vegetation assessed supported canopy species which did not include Forest Red Gum and no native grasslands were identified.
- Whilst land access prevented on-ground surveys in some locations where this community is likely to occur (primarily the Latrobe Valley), the majority of these properties were observed from adjoining land (e.g. roadsides) and were heavily modified due to intensive pastoral practices, being dominated by exotic pasture species. Given no additional roadsides, all of which were assessed, supported this community in any form, and these represent the most likely locations for the community to persist given the lack of disturbance, and that this community was not observed on any of the private properties that were assessed on-ground, the likelihood it occurs elsewhere in the alignment is considered to be very low.
- As documented in the EPRs, should this community occur in land not yet assessed, this will be identified prior to construction commencing and appropriate measures implemented to ensure impacts are avoided or minimised.

Waterways and aquatic values

Submissions raised concerns regarding the assessment of aquatic values, including the efficacy of surveys and determination of potential impacts. In response I would state:

- A total of 82 'waterways' were identified within the survey area based on the Vicmap dataset (see Plate 1 below). The vast majority of these are little more than 'drainage lines' or 'gullies' in the uppermost reaches of the catchments. In the majority of cases, these drainage lines do not support aquatic values and are often indistinguishable from the surrounding paddocks in terms of vegetation and habitat. Examples of drainage lines which do not support sensitive ecological values are shown in Photos 5, 6, 7 and 8 (Annexure C).
- Of the 86, only 22 were identified as supporting, or potentially supporting, sensitive ecological values. These include both major and minor waterways on private and public land. A summary of these waterways is provided in Annexure D.
- Whilst all 'major' waterways were surveyed on-ground, and the values documented, including assuming presence for threatened species known or considered likely to occur within the reach intersected by the alignment, several 'minor' waterways within private farmland that may support sensitive ecological values have not been observed on-ground (as detailed in Annexure D). Based on existing farming practices and observations of similar waterways elsewhere, it is likely that these unassessed waterways are heavily degraded due to low or absent cover of riparian vegetation (as can be observed from aerial imagery), stock access, weed infestations and erosion. As a result, the likely persistence of significant ecological values is considered low. Despite this, the impact assessment has assumed presence for some values, such as River Swamp Wallaby-grass, which cannot be conclusively ruled out. The significance of the waterways for threatened species is

detailed in the Terrestrial Ecology Assessment Section 6.3 and shown in Figure 5 as 'priority habitat' - in particular Aquatic 1 (Tarwin Valley), Aquatic 2 (Tarwin Valley), Aquatic 3 (Strzelecki Ranges), Aquatic 4 (Latrobe Valley), Wetland 1 (Tarwin Valley), Wetland 2 (Tarwin Valley) and Wetland 3 (Strzelecki Ranges).

- In general, waterways supporting sensitive values will be avoided by trenchless construction techniques (as detailed in Annexure D). Waterways that are proposed to be trenched will be surveyed prior to construction commencing to ensure sensitive aquatic values are not present and significant impacts unlikely. Where a risk remains, alternative approaches or controls will be considered, including trenchless construction (as detailed in EPR EC03). The exception is the Little Morwell River, which is now proposed to be constructed via trenchless methods (e.g. HDD), subject to the outcome of further geotechnical and other relevant investigations. It is therefore expected that impacts to this waterway will be avoided.
- In addition to the controls encapsulated in EPR EC03, numerous other EPRs detail controls related to the protection and management of waterways which will ensure that where impacts cannot be avoided (e.g. trenching is required), the risk to aquatic and riparian ecosystems is minimised, both at the intersection with the alignment and within the broader catchment. Given the application of these measures, it is reasonable to assume that impacts to waterways can be restricted to the point of crossing and for the duration of construction, and that sites will be appropriated rehabilitated so subsequential issues do not arise post-construction. As a selection, key EPRs include:
    - CL02 - Manage excavated soil, contaminated soils, removed wastes and potential risks to the environment due to contamination during construction
    - CL04 - Develop and implement measures to manage potential contamination impacts in operation
    - GM02 - Develop designs that minimise construction induced ground movement
    - GM03 - Develop designs that minimise ground disturbance due to vegetation removal and disturbance of acid sulfate soils
    - GM08 - Develop and implement a site drainage plan to minimise site run off and avoid and/or minimise impacts to ground and slope stability
    - GM09 - Develop and implement a watercourse crossing plan to avoid and/or minimise impacts to existing fluvial geomorphology
    - GW02 - Develop and implement methods to minimise groundwater inflow into trenches and groundwater level drawdown
    - GW03 - Develop and implement methods for HDD and drilling to prevent groundwater movement and contamination
    - GW05 - Design and implement measures to manage and dispose of extracted groundwater during construction to avoid (where possible) or minimise environmental impacts
    - SW01 - Develop and implement an erosion and surface water management plan (including key controls to '*Maintain the key hydrologic and hydraulic functionality and reliability of existing flow paths and drainage channels, retain existing flow characteristics to maintain waterway stability downstream of construction and Minimise erosion and acceleration of stream processes to protect bank stability of*

waterways and drainage channels that could be affected by directly or indirectly affected by construction activities')

- SW04 - Develop and implement a surface water monitoring program

- Furthermore, proposed amendments to EPRs associated with the Contaminated land and acid sulfate soils, Geomorphology and soils, Groundwater, and Surface Water have been reviewed (as of 27 August 2024) and, in my opinion, further strengthen the controls around waterways and the associated management of unforeseen events, such as the requirement to salvage bore heads during HDD. In particular, the proposed amendments to EPR GM01 will improve the assessment of risks through detailed investigation and planning prior to construction commencing, and further reduce the likelihood and consequences of unforeseen events. Finally, should an unforeseen event occur, these will be managed in accordance with emergency management protocols to be included in the erosion and surface water plan (EPR SW01).

- Concerns arising about the potential for impacts associated with trenching of waterways, or indirectly as a result of sedimentation or pollution (including where trenchless construction is proposed) are valid in a limited number of locations, but fail, in my opinion, to recognise the heavily modified nature of the majority of the waterways and associated ecosystems, and the existing land uses which have resulted in degradation and subsequent loss of function and habitat, and as a result much of their biodiversity.

- With regards to the Little Morwell River, a submission identified the correct omission of a small area of swamp habitat immediately upstream of the proposed crossing point, which may be affected if dewatering for extended periods is required during construction (whilst the woodland was mapped the full extent of the associated aquatic habitat was not). It is recommended that this area be accurately mapped by broadening the extent of priority habitat (Aquatic 3 [Strzelecki Ranges]) to cover the native vegetation that was mapped and appropriate controls implemented during construction to maintain the associated hydrology of this value if trenchless construction is not possible.

- Two minor waterways (KP66.7 and 67) supporting high quality riparian and aquatic habitats are proposed to be trenched. The decision to trench these locations is based on the nature of the proposed crossing points, which follow an existing track which has been built up over the waterway utilising culverts to allow water to pass (as shown in Photo 20, Annexure C). Given the already modified nature of these crossing points, it is reasonable to assume that trenching in these locations can be undertaken without directly impacting the watercourse, and, assuming appropriate controls to manage pollution and sediment release are in place, impacts to the associated ecological values can be largely avoided.

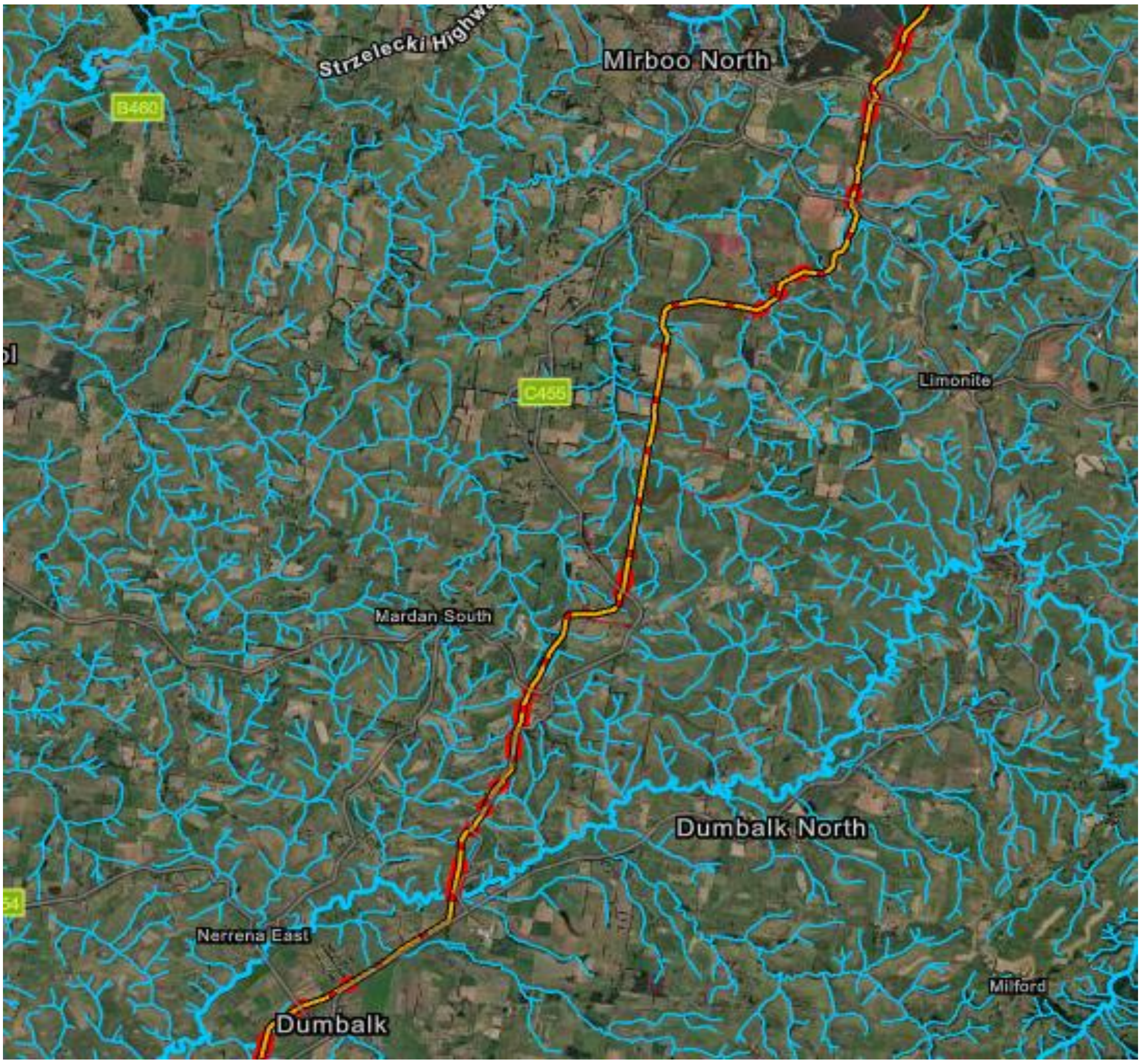


Plate 1. Image showing high density of minor water courses between Dumbalk and Mirboo North, the majority of which are infrequently flowing drainage lines which do not support sensitive ecological values.

Koalas

Numerous submissions raised concerns that Koala *Phascolarctos cinereus victor* has not been surveyed or adequately assessed in the study. In response I would state:

- The presence and location of Koala's were recorded whenever observed during field assessments, whether during initial vegetation and habitat condition surveys or targeted surveys for threatened species (including remote sensing cameras, spotlighting, drone surveys and acoustic recorders). This is documented in Terrestrial Ecology Assessment Section 6.3.1 (Regionally significant species) and the locations of individuals observed presented in Figure 5 and detailed in Appendix 4. Primarily, this species was recorded in the Great Southern Rail Trail between KP 21.7 – KP 28.6 and through the Strzelecki Ranges between KP 61.4 and 73.1. No individuals were observed outside these areas, however the species may persist in lower numbers in intact woodland or forest remnants in other parts of the landscape.

- Koala is not a listed species under either the FFG Act or EPBC Act. Whilst many stakeholders may disagree with this situation, the current position of the Victorian and Australian governments is that Koalas are not threatened in Victoria, and given the recent amendment of the FFG Act and subsequent review of all threatened species in Victoria completed in 2022, this is unlikely to change in the short-term. Therefore, in considering impacts to biodiversity values an objective study should not focus on a particular species simply because of its iconic nature or high public profile. That being said, the study has recognised the concerns of stakeholders and the importance of this species to the local community and documented its presence within the study area in detail (as described above).
- Given the species is not listed under relevant legislation as threatened, a specific impact assessment has not been conducted for this species. However, to address the requests of the Technical Reference Group I would make the following observations based on the findings of the terrestrial ecology study:
  - The post-mitigation direct impacts to native vegetation within the Strzelecki Ranges is 1.87 hectares, including 14 large trees. Indirect impacts are unlikely to have a material impact on the habitat for this species, and amount to only 0.41 hectares and 9 large trees. This equates to 0.021% of native vegetation recorded within the broader Strzelecki Ranges landscape, as discussed in Annexure E.
  - The post-mitigation direct impact to native vegetation in the Tarwin Valley section, which contains the Great Southern Rail Trail where Koala's were observed, is 3.5 hectares, including 15 large trees. The significant majority of this vegetation is not considered suitable habitat, due to its heavily fragmented and modified nature, and actual post-mitigation impacts to habitat for Koalas in the vicinity of the Great Southern Rail trail is approximately 0.21 hectares. As a result, post-mitigation direct impacts to habitat in this area are considered to be relatively small and temporal in nature compared to the actual extent of habitat within the broader landscape (e.g. 14,348 ha; Annexure E).
  - Whilst there is some validity to claims that small impacts can accumulate over time, the proposed impacts are incomparable to those which occur as a result of, say, Blue Gum logging operations in native plantations in the Strezlecki Ranges, as per the following submission: *"...*[redacted] *intend to replace eucalyptus plantations with pine in the coming years. More than 14,000 hectares of softwood plantations will be planted over the next 5 to 10 years under the Gippsland Plantations Investment Program and 16,000 hectares will be converted from hardwood to pine by* [redacted] *in the Strzelecki Ranges. This means* [redacted]*'s pine plantations will see a 30% increase from 65,000 hectares to 95,000 hectares."*
  - Based on the post-mitigation impacts to habitat, the Project is unlikely to lead to a long-term decrease in the size of the local populations nor materially reduce the area of occupancy for the population. As a result, the project should not be considered a significant threat to Koala populations in the Strzelecki Ranges or elsewhere and it should not be a significant factor when considering the viability of the Project.

References

Wright, M.D., Goodman, P., Cameron, T.C., 2010. *Exploring behavioural responses of shorebirds to impulsive noise*. Wildfowl 60:150-167.

VAGO, 2022. Offsetting Native Vegetation Loss on Private Land. Independent reasonable assurance report to Parliament.

DECCA, 2022. Flora and Fauna Guarantee Act 1988 – Threatened List : Characteristics of Threatened Communities. Accessed 21 August 2024 [https://www.environment.vic.gov.au/__data/assets/pdf_file/0018/50418/04072019-Flora-and-Fauna-Guarantee-Characteristics-of-Threatened-Communities-3.pdf].

8 Environmental Performance Requirements

As described at Section 6 above, the Terrestrial Ecology Assessment recommended EPRs as relevant to ecology.

I support the proposed amendments to EPR EC03 which include:

- adopting a preference for trenchless construction, so far as reasonable practicable at the listed waterway crossings, including inclusion of the Little Morwell River.
- insert a cross-reference to EPR GM09 to ensure the planning and management of waterway crossing considers fluvial geomorphology and, as such, minimises the risk of direct and indirect impacts to ecological values both at the crossing and downstream.

I have also reviewed EPRs recommended by the associated technical assessments, including the proposed amendments as a result of the constructability workshop, and have no further recommendations.

Based on this, I believe the measures to avoid and minimise impacts will be strengthened and the risk and consequence of impacts reduced based on the post-mitigation impact scenario.

9 Declarations

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

If I am presenting evidence from a different location by video conference, I confirm that:

(a) I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel.

(b) I will inform the Panel immediately should another person enter the room from which I am giving evidence.

(c) during breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel.

(d) I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

	Signed by James Garden
Signed	
Date	28 August 2024

Marinus Link Environment Effects Statement and draft Planning Scheme Amendment

Inquiry and Advisory Committee hearing

Expert Witness Statement of David Balloch

1 Introduction

My name is David Balloch. I am an aquatic ecologist and director of EnviroGulf Consulting, C/- Scarborough Business Centre, Level 1, Unit 4, 91 Landsborough Avenue, Scarborough, QLD 4020.

I was the technical specialist for the **Marine Ecology and Resource Use Assessment** dated 31 May 2024 which was a technical appendix to the consolidated Environment Effects Statement (**EES**) under the *Environment Effects Act 1978* (Vic) and the draft Environmental Impact Statement under the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) (**EIS/EES**) for the Marinus Link Project (**Project**).

2 Summary

A summary of key issues, opinions and recommended changes to Environmental Performance requirements (EPRs) is presented in Table 2-1.

Table 2-1: Summary of key issues and opinions

Key issues
Key issues during Project construction: • Biophysical impacts of seabed disturbance on water quality, sediment quality, seabed habitats and associated benthic biological communities arising from: – Route clearance (pre lay grapnel runs). – Horizontal directional drilling (HDD) pilot borehole exit breakthrough. – Cable laying operations. – Post lay cable installation and burial. – Project cable crossings of third-party seabed infrastructure. – Disturbance of contaminated seabed sediment (where present). • Underwater noise impacts of construction activities: – Cable lay ship and cable laying operations. – Cable installation and burial (e.g., cable trencher and associated construction vessel). – Other construction vessels (e.g., guard vessels and small boats pulling and/or manoeuvring cables). • Risks of introductions, translocation, and spread of Invasive Marine Species (IMS) : – Risk of IMS introduction and via ballast discharges waters and sediment. – Risk of IMS introduction via vessel hull biofouling. • Nighttime lighting impacts of illuminated vessels to light-sensitive fauna including: – Seabird and migratory bird collision impacts with vessel superstructure. – Light-induced disorientation and/or deviation in the flight paths of nocturnally migrating birds. – Light entrapment of birds. – Light attraction of near surface marine fauna. • Risks of Project vessel collisions with megafauna such as slower moving or stationary large cetaceans and sea turtles. ***Key issues during Project operation:***

- Magnetic field impacts on magnetosensitive marine fauna interference of magnetic compasses (where used).
- Induced electric field impacts on electrosensitive marine fauna.
- Thermal field impacts on bottom-living flora and fauna.
- Underwater noise impacts of Project vessels during routine inspection and monitoring, as well as during any major cable retrieval and repair operations.

Key issues during Project decommissioning:

- Two decommissioning scenarios considered a) cables removed at end of Project life and b) cables not removed and left in situ:
- Seabed cable removal option issues:
  - Seabed disturbance impacts on benthic habitats and associated biological communities.
  - Underwater noise impacts of cable removal operation vessels on marine fauna.
- Seabed cables remaining in situ option issues:
  - Long-term risk of buried Project cables to potentially become exposed via bed sediment transport and/or seabed scour.
  - Long-term risk of exposed cable sections on seabed to anchor hook-up or snagging of bottom trawling gear and equipment with consequential impacts to commercial fisheries.
  - Long-term corrosion of subsea buried cables with potential for metal contamination of seabed sediments, bottom water quality, and potential toxicity to sediment infauna and benthic biological communities.

Project cumulative impact key issues:

The Victorian EES scoping requirements include requirements for the assessment of cumulative impacts. Cumulative impacts result from incremental impacts caused by multiple projects occurring at similar times and within proximity to each other. Proposed and reasonably foreseeable projects were identified based on their potential to credibly contribute to cumulative impacts within the marine environment due to their temporal and spatial boundaries overlapping with those of the Project.

The key cumulative impact issues include:

- Cumulative impacts of underwater noise generated by Project construction and the construction of nearby offshore wind energy developments proposed off the Victorian coast and/or Commonwealth marine waters.
- Cumulative impacts of Project-generated magnetic fields interacting with magnetic fields generated by subsea export power cables from future nearby operational offshore wind farms.

Opinions

Adequacy of Environmental Performance Requirements:

- The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) recommended 13 EPRs as relevant to the marine environment of the Project. The EPRs and contained explicit avoidance, mitigation, and management measures are considered adequate for avoiding or reducing potential impacts and/or risks of the Project to marine ecology and marine resource uses. The mitigation and management measures outlined in the EPRs were adequate for the purposes of assessing the environmental impacts and risks of the Project to marine ecology and resource uses.
- None of the public submissions reviewed has identified any specific marine ecological or resource use impact that should be considered unacceptable or require modification of the current avoidance, environmental management and mitigation measures proposed to underpin the marine EPRs presented in the published **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).
- The thirteen EPRs outlined in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) should remain as exhibited. The management plans to be developed and implemented under the EPRs would evolve in line with Project design, changing understanding of risk, environmental laws, etc.

Recommendations for changes to the draft Planning Scheme Amendment and Environmental Performance Requirements

Draft Planning Scheme Amendment:

- The draft Planning Scheme Amendment (Draft **PSA**) applies to land-based components of the Project within Victoria only (i.e., Latrobe and South Gippsland planning schemes), which lie inland of the high-water mark. Land and waters within Victoria, below the high-water line, are not subject to the Planning Schemes.
- The Draft PSA is not relevant to the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and therefore is not discussed further.

Environmental Performance Requirements:

- I consider the thirteen Environmental Performance Requirements (EPRs) detailed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) are appropriate as exhibited. Therefore, there are no recommendations proposing changes to the EPRs.

Conclusions:

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) assessed that the impacts associated with construction, operation and decommissioning of the Project will be manageable to acceptable levels to avoid significant adverse impacts in compliance with , given the implementation of mitigation and management measures to comply with EPRs.

A high level of confidence can be placed on the findings of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) based on experience gained at other subsea HVDC cable projects and operating HVDC interconnectors.

Overall, Project construction, operations and decommissioning impacts are not predicted to adversely impact upon on any Commonwealth EPBC Act threatened species of flora and fauna, threatened ecological communities, listed migratory species and listed marine species, as well as the threatened species listed under both the Victorian FFG Act.

3 Qualifications, experience and expertise

A statement setting out my qualifications, experience and expertise is provided as Annexure A and summarised below.

3.1 Qualifications

B.A. (Hons.) Biology, University of Stirling (UK).

M.Sc. Biology of Water Management, University of Aston (UK).

Chartered Biologist (CBiol), Royal Society of Biology (UK).

Chartered Professional Environmental (CPEnv), AusIMM (Australia).

3.2 Experience

My general experience and experience directly relevant to the Marinus Link project are summarised below.

(a) General experience

I have been working in various fields of freshwater, estuarine, and marine ecological research and impact assessments over a period of 56 years. I have 39 years experience as an environmental consultant with substantial experience in marine impact assessments, particularly discharges and physical disturbances to the marine environment. These impact assessments include wastewater discharges, seismic surveys, dredging, subsea cable/pipe installations, and natural resource and industrial projects including the mining and minerals industry, pulp and paper industry, oil and gas industry, and electric transmission industry. The latter industry focused on Australia’s three subsea high voltage direct current (HVDC) cable projects.

(b) Relevant experience of subsea HVDC cable interconnectors

I have experience directly relevant to the Project including involvement in assessing the environmental impacts of two other subsea HVDC interconnector projects in Australia. This experience is summarised below:

- **Sun Cable's Australia-Asia PowerLink Project (2023 – ongoing)** – Review of Draft EIS and independent review and update of scientific studies of EMF impacts on marine species. Responsible for assessing the EMF effects of different subsea HVDC cable configurations and cable bundling, spacing, and burial depth options to magnetosensitive and electrosensitive marine (to Sun Cable (Singapore) for the Northern Territory Environment Protection Agency (NT EPA), Australia).
- **Basslink HVDC Interconnector Project (2000 - 2003)** – Assessment of construction environmental impacts of HVDC cable installation and sea electrode emplacement and operational environmental impacts (electric fields, magnetic fields, chlorine-produced oxidants and halogenated organic compounds, and heat generation) on marine water quality, flora, fauna and marine resource use (with NSR Environmental Consultants Pty. Ltd for Basslink Pty. Ltd.).

The above accumulation of general and subsea HVDC cable project experience facilitated the preparation of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) for the Project (see below).

4 Instructions

4.1 Involvement in the Marinus Link Project

Involvement in the Marinus Link Project Coffey Services Australia Pty Ltd (Coffey) is the lead consultant to Marinus Link Pty Ltd for environmental, land use planning and heritage services, and is supported by specialist subconsultants. I was engaged by Coffey to:

- Conduct a Marine Ecology and Resource Use Assessment of Project construction, operation, and decommissioning. This report is presented as Technical Appendix H of the EIS/EES.
- Conduct a literature review and summarise supplementary information for the Project's underwater noise assessment. This report is presented as Attachment D of Appendix H of the EIS/EES

I am the author of the above reports and I adopt the contents except where qualified in this witness statement.

4.2 General instructions

I have been instructed by Herbert Smith Freehills (HSF) on behalf of Marinus Link Pty Ltd to give evidence on the environmental effects of the Project relevant to Victoria and relevant to my area of expertise and prepare an expert witness statement that summarises the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and responds to six submissions to the EIS/EES forwarded to me by HSF.

A copy of my instructions from HSF is included as **Annexure B**.

4.3 Specific instructions

I was asked to prepare an expert witness statement that:

- briefly summarises the marine ecology and resource use assessment report that I prepared in relation to the Project and the Supplementary Report that I was separately instructed to prepare in relation to Marinus Link Information Update #1 – timing of Stage 2,
- provides my opinion, as within my expertise, on any matters raised in the requests for further information, submissions, and referral responses to be provided to me in due course relevant to my area of expertise.

If requested or directed by the IAC, I may be asked to attend a conference of experts relevant to my area of expertise and prepare a joint statement, and to also appear as expert witness at the IAC Hearing commencing 16 September 2024.

5 Statements in relation to the Marine Ecology and Resource Use Assessment

I am the sole author of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES). I was the marine ecologist responsible for assessing the potential impacts and residual impacts (i.e., after mitigation and management measures have been implemented) arising during the construction, operation, and decommissioning phases of the Project. .

Annexure D presents a summary of general statements in relation to the **Marine Ecology and Resource Use Assessment (**Technical Appendix H of the EIS/EES). Including:

- Tasks carried out for the marine ecology and resource use impact assessment,
- Sources of information and data relied upon.
- Key assumption, limitations and exclusions.

Matters arising since EIS/EES publication in May 2024 have been considered in this witness statement and limitations and exclusions are summarised below.

5.1 Departures from the findings or opinions

I confirm that the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), to the best of my knowledge, is complete and accurate, except for the following aspects:

- Errata and corrigenda.
- Changes since EIS/EES publication:
  - Updates to offshore wind energy Feasibility Licence (FL) areas offshore of Victoria.
  - Updated technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing (NMFS 2024).

(a) Errata and corrigenda.

Errata and corrigenda relate to an important paper by Gales et al. (2012) referenced in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), which is the only known scientific study that purports to show an inhibitive interaction of a cetacean with an operating subsea HVDC cable system.

Errata:

In the first paragraph of page 423 of Technical Appendix H, the following is stated:

"However, a critical review of this study for the present report, assessed that this finding is not correct as the location where they stopped their easterly movement (135 km east of their release point at Godfrey's Beach at Stanley Peninsula) is 7 km short of the Basslink cable's location."

However, this paragraph should have been (changes emphasised in bold font) as follows:

*"However, a critical review of this study for the present report, assessed that this finding is not correct as the location where they stopped their easterly movement (**120** km east of their release point at Godfrey's Beach at Stanley Peninsula) is **12 km** short of the Basslink cable's location **at 132 km east of the release point at Stanley."***

Corrigenda:

In the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), it was mistakenly assumed that the location 120 km east of the release point at Stanley was at the Basslink cable location. However, this was not the case as Gales et al. (2012) state that the eastward moving long-finned pilot whales were relocated 120 km east of Stanley by a contracted Cessna 127 aeroplane undertaking an aerial survey and further state that:

"Within hours of being relocated from the plane, the group approached the Basslink cable, a high-voltage, direct-current submarine electrical cable that runs across Bass Strait (see Fig. 4), from the west. On reaching the cable location, the tracked whales ceased their consistent eastward movement and appeared to mill within an adjacent area for ~12 h, before crossing the cable and resuming their eastward travels."

Based on the above, the area where the whales stopped and milled around before crossing the Basslink cable's location was a location to the west of the Basslink cable's location but the actual distance east from Stanley (or west of the Basslink cable) and coordinates were not given in Gales et al. (2012). Therefore, the first three paragraphs and Figure 7.22 (Gales et al. (2012) tagged long-finned pilot whales and magnetic anomaly map) are no longer relevant and can be dismissed.

Notwithstanding, Gales et al. (2012) also state that it was "i*mpossible to determine the extent to which the cable itself was related to the observed behaviours of the tracked long-finned pilot whales*" and, in terms of a potential barrier effect, they state that *"clearly, the submarine cable did not represent a physical barrier because the tracked whales swam across it on at least 14 separate occasions during the study period, both singly and in a group, and often twice within 24h".*

Magnetic field impacts on cetaceans are further discussed and summarised in Section 7.2 of this witness report, including reference to the Gales et al. (2012) field study.

In relation to my technical appendix (**Marine Ecology and Resource Use Assessment**, Technical Appendix H, EIS/EES) and taking account of the abovementioned corrigenda, I am not aware of any limitations or exclusions that will materially alter the findings in Technical Appendix H or opinions contained in this witness statement.

(b) May 2024 update to offshore wind energy Feasibility Licence (FL) areas

The Marine Ecology and Resource Use Assessment (Technical Appendix H, EIS/EES) considered cumulative impacts of the Project with four proposed offshore wind energy projects: Star of the South, Greater Gippsland, Great Eastern and Seadragon, which are all located in offshore wind block Part 1 (refer Figure 7.23, page 452 of Technical Appendix H, EIS/EES). However, in May 2024 after EIS/EES publication, the Australian Government granted 12 feasibility licences for offshore wind projects off Gippsland's coast in Victoria.

One of these additional offshore wind energy projects includes the Feasibility Licence (FL) area for Gippsland Skies offshore wind project (Gippsland Skies, 2024), which is located within the declared offshore wind block Part 3 and overlaps part of the route of the proposed Marinus Link. I am instructed to briefly address potential interactions and cumulative impacts of the current Project and the Gippsland Skies offshore wind energy project, and which are addressed below as potentially relevant to Victoria.

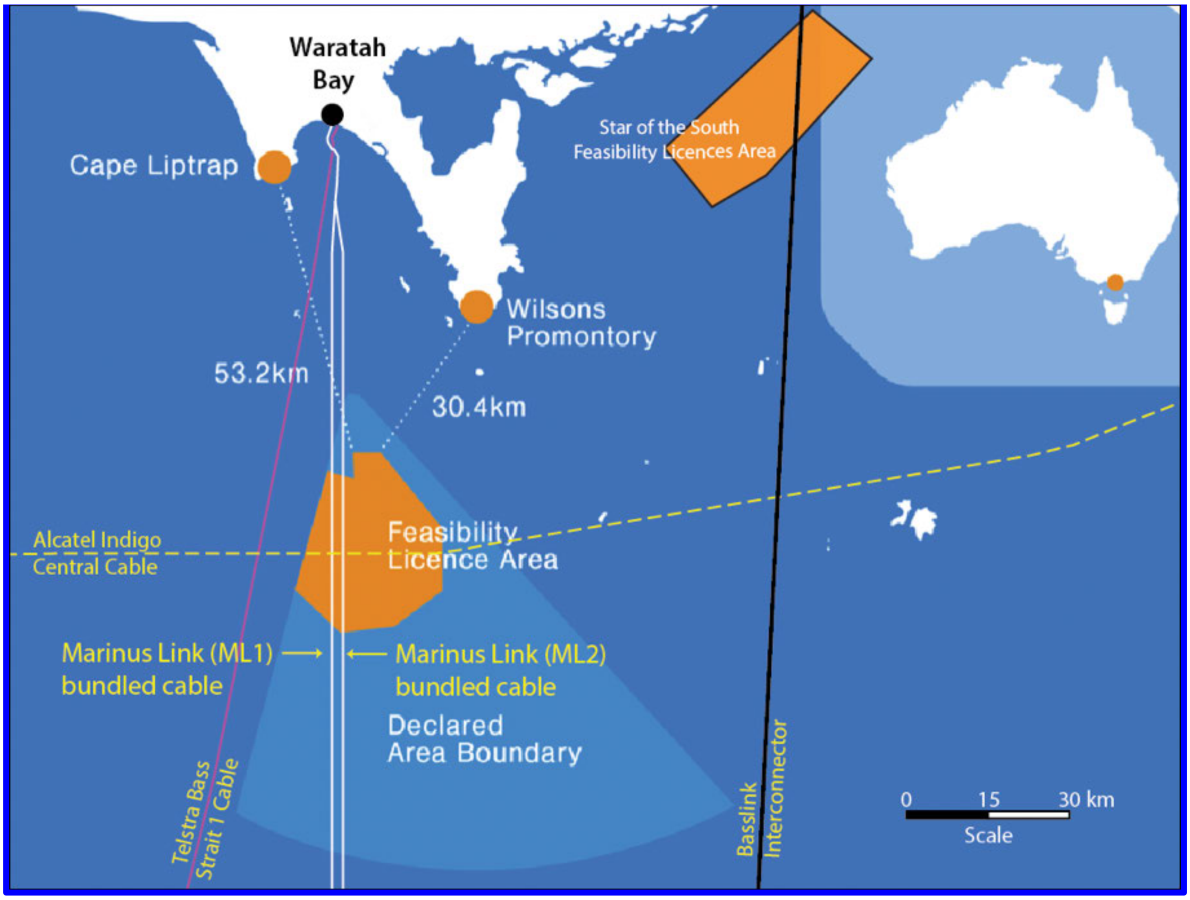
Gippsland Skies Offshore Wind Energy Project

Figure 5-1 shows the location of the Feasibility Licence FL area of the Gippsland Skies Offshore Wind Energy project located in the Commonwealth Declared Area Part 3. The key issues relating to Project interactions with the Gippsland Skies offshore wind energy project include:

- The Marinus Link alignments intersect the Gippsland Skies FL area.
  - The western monopole (ML1) intersects 29.4 km of the FL area.
  - The eastern monopole (ML2) intersects 28.3 km of the FL area.

– ML1 and ML2 are separated by 2 km in offshore Bass Strait and each monopole includes a 1-km-wide buffer[1] to the west and east, respectively, giving a total buffer width of 4 km.

- Route options for a high voltage export power cable from the Gippsland Skies FL area to shore (landfall) may be considered by o Gippsland Skies Pty Ltd include:
  – export cable route to landfall towards the east that would not cross the ML cables,
  – export cable route to landfall to the west that would not cross the Marinus Link cables.



Source: Adapted from a location map published by Gippsland Skies (2024). The dotted lines from the FL area to Cape Liptrap and Wilsons Promontory indicate distance to nearest land and not to any proposed export cable routes. The map is for illustrative purposes only.

Figure 5-1: Gippsland Skies offshore wind energy Feasibility Licence area

The potential cumulative impacts are assessed briefly below.

Findings and opinion

None of the routeing options for Gippsland Skies export cable affects Marinus Link cables within nearshore Victoria, as any Marinus Link crossings would most likely take place in adjoining offshore Commonwealth waters.

The interaction between the Marinus Link cables and the infrastructure within the Gippsland Skies Offshore Wind Energy Project will be managed in accordance with the *Offshore Electricity Infrastructure Act 2021* (OEI Act) between MLPL and Gippsland Skies Offshore Wind Energy Project licence holder.

[1] The 1-km wide zone either side of a subsea power cable is based on separation buffer between Star of the South offshore wind energy project (SOTS, 2022) and the Basslink bundled cable.

I have assumed an average route length of 29 km for the Marinus Link alignments (ML1 and ML2) within the Gippsland FL area. I have assumed a 4 km wide licence area around the cables but note I am instructed the width and conditions of the anticipated Marinus Link transmission and infrastructure licence area (subject to approval) will be subject to the licensing regime under the OEI Act. Adopting these assumptions, this equates to 116 km^2 of the Gippsland Skies FL area within which offshore floating or submerged wind energy generators may be restricted and potential impacts between Gippsland Skies and Marinus Link will be managed in accordance with the licensing regime under the OEI Act. For the purposes of the cumulative impact assessment, I have assumed that in the 116km^2 area, Gippsland Skies will not be able to install permanent infrastructure. The 116 km^2 area represents 18.5% of the Gippsland Skies FL total area of 626.4 km^2.

Relevant Marinus link EPRs and their mitigation and management plans that serve to minimise interaction of the two projects and minimise cumulative impacts include:

- **EPR MERU06** (Develop and implement a marine communication plan), which includes:
  - A protocol for notifying the AMSA of the proposed locations, timing and duration of proposed marine construction activities (and would be available to Gippsland Skies Pty Ltd).
  - A protocol for informing the Australian Hydrographic Office of the locations, dates, times and duration of proposed marine construction activities.
  - An approach for compliance with AMSA Marine Orders Part 30 (Prevention of Collisions), AMSA Marine Orders Part 59 (Offshore Support Vessel Operations) and the convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs).
- **EPR MERU13** (Notification of the final subsea project alignment), which includes at the completion of marine construction:
  - MLPL must inform the Australian Hydrographic Office and the Victorian Department of Energy, Environment and Climate Action of the locations and coordinates of the final subsea project alignment to enable the Australian Hydrographic Office to publish Notices to Mariners to inform maritime users of the presence of seabed power cables and mark them on navigation charts. These navigation charts will be available to the captains and skippers of vessels contracted by Gippsland Skies Pty Ltd for its offshore wind energy project.

In the Notice of Grant – Feasibility Licence FL-003 (Commonwealth of Australia, 2024) for the Gippsland Skies Offshore Wind Energy project, section 6 of the FL states the following:

"The licence holder must, in preparing a management plan for the licence, consult with Marinus Link Pty Ltd and, in the management plan for the licence, address the outcomes of this consultation, including how impacts on the Marinus Link project may be avoided or mitigated."

Overall, given the likely timeframes (e.g., late 2028 for ML1 and 2031 for ML2) and relatively short duration of Marinus Link construction activities within the Gippsland Skies FL area, cumulative impacts of the two projects can be avoided or minimised by developing and implementing EPR management plans from both proponents/owners and by clear consultation and communications between the two proponents/owners.

(c) May 2024 Update to NMFS' 2018 Revised Technical Guidance

Since EIS/EES publication in mid-May 2024, the NMFS Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS2018) has been updated to NMFS (2024).

Key changes include:

- Adoption of marine mammal hearing group terminology from Southall et al. (2019), where:
  - Existing low frequency (LF) hearing cetaceans remain the same.
  - Existing mid-frequency (MF) hearing cetaceans are reclassified as high frequency (HF) hearing cetaceans.

  - Some high frequency (HF) hearing cetaceans are reclassified as Very high frequency (VHF) hearing cetaceans.

- Update of marine mammal audiogram and TTS data made available since the publication of the NMFS Revised Technical Guidance (NMFS, 2018).
- Change of the term "auditory injury (AUF INJ)" to replace "Permanent Threshold Shift (PTS)":
  - Auditory injury (AUD INJ) is defined as damage to the inner ear that can result in destruction of tissue, such as the loss of cochlear neuron synapses or auditory neuropathy. Auditory injury (AUD INJ) may or may not result in a permanent threshold shift (PTS).
  - Permanent threshold shift (PTS) is defined as a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level.
- Update of marine mammal noise exposure criteria, examples include:
  - Lower TTS and AUD INJ thresholds (SEL_{24h} metric) for HF cetaceans, below 10 kHz, based on new data.
  - Significantly lower TTS and AUD INJ thresholds (SEL_{24h} metric) for OW pinnipeds based on new data.
  - It is noted that the NMFS (2018) HF cetacean $SEL_{cum(HF,\ 24h)}$ threshold of 173 dB re 1 $\mu Pa^2 \cdot s$ for PTS onset in HF cetaceans exposed constantly for 24 hours to non-impulsive noise has been replaced by the NMFS (2024) HF cetacean auditory injury (AUD INJ) $SEL_{cum(HF,\ 24h)}$ threshold of 201 dB re 1 $\mu Pa^2 \cdot s$ which, without recourse to numerical modelling, would most likely reduce the size of the NMFS (2018) PTS onset impact zone radius of 67 m to a much smaller radius than under the NMFS (2024) auditory injury (AUD INJ) zone.
- Addition of in-air criteria for pinnipeds.

In the NMFS (2024) update to the technical guidelines, NMFS states clearly that the 2024 update to the 2018 Revised Technical Guidance is distributed solely for the purpose of pre-dissemination peer review and it has not formally been disseminated the National Oceanic and Atmospheric Administration, which includes the National marine Fisheries Service (NMFS).

Given that NMFS (2024) was published after the Marinus Link EIS/EES publication and exhibition, I consider that the changes do not warrant a detailed analysis of potential implications for the Project. Indeed, there is expected to be critical reviews of the NMFS (2024) by peer reviewers and feedback from fellow marine ecologists; hence, further changes to the NMFS (2024) document are most likely to occur.

5.2 Concluding statements

I confirm that I have read Chapter 2 (Marine Ecology) and Chapter 3 (Marine Resource Use) in the EIS/EES corresponding to my area of expertise and consider that these chapter summaries are reasonable and consistent with my report (the Marine Ecology and Resource Use Assessment (Technical Appendix H, EIS/EES).

I adopt the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), in combination with this witness statement, as my written expert evidence for the purposes of the Panel's inquiry into the environmental effects of the Project.

6 Further work since preparation of the Marine Ecology and Resource Use Assessment

6.1 Supplementary Report

Since EES/EIS publication in May 2024, Marinus Link Proprietary Limited (MLPL) issued an update about the timing of Stage 2. The project update entitled "Marinus Link Information Update #1 (Timing of Stage 2)" was published on 20th May 2024 on the MLPL website (https://marinuslink.com.au/eis-ees-updates/).

MLPL is seeking approvals for both Stages, but timing for delivery of Stage 2 will be subject to market demand. MLPL is now considering the following likely timing scenario for individual stages 1 and 2:

- Stage 1 works would take place in the period 2025 – 2030, which represents a 5-year construction phase prior to commissioning of Stage 1 in 2030.
- Stage 2 construction period would take place between 2031 – 2033, which represents a 3-year construction phase with commissioning of Stage 2 in 2033.

The above scenario indicates that all Stage 1 works would be completed, and the Stage 1 circuit commissioned by 2030 as anticipated, followed by a potential gap in construction so that the Stage 2 circuit is laid and commissioned by 2033.

On 31 May 2024, I was requested by Coffey to review the Marinus Link Information Update #1– timing of Stage 2 (MLPL, 2024), and prepare a Supplementary Report which:

- Identifies whether a change to the timing for delivery of stages 1 and 2 in accordance with the Information Update would have any material implications for the assessment described in, or conclusions of, the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).
- Considers whether any additional mitigation measures or Environmental Performance Requirements (EPRs) would be recommended.
- Considers whether any changes to any of the proposed EPRs and any specific avoidance, management and mitigation measures recommended in the Marine Ecology and Resource Use Assessment would be required.

My Supplementary Report entitled, "Marinus Link supplementary impact assessment - revised timing of stage 2, Letter Report prepared by EnviroGulf Consulting" and dated 26th June 2024, is attached as **Annexure C**. The findings of Supplementary Report are summarised below.

(a) Findings

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H of the EES/EIS) already considered that there would be a gap in time between commissioning of the stage 1 western monopole (i.e., ML1) and the start of construction for the stage 2 eastern monopole (i.e., ML2) across Bass Strait. If there is potentially a longer gap between the stages, due to the changed timing of Stage 2, this does not affect or change the impact assessments, conclusions or recommendations presented in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H of the EES/EIS).

Overall, since the construction of the marine components of Stages 1 and 2 are physically separate in space and do not coincide in time (i.e., 2 to 3-years or longer apart), no cumulative impacts are predicted. Furthermore, no changes to the thirteen proposed EPRs and their mitigation and management measures presented in the published **Marine Ecology and Resource Use Assessment** (Technical Appendix H of the EES/EIS) are envisaged due to the changed timing of Stage 2.

6.2 Other further work

No further work is proposed in relation to the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

7 Marine Ecology and Resource Use Impact Assessment

This section summarises the findings of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), impacts, EPRs and residual impacts arising during Project construction, operation, and decommissioning. Emphasis has been placed on Victorian nearshore waters and adjoining Commonwealth waters as the Independent Advisory Committee's remit is related mainly to potential impacts of the Project in Victoria.

7.1 Construction phase impact assessment summary

A summary of construction phase residual impacts is given in Table 7-1.

Table 7-1: Summary of construction residual impacts on marine ecology and resource use

Impact assessment descriptor	Sensitivity of value / Likelihood	Magnitude of impact / Consequence	Residual impact / risk significance
HDD marine exit hole breakthrough impacts:			
Nearshore seabed habitats (Vic)	Low	Negligible	Very low
Nearshore water quality (Vic)	Moderate	Negligible	Low
Nearshore benthic communities (Vic)	High	Negligible	Low
Cable installation and burial impacts:			
Nearshore seabed habitats (Vic)	Very low	Negligible	Very low
Nearshore water quality (Vic)	High	Negligible	Low
Nearshore benthic invertebrates and fishes (Vic)	Very low	Negligible	Very low
Nearshore endangered Tasman grass-wrack (Vic)	High	Negligible	Low
Impacts of cable installation on hard seabed and third-party crossings:			
Soft-sediment seabed habitat degradation (Vic)	Very low	Negligible	Very low
Third-party crossing water quality impacts (Vic)	Moderate	Negligible	Low
Third-party crossing benthic communities (Vic)	Low	Minor	Very low
Offshore construction disturbance of seabed impacts:			
Offshore seabed habitat impacts	Low	Negligible	Very low
Offshore bottom water quality impacts	High	Negligible	Low
Offshore seabed fauna and infauna	Low	Negligible	Very low
Offshore seabed benthic with sponge corals patches	Moderate	Negligible	Low
Impacts of cable installation on hard seabed and third-party crossings:			
Soft-sediment seabed habitats (Bass Strait)	Low	Negligible	Very low
Third-party crossing water quality impacts	High	Negligible	Low
Soft-sediment seabed benthic fauna (Bass Strait)	Low	Negligible	Very low
****Underwater noise impacts to marine fauna:***			
LF cetacean disturbance and TTS onset impacts	Low	Moderate	Low
LF cetacean behavioural disturbance impacts	Low	Low to Moderate	Low
LF cetacean communication masking impacts	Low	Low	Low

Impact assessment descriptor	Sensitivity of value / Likelihood	Magnitude of impact / Consequence	Residual impact / risk significance
MF cetacean disturbance and TTS onset impacts	Low	Moderate	Low
MF cetacean behavioural disturbance impacts	Low	Low	Low
MF cetacean communication masking impacts	Low	Low	Low
HF cetacean disturbance and PTS onset impacts	Low	High	Moderate
HF cetacean disturbance and TTS onset impacts	Low	Moderate	Low
HF cetacean behavioural disturbance impacts	Low	Low	Low
HF cetacean communication masking impacts	Low	Low	Low
Phocid disturbance and TTS onset impacts	Low	Moderate	Low
Phocid behavioural disturbance impacts	Low	Moderate	Low
Auditory masking impacts to phocids	Low	Low	Low
Otariid acoustic disturbance and TTS onset impacts	Low	Moderate	Low
Otariid acoustic behavioural impacts	Low	Low	Low
Otariid acoustic masking impacts	Low	Low	Low
Sea turtle acoustic behaviour impacts	Low	Low	Low
Sea turtle acoustic auditory masking impacts	Low	Low	Low
Little Penguins acoustic behaviour impacts	Low	Low	Low
Little Penguins acoustic masking impacts	Low	Low	Low
Fish acoustic disturbance and TTS onset impacts	Low	Moderate	Low
Group 3 pelagic fish behaviour impacts	Moderate	Low	Low
Group 3 benthic fish behaviour impacts	Moderate	Negligible	Low
Nearshore fish acoustic auditory masking impacts	Low	Moderate	Low
Cephalopods acoustic behaviour impacts	Very low	Negligible	Very low
Nighttime artificial lighting impacts to fauna:			
Nighttime light-sensitive albatrosses	High	Negligible	Low
Nighttime light-sensitive petrels	Low	Negligible	Very low
Nighttime light-sensitive shorebirds	High	Negligible	Low
Nighttime light-sensitive marine birds	High	Negligible	Low
Near-surface pelagic fish behaviour	Moderate	Negligible	Low
Near-surface zooplankton and micronekton migration	High	Negligible	Low
Construction impacts on marine resource uses:			
Navigation and marine traffic exclusion zone impacts	Low	Negligible	Very low
Temporary exclusion zones and fisheries impacts	Low	Negligible	Very low
Commercial fishery resource direct impacts	High	Negligible	Low
Commercial fishery – indirect impacts on fish diet	High	Negligible	Low
Recreational fishing temporary exclusion zones	Moderate	Negligible	Low
Recreational fishing boat transit impacts	Moderate	Negligible	Low
Nearshore recreational fishing targeted fish (Vic)	High	Negligible	Low
Risks of introducing or spreading Invasive Marine Species (IMS):			
IMS in ballast water discharges	Unlikely	Negligible	Very Low
IMS colonisation of project nearshore hard seabed	Possible	Minor	Low
IMS colonisation of project offshore hard seabed	Unlikely	Negligible	Very Low
European shore crab spread in nearshore Victoria	Possible	Minor	Low
Risks of project vessel strikes to megafauna:			

Impact assessment descriptor	Sensitivity of value / Likelihood	Magnitude of impact / Consequence	Residual impact / risk significance
Cable lay ship or OSV strike risks to large cetaceans	Rare	Negligible	Very low
Fast-moving vessel strike risks to large cetaceans	Unlikely	Minor	Low
Cable lay ship or OSV strike risks to sea turtles	Rare	Negligible	Very low
Fast-moving transit vessel strike risks to sea turtles	Unlikely	Minor	Low

Source: Marine Ecology and Resource Use Assessment (Technical Appendix H, EIS/EES). Cetacean hearing groups: LF = Low frequency; MF = Mid-frequency; HF = High frequency.

Key construction phase issues

The key marine ecology and resource use issues arising during the Project's construction phase relate to:

- Physical impacts of seabed disturbance on:
  - marine water quality.
  - marine sediment quality.
- Biophysical impacts of seabed disturbance on:
  - marine benthic communities.
- Underwater noise impacts on marine fauna:
  - cetaceans (whales and dolphins).
  - pinnipeds (seals and sea lions).
  - sea turtles.
  - diving birds and Little Penguins.
  - marine pelagic invertebrates (squid)

Construction impacts on other users of the marine environment and marine resources have also been considered. While not included in the above selected list of key issues, they are addressed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

This section assesses the following construction related impacts on marine ecology and marine resource use:

- Seabed clearance of cable routes.
- Shore crossing impacts by horizontal directional drilling (HDD).
- Victorian nearshore construction impacts
- Offshore construction impacts

(a) Seabed clearance of cable routes

Clearance of the seabed along the proposed cable alignments will be undertaken by pre lay grapnels runs (PLGRs) in which grapnels are towed along the seabed to snare seabed debris such as ropes, wires, and discarded fishing gear.

A literature review revealed that PLGR impact assessments were commonly not undertaken due to their limited spatial and temporal extent. For these reasons, the seabed disturbance impacts of the PLGRs with a maximum combined grapnel trench path and seabed disturbance width of 0.5 m within predominantly sandy seabed (98% of the Project's alignments across Bass Strait) were not separately assessed as subsequent disturbance by cable installation and burial by wet jetting one or two days later would override any PLGR impacts. Greater emphasis has been placed on assessing the overriding seabed impacts of cable installation and burial by wet jetting using a trencher operating in burial mode.

The principal sources of seabed disturbance arise from shore crossings, cable installation and burial, and cable removal (if this decommissioning option is selected) and the consequential impacts of these activities on the marine environment are summarised below.

(b) Shore crossing impact summary

Shore crossings of the project's individual HVDC and optical fibre cables will be undertaken using horizontal directional drilling (HDD).

- Shore crossings of the project's individual HVDC and optical fibre cables will be undertaken using long trajectory HDD) with their marine exit holes located within nearshore Victoria at about 10 m water depth.
- Unlike shore crossings using trenching for cable installation, HDD is a trenchless shore crossing method (i.e., undergrounding) and, as such, HDD avoids potential impacts on shore and intertidal zone marine habitats and biological communities.
- Prior to HDD exit hole breakthrough and within about 5 m of the remaining hole to be drilled, drilling fluid in the HDD borehole will be pumped out, as far as is possible, to remove all excess drilling fluid. However, residual drilling fluid that cannot be pumped out will remain in the HDD borehole and will escape to the external environment at the HDD pilot hole breakthroughs with a release volume of 2.35 m^3 at each pilot hole.
- There is no accumulative impact of drilling solids or sand release, as the HDD pilot boreholes are drilled separately (50 m apart) and sequentially.

Management measures to reduce potential HDD impacts on the nearshore environment are outlined in **EPR MERU01** (Monitor HDD activities for the shore crossing to avoid or minimise impacts to the marine environment), which is presented in Technical Appendix H of the EIS/EES and includes the development of procedures prior to construction to minimise impacts on the nearshore environment such as:

- Monitoring HDD activities and drilling fluid pressures to minimise release of drilling fluid to the marine environment.
- Extracting cuttings and drilling fluids from the HDD pilot boreholes for the shore crossing prior to breaking through to the sea floor

No additional mitigation measures are proposed in addition to **EPR MERU01** because the HDD activities can be managed by the HDD contractor with oversight by MLPL.

Residual impacts of HDD on nearshore water quality and benthic habitats summarised below.

Water quality impacts

- Changes in water quality at HDD exit hole breakthrough will arise from the very-short term release of residual drilling fluids, which contain fine-grained (<0.63 μm particle size class) cuttings and bentonite clay. This will cause a localised increase in suspended sediment concentrations (SSCs) and associated turbidities.
- Given the small volume (less than 2.35 m^3) of residual drilling fluid released at each marine exit hole breakthrough and high dilution afforded by tidal flows and/or longshore currents, the initial SSCs and associated turbidity plumes are predicted to reduce background levels within several kilometres down current as has been observed for turbidity plumes from dredging operations (Kim et al, 2018; PMSS, 2018).
- Standard HDD operational controls and management measures outlined in **EPR MERU01** for shore crossings are considered adequate for avoiding or minimising impacts on nearshore water quality in Victoria (Waratah Bay).

The residual impact significance ratings for impacts of long trajectory HDD marine exit holes on Victorian nearshore water quality are assessed as ***Low***, which is a reasonable assessment for the once-off and very short-term increase in SSCs and associated turbidity plumes at each HDD pilot hole breakthrough, as well as the high dilution available by tidal flows and/or longshore currents.

Impacts on benthic habitats

- Each HDD marine exit hole has a diameter of 300 mm, which will disturb an extremely small area (0.07 m^2) of subtidal seabed habitat. However, the total disturbance area at each HDD exit hole the area will be typically less than 3 m^2 for an HDD pilot hole breakthrough, which assumes that the drill cuttings and coarser sediment fractions within the release volume of 2.35 m^3 will settle out rapidly following HDD breakthrough.
- Given the very small areal extent of nearshore seabed habitat loss or degradation by drill cutting deposition and the absence of significant impacts to water quality due to the very short-term discharge of residual drilling fluid at HDD bore breakthrough, the residual impact significance rating for HDD breakthrough impacts on nearshore flora and fauna and their benthic habitats in nearshore Victoria has been assessed to be ***Low***.

(c) Seabed cable installation and burial disturbance impact summary

Given the extremely low impact and temporary disturbance of the seabed of Project cables laid directly on the seabed of both the nearshore and offshore environment and the very short duration (a day or two) prior to post lay cable installation and burial, potential impacts of cables directly laid on seabed habitats and associated benthic biological communities were not assessed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES). However, cable lay operations and associated vessel underwater noise impacts to marine fauna were assessed and are summarised later.

Seabed disturbance from post-lay cable installation and burial (i.e., the key seabed disturbance impact source) has been assessed and summarised below.

Impacts on seabed habitats

Impacts on the dominant sandy seabed habitats in nearshore Victoria (Waratah Bay) have been used to illustrate impacts of cable installation and burial.

The widths of seabed disturbance are based on a proposed Helix T-1200 trencher operating in wet trenching (burial) mode (Helix, 2022). The width of seabed disturbance from the wet jetting and cable burial operation has been assumed to be 1.67 m for the trenched area and a total 1.2 m for both caterpillar tracks (width of 0.6 m each), which gives a total disturbance width of 2.87 m.

- The lengths of the cable alignments where cable installation and burial will take place for both ML1 and ML2 commence at the HDD marine exit holes at 10 m water depth (KP 0.8) to the 3-NM Victorian state limit is approximately 7,400 m.
- The combined wet jetted trench surface disturbance area (12,360 m^2) and track compaction (8,880 m^2) gives a total seabed habitat disturbance area, for each of the ML1 and ML2 subsea cables, of 21,240 m^2 (about 2.1 ha). This represents an extremely small seabed habitat impact zone (0.02%) when compared to the very large area (about 88 km^2) of undisturbed nearshore seabed habitat of Waratah Bay between the 10 m isobath (i.e., HDD marine exit holes) and 27 m isobath (i.e., at the 3 NM limit) that extends laterally about 4 km to the west and 8 km to the east.

Based on the small area (0.02%) of disturbed seabed habitats compared to the very large area of available undisturbed seabed habitats, the predicted impacts of nearshore cable installation and burial on the seabed habitats within Waratah Bay are assessed to have a residual impact significance rating of ***Very low***. This is based on a nearshore sandy seabed habitat sensitivity of *Very low*, due to frequent natural exposure to sediment transport and mobilisation, and an impact magnitude of impact of *Negligible*, given the short-term impact of cable burial (about two days duration for wet jetting). Any depressions along the cable burial paths will be filled rapidly (within a few tidal cycles or days) as the natural movements of the seabed surface sediments restore the nearshore seabed to a natural pre-disturbance state.

Management measures to avoid and/or reduce impacts on benthic habitats are outlined in **EPR MERU02** (Placement of final subsea project alignment to avoid or minimise impacts on benthic habitats), which proposes that the subsea project alignments, should be located, to the extent reasonably practicable:

- Within the sandy seabed of Waratah Bay in nearshore Victoria

- Away from nearshore areas of higher biological productivity (e.g., low- and high-profile reefs).
- To avoid obstacles such as rocks and relocated to areas of soft-sediment seabed.
- The final subsea project alignment must be informed by geophysical surveys and geotechnical investigations, and seabed sampling.

In addition, management measures outlined in **EPR MERU03** (Undertake a pre-lay survey prior to subsea cable installation to minimise seabed disturbance) include pre-lay surveys to inform the final subsea project alignment so that it is clear of obstacles to the extent reasonably practicable, including low-profile reefs.

Water quality impacts

Water quality impacts were assessed at three locations: nearshore Victoria, offshore Bass Strait, and nearshore Tasmania. The principal source of cable installation and burial impacts on water quality arises from wet jetting of soft-sediment seabed (i.e., 98% of the seabed of the Project alignments across Bass Strait) using a cable trencher machine operating in burial mode. Water quality impact assessment relevant to nearshore Victoria is summarised below.

- Impacts to water quality relate primarily to the development of wet-jetting turbidity plumes with increased suspended sediment concentrations (SSC), which will depend on the duration of wet jetting and the amount of very fine- grained sediments such as silts and clays (< 63 particle size fraction) that will be resuspended along the wet jetting track at point sources of active wet jetting.
- The proposed Helix T-1200 jet trencher can undertake wet jetting through sands at a rate of 400 m/h (Helix, 2022) and this progress rate has been adopted in the present report.
- As the jet trencher progresses along the seabed, water pumped via the water jet nozzles of the twin swords fluidises the sediments and the excess water rises and exits above the cable burial trench path. This excess water carries any disturbed fine-grained suspended sediment particles in the silt (4 to 63 μm particle diameter) and clay (2 to 4 μm particle diameter) size range into the overlying water column, causing short term increases in SSC and associated turbidity at the point of the active wet jetting operation.
- The wet jetting-generated turbidity plumes will travel in the direction of tidal and/or alongshore currents, with SSC reducing by settling of medium- to fine-grained sediment particles (deposition) with distance as well as by dilution as the plumes disperse down current. Background SSC (typically less than 2 mg/L) and turbidity (<5 NTU) are likely to be achieved within several kilometres down-current based conservatively on dredging sediment dispersal (Kim et al., 2018; PMSS, 2018).
- Nearshore Victorian water quality impact summary:
  - Predicted impacts of nearshore cable installation and burial on marine water quality are also assessed to have a residual impact significance rating of ***Low***, given limited fine sediment (<63 μm) content of around 1 to 2%, the small area seabed disturbed per cable laid (e.g., 12,360 m^2 for a ML1 HVDC cable), and the short durations of the nearshore wet jetting operation for each individually laid HVDC or optic fibre cable (e.g., 18.5 hours) for the wet jetting progress rate of 400 m/h.
- Offshore Bass Strait water quality impact summary:
  - The project's offshore alignment of the ML1 or ML2 bundled cables is approximately 248 km long between the Tasmanian and Victorian nearshore seaward limits of the 20 m isobath, which represents about 97% of the total length of the Project's Bass Strait crossing.
  - Offshore seabed sediment grain size varies in relation to current velocity, with fine materials (silt and clay) in the central basin of Bass Strait and coarser sands around the coastal margins, where wave and current action is stronger (AMOG, 2000; Li et al., 2011a, b and c).

  - A the 112-km-long offshore Zone 3 (SILT/CLAY) has been selected as a worst-case scenario, owing to the high content (range 81.7% to 87.2 %) of silts and clays (<63 µm particle size fraction) based on sediment sample analyses (Fugro, 2020). Based on the seabed surface wet jetting trench width of 1.67 m and the 112-km-long seabed segment of offshore Zone 3, the total area of soft sediment seabed disturbed by wet jetting is 187,000 m^2.
  - A study by Corell et al. (2023) investigated the fate of fine-grained seabed sediments resuspended from a trawling track in offshore waters of the Baltic Sea. The Baltic Sea seabed sediments trawled contained 46% fine silt/clay (i.e., <63-micron fraction) compared to the range of 81.7 to 87.2%) for offshore Bass Strait. In the Corell et al (2023) study, down-current dilutions of the initial turbidity plume (SSC of 1,000 mg/L) were 25 mg/L at 500 m (i.e., 40-fold dilution), 15 mg/L at 750 m (i.e., 66-fold dilution), 10 mg/L at 1,000 m (i.e., 100-fold dilution), and 5 mg/L at 1,500 m distance (i.e., 200-fold dilution). A similar pattern of increasing dilution downcurrent of the Project's offshore cable installation and burial is anticipated.
  - The predicted impacts on bottom water quality arising from Project wet jetting operations within the silt and clay seabed of offshore Zone 3 is assessed as have a residual impact significance rating of ***Low***, given the small areas and volumes of bottom water directly impacted by wet jetting turbidity plumes.

- Empirical evidence of negligible or low impacts from wet jetting method for cable installation and burial include:
  - A literature search on the impacts of cable burial by wet jetting on water quality indicated that this technique is less impactful as disturbances of the seabed sediments are kept at a minimum (EuropeCable, 2012).
  - OSPAR (2012) considers that cable burial by wet jetting by means of sledge or ROV jet trencher involves the *'lowest environmental impacts'* on water quality.
  - Vise et al. (2008) notes that in those cases where cable burial is undertaken by wet jetting, if the jetting system only fluidises the seabed sediments to allow the cable to sink through it (as proposed in the present Project's case), they concluded that *'the impact will be negligible, since there will be no significant sediment displacement.'*

Contaminants and sediment quality impacts

Given the absence of industrial discharges or municipal discharges in South Gippsland adjacent to Waratah Bay and adjacent offshore waters, seabed sediments along the Project's proposed alignments in nearshore Victoria and Bass Strait are anticipated to be of good quality with metals concentrations being typical of uncontaminated seabeds and below sediment quality guidelines and, as such, a program of sampling bed sediments in nearshore Victoria and Bass Strait was considered unnecessary.

(d) Construction phase underwater noise assessment

This section summarises the impacts of Project-generated underwater noise on marine fauna. Underwater sound terminology, modeling and background noise levels are summarised below.

Sound propagation and transmission loss modelling

Underwater sound pressure levels (SPL) are reported in units of dB re 1 µPa. The source sound pressure level is referenced back to a representative distance of 1 m from an assumed point source and expressed in units of dB re 1 µPa at 1 m (at source) or received sound in units of dB re 1 μPa_{rms} (i.e., as received by an underwater microphone or marine animal at distance from the source). Underwater sound exposure levels (SEL) are reported in units of dB re 1 μPa^2•s.

Two methods were used to calculate distances (metres or kilometres) to nominal isopleths representing acoustic threshold criteria for selected hearing groups of marine fauna.

Geometric spreading laws

Where a noise source is detectable to marine fauna and has a sound pressure level that exceeds the behavioural disturbance criteria for selected species, a simple but conservative propagation loss model is typically used to estimate the range of potential behavioural disturbance from the noise source.

Propagation of root-mean-square (rms) sound pressure and range estimation is based on geometric spreading loss equations:

- Spherical spreading loss equation (20 $Log_{10}R$), where R is the radius in metres for use in the dep eater of Bass Strait. Spherical spreading results in a general 6 dB decrease in the intensity of noise per doubling of distance.
- Practical spreading loss equation (15 $Log_{10}R$), where R is radius in metres for use in shallow marine waters less than 50 m deep (e.g., the Tasmanian and Victorian nearshore zones). Practical spreading results in a general 4.5 dB decrease in the intensity of noise per doubling of distance.
- Cylindrical spreading loss equation (10 $Log_{10}R$), where R is radius in metres for use in very shallow marine waters less than 15 m deep (e.g., the Tasmanian and Victorian nearshore zones). Practical spreading results in a general 3 dB decrease in the intensity of noise per doubling of distance.

Note that the transition from 20 $Log_{10}R$ to 15 $Log_{10}R$ to 10 $Log_{10}R$ is a continuous one, in that the surface of an expanding sound field (ray) does not instantly become a cylinder once the ray encounters a boundary.

In the case of Bass Strait with an average depth of 50 m, the practical spreading loss equation is most suitable for range estimation and was adopted in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

Numerical modelling

MDA (2023) undertook numerical modelling of underwater noise propagation using dBSea software based on 3D modelling inputs. The modelling included a parabolic equation solver for below 2 kHz and a ray trace solver for above 2 kHz. A more detailed description of the underwater noise modelling inputs is given in **Attachment D** of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

Background noise levels

Background underwater noise levels in Bass Strait nearshore and offshore waters were estimated based on a literature review of underwater noise levels in Australia waters. The adopted estimated background noise levels are summarised below:

- The average background noise level in nearshore Waratah Bay is expected to be 105 dB re 1 μPa_{rms}, and range between 90 dB and 145 dB re 1 μPa_{rms}. It is expected to be in the higher end of the range during summer months, when there is greater watercraft activity within the bay.
- The average background noise level in central Bass Strait is expected to be 95 dB re 1 μPa_{rms}, with a range between 90 dB and 110 dB re 1 μPa_{rms}.

Attachment D (Supplementary information – Underwater noise assessment) in **Technical Appendix H – Marine Ecology and Resource Use Assessment** of the EIS/EES provides the basis for estimating background noise in Bass Strait., given a paucity of existing underwater noise levels in the strait.

Project noise sources

For Project construction, non-impulsive noise acoustic criteria for selected marine fauna are only used, as there are no significant impulsive noise sources (e.g., underwater blasting, seismic survey air guns, or impact pile driving) associated with the project. All project noise sources relating to project construction generate continuous or intermittent non-impulsive noise broadband noise (e.g., vessels, rock mattress placement, and cable installation and burial by use of a jet trencher used in burial mode).

Underwater noise impacts have been assessed for modelling locations in nearshore Tasmania, offshore Bass Strait (mid-point), and nearshore Victoria in Waratah Bay. The following underwater noise source levels of project vessels or cable installation activities have been adopted in this report presented in **Attachment D** (Supplementary information – Underwater noise assessment) in **Technical Appendix H – Marine Ecology and Resource Use Assessment** (EIS/EES):

- Large cable lay ship (e.g., CS Giulio Verne as a surrogate):
  - Source level of **185 dB re 1 μPa$_{rms}$ at 1 m**.
- Cable installation and burial using a seabed jet trencher in burial mode (e.g., HELIX T-1200 jet trencher):
  - Source level of **150 dB re 1 μPa$_{rms}$ at 1 m** for the seabed trencher in burial mode.
  - Source level of **180 dB re 1 μPa$_{rms}$ at 1** m for the jet trencher's host vessel at 0.5 knots.
- Nearshore floated cable pulling to shore using a spread of small boats:
  - Source level of **145 dB re 1 μPa$_{rms}$ at 1 m** for boats idling.
  - Source level of **165 dB re 1 μPa$_{rms}$ at 1 m** for boats manoeuvring floated cables.

Impacts of underwater noise on marine fauna

This section summarises the residual impacts of underwater noise to marine fauna. A summary of underwater noise impacts on marine fauna is presented in Table 7-1 above.

The marine fauna species or hearing groups of interest for assessing acoustic impacts of Project construction include:

- Cetaceans according to the following hearing groups:
  - Low-frequency (LF) hearing cetaceans.
  - Mid-frequency (MF) hearing cetaceans.
  - High-frequency (HF) hearing cetaceans.
- Pinnipeds:
  - Phocid pinnipeds (PW) – earless or true seals.
  - Otariid pinnipeds (OW) – eared seals.
- Sea turtles.
- Marine fishes:
  - Osteichthyes (bony fishes).
  - Chondrichthyes (cartilaginous fishes
- Marine invertebrates:
  - Pelagic macroinvertebrates.
  - Benthic macroinvertebrates.

Underwater noise impact Assessment Approach

The underwater noise impact assessment approach was based on the standard Significance Assessment Method described in Section 5.3 of Chapter 5 (Volume 1 of the EIS/EES). However, this standard approach was not considered appropriate for assessing underwater noise impacts as the sensitivities of marine fauna need to relate specifically to underwater noise. Different sensitivity criteria and magnitude of impact criteria were used to assess the residual impact significance ratings of underwater noise to sound-sensitive marine fauna (see Section 7.2.3.4 in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

The impact assessment approach uses a modified significance assessment method and/or acoustic threshold criteria for injury to tissues or organs of marine fauna (including permanent or temporary hearing loss) and behavioural disturbance thresholds that have been published in the peer-reviewed scientific literature.

Based on the interaction of sensitivity to noise criteria and magnitude due of impact criteria, the resultant residual impact significance ratings (***Very low***, ***Low***, ***Moderate***, ***High*** or ***Major***) were used to assess underwater noise impacts after potential avoidance, mitigation and management measures were assumed to have been implemented and which have informed the following Environmental Performance Requirements (EPRs):

- **EPR MERU07** – Develop and implement a marine fauna management plan.
- **EPR MERU08** – Develop and implement a cetacean interaction management plan (which is a subplan of the marine fauna management plan).

The criteria used in the modified significance assessment method are also consistent with the significant impact criteria for the environment within a Commonwealth marine area, which are outlined in the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE, 2013). In relation to underwater noise on marine fauna, DoE (2013) state that "*an action is likely to have a significant impact on the environment in a Commonwealth marine area if there is a real chance or possibility that the action will:*

- *Modify, destroy, fragment, isolate or disturb an important or substantial area of habitat such that an adverse impact on marine ecosystem functioning or integrity in a Commonwealth marine area results.*
- *Have a substantial adverse effect on a population of a marine species or cetacean including its life cycle (for example, breeding, feeding, migration behaviour, life expectancy) and spatial distribution.* "

Note that only Project assessed residual impact significance ratings of ***High*** to ***Major*** in the adopted significance assessment method) would equate to a significant impact under the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE 2013), which also includes any MNES of the environment within a Commonwealth marine area. Whereas Project assessed residual impact significance ratings of ***Very low*** to ***Moderate*** indicate the absence of adverse environmental impacts under the (DoE, 2103) Significant Impact Guidelines.

Residual impacts of Project construction underwater noise to the above marine fauna and/or functional hearing groups are summarised below using the worst-case scenario, which is the cable lay vessel maintaining station for 10 days in nearshore waters of Waratah Bay (Victoria). Waratah Bay was selected over the Tasmanian nearshore modelling location, as the former has lower average background noise level of 105 dB re 1 μPa_{rms} (range 90 to 145 dB re 1 μPa_{rms}.)

Underwater noise impacts on cetaceans

This section provides acoustic damage, disturbance and behavioural acoustic threshold criteria for cetaceans, which were adopted in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES). A summary of underwater noise impacts on cetaceans is given on Table 7-1 above.

Acoustic damage sound exposure level (SEL) threshold criteria

SEL threshold level criteria for permanent hearing loss (PTS onset exceeded) and temporary hearing loss (TTS onset exceeded) to cetacean hearing groups are summarised below:

- PTS onset threshold criteria:
  - LF cetacean – 199 dB re 1 $\mu Pa^2{\cdot}s$
  - MF cetacean – 198 dB re 1 $\mu Pa^2{\cdot}s$
  - HF cetacean – 173 dB re 1 $\mu Pa^2{\cdot}s$
- TTS threshold criteria:
  - LF cetacean – 179 dB re 1 $\mu Pa^2{\cdot}s$
  - MF cetacean – 178 dB re 1 $\mu Pa^2{\cdot}s$
  - HF cetacean – 153 dB re 1 $\mu Pa^2{\cdot}s$

The above acoustic threshold criteria apply to non-impulsive noise, which is the dominant form of underwater noise generated by the Project during the construction phase. The source of the acoustic threshold criteria is the peer reviewed paper by NMFS (2018). Distances to cumulative SEL_{cum} acoustic thresholds were calculated and presented in **Attachment G** of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

Acoustic sound pressure level (SPL) behavioural threshold criteria

The following SPL threshold levels for behavioural disturbances are based on humpback whales (the most studied baleen whale) and have been adopted for all cetaceans in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES):

- Lower range acoustic behavioural threshold of 130 dB re 1 µPa rms for nearshore waters:
  - Threshold level above which more subtle behavioural responses such as increased presence at the surface, less frequent diving, changes in breathing rate or swimming

speed, and short- term avoidance which may be countered by habituation and desensitisation to continuous non-impulsive broadband noise.

- Lower range acoustic behavioural threshold of **130 dB re 1 μPa$_{rms}$** for nearshore waters:
  - Threshold level above which more subtle behavioural responses such as increased presence at the surface, less frequent diving, changes in breathing rate or swimming speed, and short- term avoidance which may be countered by habituation and desensitisation to continuous non-impulsive broadband noise.
- Upper range acoustic behavioural threshold of **160 dB re 1 μPa$_{rms}$** for both nearshore and offshore waters:
  - Threshold above which disruptive behavioural responses may be expected such as sudden dives, abrupt movements, changes in swimming speeds, decreased foraging, and avoidance of the sound field by increasing distance from the continuous non-impulsive broadband noise source (ether by moving away or deviating around the noise field).

Underwater noise impacts on LF cetaceans

Low-frequency (LF) cetaceans include baleen whales such as the humpback, southern right, blue whale, sei, fin, and minke whales. LF cetaceans have a hearing range between 7 Hz and 35 kHz. Non-impulsive noise threshold criteria are available for hearing damage in cetaceans and for behavioural disturbance of LF cetaceans. Acoustic damage to and disturbance of LF cetaceans were assessed for the worst-case scenario, which is for the cable lay ship will maintain location by dynamic positioning for around 10 days duration in nearshore Victoria (Waratah Bay, where the average background noise level is 105 dB re 1 μPa$_{rms}$ (range 90 dB and 145 dB re 1 μPa$_{rms}$).

Note that the assumption of a LF cetacean remaining stationary for 24-hours (as required for application of the NMFS (2018) threshold criteria) is not realistic; therefore, MDA (2023) adopted a 1-hour cumulative SEL exposure period rather than a 24-hour cumulative exposure period.

Permanent Threshold Shift (PTS) onset is indicative of irreversible hearing damage and Temporary Threshold Shift (TTS) onset is indicative of temporary hearing loss that is recoverable.

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to LF cetaceans are summarised below:

- Acoustic damage impacts:
  - Acoustic damage impacts are assessed as barotrauma (tissue damage) and/or permanent hearing loss (as measured by PTS onset being exceeded).
  - Distance to the NMFS (2018) $SEL_{cum(LF)}$ threshold of 199 dB re 1 μPa^2·s for PTS onset is predicted to be within one or two metres of the cable ship noise source, where LF cetaceans are most unlikely to approach or be found at such close distances to the cable lay ship's thrusters. Consequently, acoustic damage impacts to LF cetaceans are not predicted.
- Temporary hearing loss (as measured by TTS onset being exceeded):
  - The distance to the NMFS (2018) $SEL_{cum(LF)}$ threshold of 179 dB re 1 μPa^2·s for TTS onset is 114 m. This represents a small acoustic disturbance zone within which LF cetaceans may suffer from temporary hearing loss if they remain within the zone for a protracted period, which is an unlikely scenario.
  - It is more than likely that an approaching LF cetacean will detect the underwater noise gradient at distance from the noise source of the cable ship and avoid (turn away) or pass around the sound field if migrating or moving along the coastline.
  - The predicted acoustic disturbance and temporary hearing loss impacts to LF cetaceans are assessed to have a residual impact significance rating of ***Low***.
- Acoustic behavioural disturbance impacts on LF cetaceans:
  - The distance to the upper behavioural SPL acoustic threshold criterion 160 dB re 1 μPa$_{rms}$ (above which disruptive behavioral responses and avoidance in LF cetaceans may occur) is 46.4 m. This represents a small behavioural impact zone and LF cetaceans are assessed to be unlikely to enter this zone, which is in very close proximity to the cable lay ship holding station in DP mode. Given decreasing noise with distance from the Project's cable lay ship, LF cetaceans should be able to sense this

gradient and may initiate a range of responses, such as moving towards or away from the ship, or not reacting at all (Richardson et al., 1995).

  - The distance to the lower behavioural SPL acoustic threshold criterion 130 dB re 1 μPa_{rms} (above which more subtle behavioural responses in LF cetaceans may occur) is 4.6 km. This distance is a conservative estimate of distance as the practical spreading loss equation (i.e., 15 $Log_{10}R$, where 'R' is the distance in metres) is a simple formula that does not take account of noise source characteristics, noise frequency, bathymetry, water depth, bottom sediment composition and other factors that can influence sound transmission loss. Furthermore, due to the worst-case assumptions combined with the adopted worst-case noise source level (185 dB re 1 μPa at 1 m for the cable ship in DP mode), it is likely that the 4.6 km radius is overly pessimistic. Overall, acoustic disturbance causing subtle behavioural reactions in LF cetaceans has been assessed to have a residual impact significance rating of ***Low***.
- Acoustic masking impacts to LF cetaceans
  - There are no threshold or acoustic criteria for assessing masking impacts on LF cetaceans; therefore ,a qualitative assessment was undertaken including a literature review.
  - The hearing ranges of humpback whales (10 Hz to 24 kHz) and southern right whales (30 Hz to 2.2 kHz) overlap that of the cable lay ship (20 Hz to 2 kHz). Therefore, there is a potential for project-generated underwater noise to cause auditory masking of biologically relevant sounds to LF cetaceans.
  - In the case of a LF cetacean (e.g., a baleen whale) near the cable lay ship's noise source, the noise fielder will be high, and the whale will be able to hear calls from only nearby whales, whereas a whale located further away from a project noise source where the noise level will be lower, the whale will be able to hear calls from more distant whales. Communications between baleen whale mother and calf pairs are least likely to be affected by acoustic auditory masking, given their natural protective proximity to each other.
  - Some LF cetaceans such as humpback whales and southern right whales have strategies that can counter auditory masking effects in areas of increased vessel noise by increasing the amplitude of their calls. One strategy to compensate for increased background noise involves increasing the source level or amplitude and/or frequencies of the acoustic signal found in some cetaceans. These strategies serve to reduce any auditory masking effects.

Minor deviations of whales around Project vessels or construction activities need not be regarded as deleterious to LF frequency cetaceans, since exposed or affected individuals (e.g., humpback or southern right whales) would most likely continue along their intended migration route or along coastal connecting habitat. Watkins (1986) emphasised that the most vigorous whale responses came from noise sources that changed suddenly, rapidly increased (such as an approaching ship) or were unexpected. Richardson et al. (1995) also noted that '*stationary industrial activities producing continuous noise result in less dramatic reactions by cetaceans than do moving sound sources, particularly ships'*, which will be the case for the cable lay ship when maintain station in DP mode, or cable laying at very low speeds (i.e., effectively a stationary noise source as sensed by LF cetaceans).

Overall, the predicted impacts on LF cetacean behaviour and acoustic auditory masking of biologically relevant sounds and calls are assessed to have a residual impact significance rating of ***Low***. Given decreasing underwater noise with distance from the Project's cable lay ship, LF cetaceans should be able to sense this gradient and may initiate a range of responses, such as moving towards or away from the ship or other construction activities, or not reacting at all (Richardson et al., 1995).

Implementation of the management measures in **EPR MERU08** (Develop and implement a cetacean interaction management plan), approach guidelines and visual monitoring for the presence of LF cetaceans are anticipated to reduce Project construction interactions with LF cetaceans. In addition, the management measures relating to underwater noise outlined in **EPR MERU08** comply with acoustic considerations and/or requirements of the Draft National Recovery Plan for the Southern Right Whale (DCCEEW, 2022a) and the Conservation Management Plan for the Blue Whale (DoE, 2015).

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to cetaceans are recommended.

Underwater noise impacts on mid-frequency (MF) hearing cetaceans

Mid-frequency (MF) hearing cetaceans include dolphins (e.g., bottlenose and common dolphins) and whales (e.g., sperm, false killer, shot-finned pilot, long-finned-pilot, killer, and strap-toothed whales). MF cetaceans have a hearing range between 10 Hz and 160 kHz. Non-impulsive noise threshold criteria are available for hearing damage in LF cetaceans and for behavioural disturbance of cetaceans.

Acoustic damage to and disturbance of MF cetaceans were assessed for the worst-case scenario, which is for the cable lay ship will maintain location by dynamic positioning for around 10 days duration in nearshore Victoria (Waratah Bay), where the average background noise level is 105 dB re 1 μPa_{rms} (range 90 dB and 145 dB re 1 μPa_{rms}).

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to MF cetaceans are summarised below:

- Acoustic damage impacts:
  - Acoustic damage impacts are assessed as barotrauma (tissue damage) and/or permanent hearing loss (as measured by PTS onset being exceeded).
  - Distance to the NMFS (2018) $SEL_{cum(LF)}$ threshold of 198 dB re 1 $\mu Pa^2 \cdot s$ for PTS onset is predicted to be within one or two metres of the cable ship noise source, where MF cetaceans are most unlikely to approach or be found at such close distances to the cable lay ship’s thrusters. Consequently, acoustic damage impacts to MF cetaceans are not predicted.
- Temporary hearing loss (as measured by TTS onset being exceeded):
  - The distance to the NMFS (2018) $SEL_{cum(LF)}$ threshold of 178 dB re 1 $\mu Pa^2 \cdot s$ for TTS onset is 43 m. This represents a very small acoustic disturbance zone within which MF cetaceans may suffer from temporary hearing loss if they remain within the zone for a protracted period, which is an unlikely scenario.
  - It is more than likely that an approaching MF cetacean will detect the underwater noise gradient at distance from the noise source of the cable ship and avoid (turn away) or pass around the sound field if migrating or moving along the coastline. However, some MF cetaceans such as bottlenose dolphins (*Tursiops truncatus*) are known to be inquisitive and move in and out of waters immediately surrounding the cable lay ship, but such transient movements are unlikely to result in TTS onset.
  - The predicted acoustic disturbance and temporary hearing loss impacts to MF cetaceans are assessed to have a residual impact significance rating of ***Low***.
- Acoustic behavioural disturbance impacts on MF cetaceans:
  - The distance to the upper behavioural SPL acoustic threshold criterion 160 dB re 1 μPa_{rms} (above which disruptive behavioral responses and avoidance in MF cetaceans may occur) is 46.4 m. This represents a small behavioural impact zone, and most MF cetaceans are assessed to be unlikely to enter this zone. Given decreasing noise with distance from the Project’s cable lay ship, MF cetaceans should be able to sense this gradient and may initiate a range of responses, such as moving towards or away from the ship, or not reacting at all (Richardson et al., 1995).
  - The distance to the lower behavioural SPL acoustic threshold criterion 130 dB re 1 μPa_{rms} (above which more subtle behavioural responses in MF cetaceans may occur) is 4.6 km (see caveats above in reference to using the practical loss equation for calculating distances).
  - Overall, acoustic disturbance to MF cetacean behaviour was assessed to have a residual impact significance rating of ***Low***.
- Acoustic masking impacts to MF cetaceans
  - There are no threshold or acoustic criteria for assessing masking impacts on LF cetaceans; therefore, a qualitative assessment was undertaken including a literature review.
  - The frequency range (20 Hz to 2 kHz) of underwater noise generated by the cable ship does not overlap the hearing frequencies of bottlenose dolphins (10 kHz to 120 kHz) or

common dolphins (10 kHz and 150 kHz). The lower end of the hearing range of killer whales (500 Hz to 120 kHz) overlaps the cable ship's noise frequency range (20 Hz to 2 kHz); however, the peak frequencies of the killer whale echolocation click ranges from about 40 kHz to 130 kHz (Au et al., 2004) and does not overlap the cable ship's noise frequency range.
  - While low frequency hearing has not been studied in many MF cetacean species, those species that have been tested (e.g., killer whale, false killer whale, and bottlenose dolphin) exhibit low audiometric and behavioral sensitivity to low frequency sound.
  - Some MF cetaceans also have anti-masking strategies such as compensating for increased background noise by increasing the source level or amplitude and/or frequencies of their calls or other acoustic signals (i.e., the 'Lombard effect' (Lombard, 1911)), and some MF cetaceans increase the number of elements per call to improve detectability (Branstetter and Sills, 2022).

Overall, the predicted impacts on MF cetacean behaviour and acoustic auditory masking of biologically relevant sounds and calls are assessed to have a residual impact significance rating of ***Low***, given their high frequency hearing range (150 Hz to 160 kHz) for communications and echolocation clicks. MF cetaceans should be readily able to sense the underwater noise gradient surrounding the cable lay ship gradient and initiate a range of responses, such as moving towards or away from the ship or other construction activities, or not reacting at all (Richardson et al., 1995).

As noted above, implementation of the management measures in **EPR MERU08 (Develop and implement a cetacean interaction management plan),** approach guidelines and visual monitoring for the presence of MF cetaceans are anticipated to reduce Project construction interactions with MF cetaceans.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to cetaceans are recommended.

Underwater noise impacts on high-frequency (HF)hearing cetaceans

High-frequency (HF) cetaceans include dwarf sperm whales, pygmy right whales, and true porpoises. HF cetaceans have a hearing range between 227 Hz and 160 kHz. Non-impulsive noise threshold criteria are available for hearing damage in HF cetaceans and for behavioural disturbance of cetaceans.

Acoustic damage to and disturbance of HF cetaceans were assessed for the worst-case scenario, which is for the cable lay ship will maintain location by dynamic positioning for around 10 days duration in nearshore Victoria (Waratah Bay), where the average background noise level is 105 dB re 1 μPa_{rms} (range 90 dB and 145 dB re 1 μPa_{rms}).

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to HF cetaceans are summarised below:

- Acoustic damage impacts:
  - Acoustic damage impacts are assessed as barotrauma (tissue damage) and/or permanent hearing loss (as measured by PTS onset being exceeded).
  - Distance to the NMFS (2018) $SEL_{cum(HF)}$ threshold of 173 dB re 1 $\mu Pa^2 \cdot s$ for PTS onset is predicted to be 67 m of the cable ship noise source, which represents a very small area where acoustic damage to HF cetaceans may occur if they remain in this acoustic damage impact zone for more than an hour, which is an unlikely scenario. Any HF cetaceans remaining within this 67-m radius impact zone are assessed to have a residual impact significance rating of ***Moderate***; however, HF cetaceans would be unlikely to approach and remain within this 67-m radius impact zone, which is discussed below.
  - A more likely scenario for an HF cetacean approaching the cable lay ship's noise field assumes that it will turn away ('flee') from the cable lay ship noise source at a rate of 1.5 m/s, which is considered to be a typical cruising speed for a marine mammal, then it is unlikely that a HF cetacean will receive a level of noise at which auditory injury is expected to occur based on the 1-hour cumulative $SEL_{cum(HF)}$ criterion used by MDA (2022)(see **Attachment G** in the **Marine Ecology and Resource Use Assessment**,

(Technical Appendix H, EIS/EES). In the case of a HF cetacean turning away or 'fleeing' from the cable lay ship noise field, rather than remaining stationary or at a constant distance from the cable lay ship, the PTS onset distance will be less than 1 metre (as demonstrated by Nedwell et al. (2012), Sweeney (2018), and Subacoustech, (2021a,b)). Under this more likely scenario, acoustic damage impacts to HF cetaceans would be reassessed as having a residual impact significance rating of ***Low*** rather than ***Moderate***.

- Temporary hearing loss (as measured by TTS onset being exceeded):
  - The distance to the NMFS (2018) $SEL_{cum(HF)}$ threshold of 153 dB re 1 μPa^2·s for TTS onset is 1,433 m. This represents a small zone of influence surrounding the cable lay ship noise source and within which HF cetaceans may incur temporary hearing loss, if they remain within the zone for an hour.
  - It is more than likely that an approaching HF cetacean will detect the underwater noise gradient at distance from the cable ship's noise source and avoid (turn away) or pass around the sound field if migrating or moving along the coastline.
  - The predicted acoustic disturbance and temporary hearing loss impacts to HF cetaceans are assessed to have a residual impact significance rating of ***Low***.
- Acoustic behavioural disturbance impacts on HF cetaceans:
  - The distance to the upper behavioural SPL acoustic threshold criterion 160 dB re 1 $μPa_{rms}$ (above which disruptive behavioral responses and avoidance in HF cetaceans may occur) is 46.4 m. This represents a small behavioural impact zone, and most HF cetaceans are assessed to be unlikely to enter this zone. Given decreasing noise with distance from the Project's cable lay ship, HF cetaceans should be able to sense this gradient and may initiate a range of responses, such as moving towards or away from the ship, or not reacting at all (Richardson et al., 1995). Overall, HF cetacean disruptive behavioural impacts are assessed to have a residual impact significance rating of ***Very low***, given that the HF cetaceans are unlikely to approach the cable lay ship given their known avoidance of ship and vessels (Würsig et al., 1998; al., NOAA Fisheries 2003; and McAlpine, 2018).
  - The distance to the lower behavioural SPL acoustic threshold criterion 130 dB re 1 $μPa_{rms}$ (above which more subtle behavioural responses in HF cetaceans may occur) is 4.6 km(see caveats above for LF cetaceans in reference to using the practical loss equation for calculating distances) involved Overall, the acoustic zone within which the 130 dB re 1 $μPa_{rms}$ is exceeded and likely to cause more subtle behavioural responses in HF cetaceans has been assessed to have a residual impact significance rating of ***Low***.
- Acoustic masking impacts to HF cetaceans
  - There are no threshold or acoustic criteria for assessing masking impacts on HF cetaceans; therefore, a qualitative assessment was undertaken including a literature review.
  - The frequency range (20 Hz to 2 kHz) of underwater noise generated by the cable ship does not overlap the hearing frequencies of HF cetaceans such as bottlenose dolphins (10 kHz to 120 kHz) and common dolphins (10 kHz and 150 kHz).
  - The pygmy sperm whale (*Kogia breviceps*) has a frequency range of 60 to 200 kHz with peak frequencies around 120 kHz to 130 kHz (Santoro et al., 1989; Carder et al., 1995) and is known to transit through Bass Strait.
  - Since most HF cetacean hearing, echolocation, and communication sound frequency ranges do not overlap the frequency range of the underwater noise radiating from the cable ship during cable lay operations (20 Hz to 2 kHz) while some HF cetaceans overlap only at their lower end of their hearing frequency range, masking impacts on HF cetaceans have been assessed to have a residual impact significance rating of ***Low***. This significance impact rating is based on an expected low level of acoustic auditory masking of biologically relevant sounds with brief or minor cessation of vocal behaviour.

As noted above, implementation of the management measures in EPR **MERU08** (Develop and implement a cetacean interaction management plan), cetacean approach guidelines and visual monitoring for the presence of HF cetaceans are anticipated to reduce Project construction interactions with HF cetaceans.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to cetaceans are recommended.

Underwater noise impacts on pinnipeds

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to phocid and Otariid pinnipeds are assessed below for earless or true seals (Phocidae) and eared seals (Otariidae).

Note that the assumption of a pinniped remaining stationary for 24-hours (as required for application of NMFS (2018) thresholds) is an unlikely scenario; therefore, MDA (2023; **Attachment G** in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) adopted a 1-hour stationary distance and negligible noise exposure during the remaining 23 hours rather than the NMFS (2018) 24-hour stationary distance, which is a more reasonable scenario but still conservative.

Underwater noise impacts on phocid pinnipeds

Phocid pinnipeds represented in Bass Strait include the southern elephant seal (*Mirounga leonina*) and the leopard seal (*Hydrurga leptonyx*). Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to earless or true seals (Phocidae) are summarised below.

- Acoustic damage impacts:
  - Acoustic damage impacts are assessed as barotrauma (tissue damage) and/or permanent hearing loss (as measured by PTS onset being exceeded).
  - The NMFS (2018) $SEL_{cum(PW)}$ threshold of 201 dB re 1 $\mu Pa^2 \cdot s$ for hearing damage (measured as PTS onset exceedance) will be within one or two metres of the cable ship noise source, where phocids are most unlikely to approach or be so close. Therefore, acoustic damage impacts to phocids are not predicted.
- Acoustic disruptive disturbance and temporary hearing loss:
  - The distance to the TTS cumulative $SEL_{cum(pw)}$ of 181 dB re 1 $\mu Pa^2 \cdot s$ threshold for phocids is 56 m, which represents a very small acoustic disturbance zone within which phocids may suffer from temporary hearing loss if they remain within the zone for an hour or longer, which is an unlikely scenario. It is more than likely that an approaching or transiting phocid will detect the underwater noise gradient at distance from the noise source of the cable lay ship and avoid (turn away) or pass around the sound field, if moving along the coastline or foraging in the general area where the cable lay ship is located.
  - Overall, acoustic disturbance and temporary hearing loss impacts to phocids are assessed to have a residual impact significance rating of ***Low***. Phocids are expected to detect the noise gradient surrounding the cable lay ship or visibly detect ship and therefore unlikely to approach or remain for an hour or more within the 56-m radius zone of influence where the TTS onset threshold is exceeded.
- Acoustic impacts on phocid behaviour:
  - The radial distance to the upper acoustic threshold criterion (160 dB re 1 μPa_{rms}) is 60 m. This represents a very small impact zone within which disruptive behavioural responses and avoidance in phocids may occur.
  - Overall, predicted impacts of underwater noise causing disruptive behavioural responses in phocids are assessed to have an impact significance rating of ***Very low***, given that phocids will be temporarily displaced vertically or horizontally from the project's sound field above 160 dB re 1 μPa_{rms} for the duration of noise-generating activity but return to previously occupied areas when the noise source ceases, or the cable lay ship moves on to a new location. Migrating phocids such as fast-swimming southern elephant seals and leopard seals are expected to detour around the cable lay ship when transiting Bass Strait, though the likelihood of occurrence of these two species in the Project area were assessed a Remote and Possible, respectively.
- Acoustic auditory masking impacts:
  - The generalised underwater hearing range of phocids is between 50 Hz and 86 kHz (NMFS, 2018) and its lower range overlaps the frequency range (20 Hz to 2 kHz) of underwater noise generated by the cable lay ship.

- – The southern elephant seal has a hearing range of 75 Hz to 50 kHz based on the northern elephant seal (*Mirounga angustirostris*), which has been used as a surrogate in the absence of hearing range data for the former.
- – The other phocid passing through Bass Strait is the leopard seal (*Hydrurga leptonyx*), which as a likelihood of occurrence Possible in the Project's area of influence. Male leopard seals are known to produce underwater calls with mean source levels between 159 and 179 dB re 1 µPa at 1 m (Hemila et al., 2006), which may be masked by the cable lay ship (source level of 185 dB re 1 µPa at 1 m), if leopard seals remained in proximity to the ship.
- – Overall, the predicted acoustic auditory masking impacts on phocid seals are assessed to have a residual impact significance rating of ***Low***. with a possible low level of acoustic auditory masking of biologically relevant sounds with brief or minor cessation of vocal behaviour.

Implementation of the management measures in **EPR MERU07** (Develop and implement a marine fauna management plan and visual monitoring for the presence of phocid seals are anticipated to reduce Project construction interactions with phocid seals and consequently reduce underwater noise impacts to phocid seals.

Implications for Environmental Performance Requirements

No changes to EPRs relevant to phocid seals are recommended.

Underwater noise impacts on eared seals (Otariidae)

The principal otariid pinnipeds represented in Bass Strait include the Australian fur seal (*Arctocephalus pusillus doriferus*), long-nosed fur seal (*A. fosteri*), Antarctic fur seal (*A. tropicalis*) and the Australian sea lion (*Neophoca cinerea*).

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to eared seals (Otariidae) are summarised below.

Acoustic damage impacts:

- Acoustic damage impacts:
  - – The NMSF (2018) $SEL_{cum(OW)}$ threshold of 219 dB re 1 µPa^2·s for PTS onset in otariid pinnipeds is not exceeded within the sound field of the cable lay ship. Therefore, acoustic damage impacts to otariid pinnipeds are not predicted.
- Acoustic disruptive disturbance and temporary hearing loss:
  - – The distance to the TTS cumulative $SEL_{cum(OW)}$ of 199 dB re 1 µPa^2·s threshold for phocids is 4 m. This is an extremely small zone of influence that is most unlikely to be approached by an otariid. Otariids in Waratah Bay, nearshore Tasmania at Heybridge, and in the vicinity of the cable lay ship will also sense the ship's presence visually when they are at the sea surface, as well as acoustically when submerged.
  - – Overall, acoustic disturbance and temporary hearing loss (TTS onset) impacts to otariids are assessed to have a residual impact significance rating of ***Low***. given that otariids are most unlikely to approach or remain within the 4-m radius zone of influence (basically adjacent to one of the ship's thrusters), the impact significance rating is conservative.
- Acoustic impacts on otariid behaviour:
  - – The upper behavioural acoustic threshold criterion of 160 dB re 1 µParms will be exceeded within a horizontal radial distance of 46 m, which represents a small impact zone within which disruptive behavioural effects my occur. Otariids are not expected to enter or remain within this zone surrounding the cable lay ship.
  - – The lower behavioural acoustic threshold of 130 dB re 1 µParms in nearshore waters will extend to conservative 4.6-km radius. Note the caveat above under LF cetaceans, that this distance calculated by the practical spreading loss equation is conservative and would have a smaller radius. Within this larger 4.6-km zone of influence, otariids are anticipated to show more subtle behaviours such as longer times spent at the sea surface, which will reduce through habituation to the non-impulsive broadband noise generated by the cable lay ship while maintaining station using DP control of its thrusters.

  - Overall, acoustic disruptive impacts on otariid behaviour are assessed to have a residual impact significance rating of Low, given a low magnitude of impact given that otariids will be temporarily displaced vertically or horizontally from the cable lay ship's sound field above 160 dB re 1 μParms for the duration of noise-generating activity but return to previously occupied areas when the noise source ceases or the cable lay ship moves on to a new location.
- Acoustic auditory masking impacts:
  - The generalised underwater hearing range of otariids is between 60 Hz and 39 kHz (NMFS, 2018) and the lower level of this range overlaps the cable lay ship's noise frequency range of 20 Hz to 2 kHz.
  - Otariids appear to have poorer hearing than phocids below 1 kHz and have a similar but slightly poorer hearing between 1 kHz and their high frequency cut off at around 39 kHz (Richardson et al., 1995, Thompson et al., 1998).
  - In the absence of information on the underwater hearing frequency ranges of Australian otariids, the hearing range of the northern fur seal (Callorhinus ursinus) of between 400 Hz and 40 kHz (Hemila et al., 2006) has been adopted as a generalised hearing range for the Australian fur seal, which has been selected as representative of Australian otariids and occurs widely in Bass Strait.
  - The frequency range of the underwater calls or communications of some of the above otariids overlap the frequency range of (20 Hz to 2 kHz) of the project's underwater noise sources. Therefore, masking of underwater sounds and otariid communications may potentially occur.
  - Overall, the predicted masking impacts on otariids are assessed to have a residual impact significance of ***Low***, given a low magnitude of impact based on weak masking of biologically relevant sounds (if underwater vocalisations are present), except when close to a project underwater noise source. Most of the otariid foraging areas are offshore where there is a very large expanse of undisturbed foraging habitat in the region, so potential masking of sounds and otariid vocalisations during diving for prey (e.g., Little Penguins, fish and cephalopods) will only be affected in proximity to the cable lay ship while laying bundled cables in the offshore zone. This is expected to be of short duration as the ship transits at a speed of 1.5 knots.

The nearest Australia fur seal colony to the Project's alignment is 11 km away at Kanowna Island, which will not be adversely affected by cable lay ship and marine construction activities.

Implementation of the management measures in **EPR MERU07** (Develop and implement a marine fauna management plan and visual monitoring for the presence of otariid seals are anticipated to reduce Project construction interactions with phocid seals and consequently reduce underwater noise impacts to otariid seals.

Implications for Environmental Performance Requirements

No changes to EPRs relevant to otariid seals are recommended.

Underwater noise impacts on sea turtles

A summary of underwater noise impacts to sea turtles is presented in Table 7-1 above.

Five species are known to occur in southern Australian waters, of which the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and olive ridley (*Lepidochelys olivacea*) sea turtles occur in Bass Strait only as rare vagrants, outside their usual range. The leatherback turtle (*Dermochelys coriacea*) is a regular visitor to Bass Strait and is mostly a pelagic species that is away from its breeding grounds in New Guinea and Indonesia. The flatback turtle (*Natator depressus*) does not occur in Victorian or Tasmanian waters.

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts to sea turtles are summarised below.

- Acoustic damage impacts mortality of permanent hearing loss:
  - The distance to the unweighted, cumulative sound exposure level (SELcum) of 210 dB re. 1 $\mu Pa^2 \cdot s$ was calculated to be 1 m. This represents an extremely small impact zone within which sea turtle mortality could occur should a sea turtle remained within this zone for one hour or more. However, this 1-m zone radius impact zone would be in

very close proximity to one of the underwater thrusters of the cable lay ship and sea turtles are most unlikely to approach this potential impact zone. Therefore, mortalities or permanent hearing damage (PTS onset) impacts to sea turtles are not predicted.

- Acoustic disruptive disturbance and temporary hearing loss:
  – There are no cumulative SEL (SEL_{cum}) threshold criteria for temporary hearing loss (TTS onset) in sea turtles. Therefore, acoustic impacts on sea turtle behaviour are assessed in lieu.
- Acoustic impacts on sea turtle behaviour:
  – The distance to the adopted upper behavioural threshold of 175 dB re 1 μPa_{rms} is 4.6m, which represents an extremely small impact zone, within which sea turtles are most likely to avoid or not enter, given its very close proximity to one of the cable lay ship's underwater thrusters. Overall, the predicted impacts on sea turtle disruptive behaviours (e.g., avoidance or aversion behaviour) are assessed to have a residual impact significance rating of ***Low***, given the low acoustic sensitivity sea turtles and weak responsiveness to sound pressure.
  – The distance to the lower behavioural threshold of 150 dB re 1 μPa_{rms} is 215 m, which represents a small impact zone surrounding the cable lay ship and within which more subtle responses of sea turtles (e.g., leatherback turtles) may be present.
  – Overall, predicted impacts on sea turtle behaviour have been assessed to have an impact significance rating of ***Very low***, given the small impact zone through which the passing adult and sub-adult sea turtles may transit.
- Acoustic auditory masking impacts:
  – Most of the sea turtle hearing frequency ranges (e.g., typically between 100 and 400 Hz) overlap the underwater noise frequency range (20 Hz to 2 kHz) generated by the cable lay ship.
  – There is an almost complete lack of data on masking of biologically important signals in sea turtles by anthropogenic noise (Popper et al. 2014; Erbe et al., 2022).
  – While vocalisations in sea turtle hatchlings and juveniles are known (McKenna et al., 2019), underwater vocalisation in adult and sub-adult sea turtles is lacking (Lenhard et al., 1983). Given the low numbers of sea turtles in Bass Strait and them typically being present as solitary individuals and passing migrating vagrants, there is a low likelihood of a sea turtle (e.g., the 'sender' of a signal) communicating with another sea turtle of the same species (e.g., the receptor or the 'receiver').
  – Overall, predicted acoustic auditory masking impacts on sea turtles are assessed to have a residual impact significance rating of ***Low***, given their weak responsiveness to sound pressure and their lack of communication underwater. Any acoustic auditory effects will be short-lived and persist only for the duration of the marine construction activity being carried out or for the time that a sea turtles continue their foraging movements while passing through Bass Strait.

The implementation of the management measures in **EPR MERU07** (Develop and implement a marine fauna management plan), **EPR MERU09** (Develop and implement a plan for managing interactions with sea turtles) and visual monitoring for the presence of sea turtles are anticipated to reduce Project construction interactions with sea turtles, as well as avoiding collisions. **EPR MERU09** is also in compliance with the the Recovery Plan for Marine Turtles in Australia (DoEE, 2017), which is a national plan that aims to aid in the recovery of sea turtles in Australian waters.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to sea turtles are recommended.

Underwater noise impacts on marine birds

Bass Strait is a key region for seabirds with Little Penguins (*Eudyptula minor*), short-tailed shearwaters (*Ardenna tenuirostris*), fairy prions (*Pachyptila turtur*) and common diving-petrels (*Pelecanoides urinatrix*) being particularly abundant in the region (Fromant et al., 2020). However, it is the diving depths and duration of underwater foraging that are of interest when assessing underwater noise impacts of Project construction.

- Acoustic damage and hearing system impacts:

  - A literature search did not reveal any underwater acoustic damage threshold criteria for acoustic tissue damage or permanent hearing loss (PTS onset) or temporary hearing loss (TTS onset) in diving seabirds or Little Penguins.
  - The diving depths of the albatrosses (all less than 7 m and less 11 seconds duration) are most unlikely to be exposed to underwater noise in the immediate vicinity of the cable lay ship, given that its thrusters are located at about 7 m depth with most underwater noise oriented downwards. Therefore, acoustic damage impacts on albatrosses are not predicted.
  - While Taylor (2008) stated that Sooty Shearwaters had a mean diving depth of 42.7 m, the mean diving duration was not reported. However, in a similar study, Shaffer et al. (2009) observed that 90% of sooty shearwater dives were less than 30 m with estimated duration of 100 seconds (1.6 minutes). Therefore, the mean dive duration for a mean diving depth of 42.7 m reported by Taylor (2008) will be around 142 seconds (or 2.4 minutes). In the unlikely case that a Sooty Shearwater dives and forages in the immediate vicinity of the cable lay ship, exposure to underwater noise received levels in range 150 to 185 dB re 1 μPa_{rms} below the 7-m depth of ship's thrusters down to 42 m depth will be less than 122 seconds (about 2 minutes). This represents a very short exposure to underwater noise such that no acoustic impacts to diving seabirds are predicted. For these reasons pelagic seabirds have been excluded from further assessment; however, underwater noise impacts on Little Penguins are assessed below.
- Acoustic impacts on Little Penguin behaviour:
  - There is little or no information on Little Penguin hearing ranges or sensitivity.
  - Little Penguins spend longer periods underwater while foraging for prey resulting in potential longer exposures to underwater noise.
  - In the absence of underwater threshold criteria, the generic underwater sound pressure level of 150 dB re 1 μPa_{rms} (NMFS, 2018) for fish with their swim bladder involved in hearing has also been adopted for the assessment of Project underwater noise on Little Penguins behaviour.
  - Bethge et al. (2009) determined that the mean swimming speed of Little Penguins at sea is 1.8 m/s with a maximum of 3.3 m/s and that diving depths ranged from 2 to 27 m with a mean dive duration of 21 seconds. Based on this evidence, it is more than likely that Little Penguin transits through the cable lay ship's noise field above 150 dB re 1 μPa_{rms} will be fleeting.
  - Overall, the predicted impacts of the cable lay ship's underwater noise on Little Penguin behaviour have been assessed to have a residual impact significance rating of ***Low***, given the very short-term exposure of any foraging Little Penguins within the 215-m radius impact zone where the 150 dB re 1 μPa_{rms} acoustic threshold for behavioural impacts on Little Penguins is exceeded.
- Acoustic auditory masking impacts:
  - There is little information on the auditory systems and communication of different penguin species. However, Thiebault et al. (2019) recorded underwater vocalisations of three penguin species (King, Gentoo and Macaroni penguins) while foraging at sea. The in-water fundamental frequencies ranged from 139 Hz to 1.5 kHz for Gentoo Penguins and from 309 to 850 Hz for King Penguins, and no vocalisation was observed to contain energy at frequencies higher than 7 kHz.
  - In the absence of specific underwater vocalisation for Little Penguins, the 139 Hz to 1.5 kHz range has been adopted as a proxy for this species. This vocalisation range overlaps that of the cable lay ship (20 Hz to 2 kHz).
  - Given average swimming speed of 1.8 m/s, Little Penguins transiting through the 215-m impact zone where the 150 dB re 1 μParms is exceeded would be exposed for less than a few minutes and therefore unlikely to cause auditory masking impacts should these aquatic birds communicate underwater or use their hearing to detect biologically relevant sounds of their prey (e.g., noise-producing fishes).
  - Overall, the predicted masking impacts on Little Penguins are assessed to have a residual impact significance of ***Low***. and given a low magnitude of impact based on short exposure times and weak masking of biologically relevant sounds (vocalisations if present).

Implications for Environmental Performance Requirements

No underwater noise mitigation or management measures or EPRs are proposed for marine birds including Little Penguins.

Underwater noise impacts on marine fishes

A summary of underwater noise impacts on marine fishes is presented in Table 7-1 above.

Underwater noise impacts to marine fishes have been separated for bony fishes (Osteichthyes) and cartilaginous fishes (Chondrichthyes) given that latter are mainly sensitive to vibrations rather than sound pressure.

Underwater noise impacts on bony fishes

Acoustic damage, disturbance, behavioural, and acoustic auditory masking impacts on bony fishes are summarised below.

- Acoustic damage (barotrauma) permanent hearing loss) impacts:
  - To date, there is no evidence of PTS in fishes, and it is considered unlikely to occur because fishes can replace any lost or damaged hair cells, precluding any permanent hearing loss (Popper et al., 2019). Therefore, acoustic damage to bony fishes relates to barotrauma (e.g., tissues damage or swim bladder damage).
  - The distance to the Popper et al. (2019) unweighted SEL cum of 207 dB re 1 $\mu Pa^2 \cdot s$ isopleth above which mortality of most sound pressure-sensitive fishes of Group 3 (i.e., bony fishes with a swim bladder mechanically connected to the inner ears) is 8 m, which represents an extremely small zone of impact surrounding the cable lay ship.
  - Group 3 fishes would have to remain within this zone for an hour to be exposed long enough for mortality to occur. However, it is highly unlikely that Group 3 bony fishes will remain within this 8-m radius zone as earlier behavioural responses (displacement) will have been initiated in response to the presence of the cable lay ship's noise field gradient. Therefore, mortalities of highly mobile Group 3 bony fishes and other bony fish groups with swim bladders are not predicted.
  - No mortalities or barotrauma are predicted for other bony fish hearing groups such as Group 1 fishes (fishes that do not have a swim bladder or other gas-filled organ and do not sense sound pressure) and which are not sensitive to sound pressure but to vibrations and particle motion only or Group 2 fishes (fishes having a swim bladder distant from their ear but have no known structures in the auditory system that would enhance hearing of sound pressure).
- Acoustic disruptive disturbance and temporary hearing loss:
  - The distance to the Popper et al. (2019) unweighted SEL cum of 186 dB re 1 $\mu Pa^2 \cdot s$ isopleth for TTS onset is 201 m, which represents a small area within which bony fishes will have to remain for more than one hour to be exposed to temporary hearing loss.
  - It is more than likely that bony fish will not remain within the TTS onset zone as they will have detected the underwater noise gradient at distance from the noise source of the cable lay ship and avoid (swim away) or pass around the sound field if moving along the coastline or foraging in the general area of the cable lay ship.
- Acoustic impacts on fish behaviour:
  - The NMFS and other agencies currently use 150 dB re 1 μPa_{rms} as the sound pressure level that may result in onset of behavioural effects (Caltrans, 2015). Note that this threshold is for onset of potential behavioural effects, and not necessarily an 'adverse effect' threshold.
  - The distance to the 150 dB re 1 μPa_{rms} threshold criterion is 215 m, which represents a small impact zone in which pelagic fishes may be disturbed and cause temporary changes in behaviour such as startle responses, feeding disruption, area avoidance.
  - The most likely responses in pelagic resident or passing Group 3 fishes within the 215 m radius impact zone are temporary vertical displacement (near-surface fishes diving deeper) or horizontal displacement (fishes swimming away from the noise source). These behavioural responses are likely to reduce in time as fish habituate.
  - Overall, the predicted residual impacts of underwater noise within the 215-m radius zone of influence pelagic fish behaviour are assessed to have a residual impact

significance of ***Low***, given the predicted minor changes in locomotion speed, direction or dive (swimming) depths and temporary vertical and horizontal lateral orientation behaviour during. The impact significance rating is conservative as the impact will be temporary with behaviourally disturbed fishes returning to previously occupied areas once the cable lay ship departs.
  - No acoustic impacts on pelagic or benthic cartilaginous fishes are envisages as they belong to Group 1 hearing fishes that do not have a swim bladder or other gas-filled organ and do not sense sound pressure but to vibrations and particle motion only.
- Acoustic auditory masking impacts:
  - In general, sounds produced by soniferous (sound-producing) fishes for communication are generally associated with either reproductive activities (e.g., courtship or spawning) or stressful conditions (e.g., aggression or territorial defence).
  - Some bony fish (Osteichthyes) produce sounds by means such as striking bony structures against one another, or by muscle movement amplified by the gas-filled swim bladder (or air bladder).
  - In general, the lower end of fish vocalisation or other sound source frequencies (e.g., sciaenid fishes between 45 to 60 Hz) overlap with the frequency range (20 Hz to 2 kHz) of the cable lay ship in DP mode; therefore, there is a potential for masking of fish vocalisations and communication calls.
  - In the case of nearshore fishes in the vicinity of the cable lay ship as it maintains position in DP for up to a week while the cables are pulled to shore via the long trajectory HDD ducts, the noise field surrounding the cable lay ship will be continuous. Therefore, masking impacts on soniferous fishes and the masking of other sounds that fish may use to detect predators or for locating reefs, for example, are anticipated to be occur in the short term.
  - Overall, predicted impacts on auditory masking of nearshore fishes at or near the cable lay ship are assessed to have an impact significance rating of ***Low***, given the low presence in the sandy seabed environment for soniferous fishes (sound producing and communications) and fishes using sound to detect predators within the shallow nearshore waters of the sandy seabed. Most fish are expected to temporarily leave the 215-m radius impact zone where the behavioural threshold of 150 dB re 1 μPa$_{rms}$ threshold criterion is exceeded, which also reduces potential masking impacts on fishes in the vicinity of the cable lay ship with the disturbed fishes returning to the the area once the cable lay ship has departed or moved on for further cable laying.
  - No masking impacts are predicted for cartilaginous fishes such as sharks, rays, and skates, since they detect particle motion rather than sound pressure.

Implications for Environmental Performance Requirements

No specific mitigation or management measures or EPRs are proposed for avoiding, reducing or ameliorating potential underwater noise impact to marine fishes.

Underwater noise impacts on marine macroinvertebrates

The cable lay ship's underwater noise source level (SL) of 185 dB re 1 μPa at 1 m has not been adopted as a worst-case scenario to assess impacts on marine invertebrates for the following reasons:

- Marine macroinvertebrates lack sensory organs to perceive sound pressure, but many do have organs or tactile hairs that are sensitive to hydrostatic disturbances (McCauley, 1994).
- Marine invertebrates lack gas-filled chambers or organs (except cuttlefish and nautiluses) and are thus unable to detect sound pressure changes associated with sound waves (Carroll et al., 2017).
- In cephalopods that do not have any air bladders or other gas-filled chambers, except for cuttlefishes (*Sepia* spp.) and nautiluses (*Nautilus* spp.), there is no possibility for amplification of sound pressure waves.
- There are few measurements or data on sound detection by marine macroinvertebrates and the data available indicate that only low frequency sounds are detected and relate mainly to the particle motion component of the sound field that is important (e.g., Mooney et al., 2010).

- Decapod crustaceans are sensitive to low-frequency particle motion as they lack gas-filled organs such as swim bladders or gas-filled chambers (Edmund et al., 2016)
- There are no particle motion threshold criteria available for assessing vibrations from seabed construction activities.

Based on the above, impacts of construction related sound pressure levels on marine invertebrates cannot be assessed. Macroinvertebrates mostly sense particle motion rather than sound pressure; however, some groups such as cephalopods respond to sound pressure. Therefore, cable lay ship underwater noise impacts on cephalopods behaviour was assessed and summarised below:

- Acoustic impacts on cephalopod behaviour:
  – Cephalopods, like fishes, have statocysts (otoliths) that in principle can be used to detect whole body motions such as those caused by the displacement component of a sound wave (Young, 1989). Young (1960) pointed out that the statocyst might serve as a detector for vibrations, or sound, in a similar way as the vertebrate vestibular system.
  – Cephalopods such as the common octopus (*Octopus vulgaris*) and known to be present in Bass Strait detects sounds ranging from 400 Hz to 1000 Hz (Hu et al, 2009); common cuttlefish (*Sepia officianalis*) senses 85 to 1,000 Hz (Samson et al., 2014) and Longfin inshore squid (*Loligo pealeii*) sense 80 to 1,000 Hz (Mooney et al., 2016)), and all of which overlap the cable lay ship frequency range (20 Hz to 2 kHz).
  – On a relative scale, the hearing ability of cephalopods is comparable to Group 1 fishes without a mechanically coupled swim or air bladder to the inner ear. (Lovell et al., 2005). While there are no acoustic threshold criteria for Group 1 fishes (surrogate for cephalopods), the NMFS (2018) acoustic threshold of 150 dB re 1 μPa_{rms} for onset of behavioural effects in fishes has been adopted.
  – Since the NMFS (2018) threshold criterion of 150 dB re 1 μPa_{rms} is based on Group 3 fishes that have a swim bladder connected to the inner ear, this threshold criterion is therefore overprotective for both Group 1 fishes and cephalopods.
  – Overall, the predicted impacts on cephalopods of cable lay ship underwater noise within the 215-m radius behavioural impact zone where the150 dB re 1 μPa_{rms} acoustic behavioural threshold is exceeded, are assessed to have a residual impact significance of ***Low***, given their low sensitivity to sound pressure. Cephalopod behavioural displacement will be temporary and affected cephalopods are expected to return to previously occupied areas once the cable lay ship departs or moves on.

Implications for Environmental Performance Requirements

No specific mitigation or management measures or EPRs are proposed for avoiding, reducing or ameliorating potential underwater noise impact to cephalopods, including arrow squid (*Nototodarus gouldi*) and southern calamari (*Sepioteuthis australis*), which are targeted by commercial fisheries and recreational fishers.

Construction impacts on marine resource uses

A summary of construction impacts on commercial fisheries and recreational fishing is presented in Table 7-1 above.

Project construction impacts on marine resource use relate mainly to the requirements of temporary exclusions zones around the cable lay vessel whilst undertaking cable lay operations and impacts on commercial fisheries and recreational fishing should targeted fishes, shellfish and molluscs be subject to impacts.

Construction impacts on navigation and maritime traffic

Impacts on navigation and maritime traffic likely to arise during Project construction are summarised below.

- Temporary exclusion zones:
  – A temporary moving exclusion zone of 1.5 km by 1 km will be established around the cable lay ship while laying cables. The size of the temporary exclusion zone will by communicated to AMSA and the Australian Hydrographic Office by MLPL.
  – A temporary fixed exclusion zone of 1.5 km by 1 km will be established around the cable lay ship when stationary in nearshore waters for 10 days each in Victoria

(Waratah Bay) and Tasmania (off Heybridge) and paying out cables to the HDD marine exit holes for pulling onshore (i.e., at the shore crossing).

- Guard vessels to enforce the temporary exclusion zones during cable laying across Bass Strait and at the shore crossings.
- There are few restrictions to shipping movements within the open water of offshore Bass Strait, except for the two-way Traffic Separation Scheme that operates to the south of Wilsons Promontory. During the cable lay ship's traverse across Bass Strait, passing ships will detour around the cable lay ship. Such small deviations from their planned routes are likely to be of minor nuisance value to navigation officers rather than a negative (potentially adverse) impact.
- Fishing vessel skippers will receive advanced notifications of marine construction areas and cable laying or cable installation operations.
- Overall, the predicted impacts of construction phase temporary exclusion zones on navigation and maritime traffic have been assessed to have a residual impact significance rating of ***Very low***, given the anticipated minor deviations taken by ships' captains and fishing vessel skippers around the temporary exclusion zones.

The implementation of the management measures in **EPR MERU06 (Develop and implement a marine communication plan)** prior to construction includes a protocol for notifying the AMSA of the proposed locations, timing and duration of proposed marine construction activities. Therefore, ship captains and vessel skippers will have advanced warning of marine construction areas and/or Project vessels operating in Bass Strait.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to potential impacts from marine construction to navigation or maritime traffic are recommended.

Construction impacts on commercial fisheries and recreational fishing

Impacts on commercial fisheries and recreational fishing likely to arise during Project construction are summarised below.

Construction impacts on commercial fisheries:

- Construction impacts on commercial fishery vessels are limited to the short-term use of temporary exclusion zones, which are summarised above as creating a minor nuisance effect rather than an adverse impact on fishing vessel movements or active fishing.
- In terms of commercial fishery resources (e.g., targeted fish, squid, abalone and other shellfishes), given the absence of any adverse impacts on marine fauna (including targeted fish and shellfish species) and their habitats, adverse direct or indirect impacts on commercial fishery resources are likewise not expected.
- Overall, the predicted impacts of construction on commercial fisheries have been assessed to have a residual impact significance rating of ***Low***. given that the Project alignment crosses the sandy seabed of central Bass Strait, which does not intercept any key trawling grounds or seining areas.

The implementation of the management measures in **EPR MERU06** (Develop and implement a marine communication plan) prior to construction includes a protocol for notifying the AMSA of the proposed locations, timing and duration of proposed marine construction activities. Therefore, ship captains and vessel skippers will have advanced warning of marine construction areas and/or Project vessels operating in Bass Strait. In addition, MLPL will provide fishing vessel owners/skippers with updated information on the location and progress of cable-laying operations as well as cable installation and burial operations, which ensures avoidance is maintained. This will be achieved through the abovementioned MLPL's liaison with commercial fishery or fishing representative bodies.

The implementation of the management and risk reduction measures in **EPR MERU11** (Develop and implement a plan to avoid the introduction of invasive marine species) also serves to minimise risks of invasive marine pests on Bass Strait commercial fishery resources.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to potential construction activity impacts on commercial fisheries are recommended.

Construction impacts on recreational fisheries:

- Construction impacts on recreational vessels are limited to the short-term use of temporary exclusion zones, which are summarised above as creating a minor nuisance effect rather than an adverse impact on fishing vessel movements or active fishing.
- In terms of nearshore recreational fishery resources (e.g., targeted fish, squid, abalone and other shellfishes), given the absence of any adverse impacts on marine fauna (including targeted fish and shellfish species) and their habitats, adverse direct or indirect impacts on commercial fishery resources are likewise not expected.
- Beach fishing can continue during construction at the shore crossings as the cables from the cable lay ship will be pulled through the HDD ducts marine exit holes at 10 m water depth in subtidal waters.
- Overall, the predicted impacts of construction on nearshore recreational fisheries have been assessed to have a residual impact significance rating of ***Low***, given the absence of any adverse impacts on nearshore recreational fish habitats and fishes assessed and the fact that shoreline and nearshore recreational fishing may continue during shore crossing construction activities.

In addition to implementing the management measures in **EPR MERU06** (Develop and implement a marine communication plan), MLPL will notify local recreational fishing clubs or groups of the proposed nearshore locations, timing and duration of proposed marine construction activities at the shore crossings.

In addition, recreational fishers using boats and recreational boaters will be informed of Project nearshore construction areas and timing by the management measures outlined **EPR S03** (Community and Stakeholder Engagement Plan) presented in Technical Appendix U (Social) of the EIS/EES.

Implications for Environmental Performance Requirements

No changes to the EPRs relevant to potential construction activity impacts on recreational fishing are recommended.

7.2 Operation phase impact assessment summary

During Project operation, the main impact sources relate to the energised HVDC cables (i.e., when transmitting power), which generate:

- Magnetic fields.
- Induced electric fields.
- Thermal fields.
- Underwater noise generated by cable inspection and survey vessels.

The residual impacts of the above impact sources and pathways on marine ecology and resource use are summarised below.

(a) Magnetic fields and impact assessment summary

A summary of magnetic field impacts on marine fauna and resource use (magnetic compass interference) is presented in Table 7-2.

Table 7-2: Summary of operation impacts on marine ecology and resource use.

*Scientific name	Common name / aspect	Sensitivity	Magnitude	Significance
Magnetosensitive cetaceans:				
*Humpback whale	*Megaptera novaeangliae*	Low	Negligible	Very low
Sea turtles:				
Migratory sea turtles	As a group	High	Negligible	Low
Otariid (eared) seals:				
*Arctocephalus pusillus**	Australian fur seal	Very low	Negligible	Very Low
Arctocephalus forsteri	Long-nosed fur seal	Very low	Negligible	Very Low
Arctocephalus tropicalis	Sub-Antarctic fur seal	Very low	Negligible	Very Low
Neophoca cinerea	Australian sea lion	Very low	Negligible	Very Low
Phocid (earless) seals:				
Mirounga leonina	Southern elephant seal	Moderate	Negligible	Low
Hydrurga leptonyx	Leopard seal	Very low	Negligible	Very Low
Magnetosensitive bony fishes (Osteichthyes):				
Short-finned eel	*Anguilla australis*	Moderate	Negligible	Low
Long-finned eel	*Anguilla reinhardtii*	Moderate	Negligible	Low
Magnetosensitive cartilaginous fishes (Chondrichthyes –Elasmobranchii)				
#Elasmobranch fishes	As a group	Moderate	Negligible	Low
Marine invertebrates:				
Decapod crustaceans	As a group	Low	Negligible	Very low
All other marine invertebrates	As a group	Very low	Negligible	Very low
Impacts on marine resource use				
Magnetic compass deviation	N/A	Moderate	Negligible	Low

Source: Marine Ecology and Resource Use Assessment (Technical Appendix H, EIS/EES). The known magnetosensitive humpback whale is used as a surrogate for all whales. # Elasmobranchs sense the magnetic field indirectly via induction using their electrosensory system.

Residual impacts of Project-generated magnetic fields on marine ecology and marine resource use after mitigation and management measures have been implemented are summarised below.

Earth's magnetic field (geomagnetic field)

Measurement of the background geomagnetic field allows the impact from the project's energised HVDC cables to be placed in the context of natural magnetic fields. Ranges in the magnitude of the geomagnetic field components in Bass Strait (NOAA, 2023) were:

- Total field (60.825 to 61.335 microTesla (µT).
- Horizontal component (21.203 to 19.685 µT).
- North component (20.694 to 19.139 µT).
- East component (4.602 to 4.616 µT).
- Vertical component (-56.429 to -58.090 µT).
- Declination angle (12.58 to 13.52º).
- Inclination angle (-69.41 to -71.28 º).

Total intensity is the magnetic field strength, which increases with latitude from about 30 µT near the equator to 70 µT at the poles.

Geomagnetic variation is evident in Bass Strait. Along the Project's alignment, the background total magnetic field intensity increases from about 60,281 nT at the Victorian landfall to about 61,335 µT, which is a difference of 1,054 nT and represents an average change of 4.2 nT/km from north to south over the Project's proposed 255-km long interconnector alignment across Bass Strait.

In addition, magnetic field intensity is influenced by the distribution of ferromagnetic materials in the Earth's crust, and therefore can be shown as a topographic map of magnetic intensities. In particular, the iron-rich, volcanic rocks that makes up the seabed within Bass Strait, contain significant concentrations of magnetite that results in higher field levels near the seabed (Jacobs, 2024; Technical Appendix A, EIS/EES).

HVDC cable generated magnetic fields

The Project proposed to operate as a parallel symmetrical monopole arrangement with following attributes:

- Each monopole will comprise a bundled pair of 750 MW HVDC cables and an optic fibre cable.
- The first monopole is proposed to be installed and commissioned by in 2030 and the second monopole is proposed to be installed three years' later in 2033, if the project is approved and proceeds.
- For about 95% of the subsea alignment of the project, the two monopoles will be approximately 2-km apart; therefore, there will be no combination or interaction of their separate magnetic fields during operation.
- The nominal voltage is presently proposed to be ±320 kV with a continuous rated current of 1,250 A

Jacobs (2022; **Attachment H** in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and Jacobs (2024; Technical Appendix A, EIS/EES) modelled and calculated cable-generated magnetic fields for full power (750 MW) and half power (375 MW). For the purposes of a conservative impact assessment, maximum cable-generated magnetic fields based on 750 MW power transmission were modelled at three locations as worst-case scenario:

- Nearshore Victoria:
  - bundled cable operating at maximum power (750 MW).
  - water depth of 30 m.
- Mid Bass Strait:
  - bundled cable operating at maximum power (750 MW)
  - water depth of 70 m

At each modelling location, magnetic flux density levels were calculated at different heights above the cable(s) location (i.e., vertically) and at distances laterally from the cable(s) location (i.e., horizontally). The modelled results (interaction of cable-generated and geomagnetic fields) were then compared with the background geomagnetic field for impact assessment.

Given the Independent Advisory Committee (IAC) remit includes mainly nearshore Victoria and and any interactions, overlaps or the combined effects of the works in Victoria and works outside of Victoria. A conservative approach has been taken in this statement by presenting modelling results for nearshore Victoria and adjoining Commonwealth waters are summarised below for maximum cable generated magnetic field, at the seabed above the cable's location, existing total geomagnetic field, and increment over the background field:

- Nearshore Victoria:
  - predicted maximum cable-generated field = 95.58 μT.
  - existing geomagnetic field = 60.35 μT.
  - increment over background at the seabed = 35.23 μT.
  - increment over background at the sea surface (30 m water depth) = 0.05 μT
- Mid Bass Strait:

- predicted maximum cable-generated field = 95.95 μT.
- existing geomagnetic field = 60.87 μT.
- increment over background at the seabed = 35.08 μT.
- increment over background at the sea surface (70 m water depth) = 0.01 μT

I note that the above cable-generated fields values are conservative, since Jacobs (2022; **Attachment H** in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and Jacobs (2024; Technical Appendix A, EIS/EES) used a power transfer of 1,000 MW rather than 750 MW proposed for one of the Project's monopoles.

Magnetic field impacts on marine flora

Residual impacts of the Project-generated magnetic fields on marine flora are summarised below.

- Magnetic field impacts from operating subsea HVDC cables throughout the world have not been reported for marine flora.
- Many studies have shown the presence of marine flora (benthic algae) living directly on or near exposed subsea cables, where the cable surface magnetic fields are of higher intensity (typically 2.5 to 4.3 milliTesla (mT) or 2,500 to 4,500 μT) than are observed at the seabed immediately overlying buried cables.

Given the above evidence, reviews of the scientific literature, and the absence of observed impacts of subsea HVDC cables on marine algae, magnetic field impacts to marine algae in nearshore Victoria and Commonwealth marine waters were not assessed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and not considered further.

Magnetic field impacts on marine invertebrates

A summary of magnetic field impacts on magnetosensitive marine invertebrates is presented in Table 7-2 above.

Based on a literature review, observed HVDC cable magnetic fields on marine invertebrates are summarised below.

- No adverse impacts of magnetic fields from operating HVDC cables throughout the world have been reported for non-magnetosensitive marine invertebrates.
- Many studies have shown the presence of benthic invertebrates living directly on or near exposed (non-buried) subsea HVDC cables and sea electrodes of monopolar systems with a sea-earth return current, without apparent harm, even though they are exposed to a combination of magnetic fields, electric fields, and electrolysis products.
- Most evidence of the effects of magnetic fields on marine invertebrates is based on laboratory experiments in which applied artificial DC magnetic fields that are typically in the range of between 2,700 and 2,800 μT). The main reason for using such high experimental magnetic fields appears to be that values in this range are equivalent to the magnetic fields typically measured (or modelled) at the surface of operating HVDC cables.
- There is evidence that some weak magnetic fields can influence the behaviour of some marine invertebrates, such as marine snails and crustaceans. There is a suggestion of a magnetic compass sense in some of the large decapod species, such as lobsters that undergo long seabed migrations (see below).
- A literature review of the field experimental effects of magnetic fields on marine invertebrates at sites of operating HVDC cables indicated that the distribution of lobsters and crabs and their exploratory and sheltering behaviour were not adversely impacted by the HVDC cable magnetic fields, and all lobsters and crabs crossed the cable magnetic fields. However, subtle changes in the use of space near HVDC cables may be expected as shown by Hutchison et al. (2018) for American lobsters.
- There are some lobster species in the family Palinuridae that undertake long distance migrations, which are usually linked to specific periods of the life cycle such as pre-adult, moulting, and reproductive stages. Sensing of the magnetic field has been postulated in the long distance (500 km) spawning migrations of the spiny ornate lobster (*Panulirus*

ornatus) in northern Australia and Papua New Guinea (MacFarlane and Moore, 1986). However, there are no similar spawning migrations or other long distance lobster migrations in Bass Strait.

Given that the predicted low incremental magnetic fields of between 17 and 35 µT at the seabed above the Project's buried and bundled HVDC cables operating at half-power (375 MW) and full power (750 MW) and the background geomagnetic field of around 60 µT, the resultant maximum total magnetic fields (range 77 to 95 µT) are well below the much higher magnetic field levels outlined in the literature reviews above and which showed no adverse impacts.

Overall, the predicted impacts of Project-generated magnetic fields on marine invertebrates including decapod crustaceans are assessed to have an impact significance rating of ***Very low***, and the Project's operating cables are not predicted to be a barrier to marine invertebrates.

Implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) includes adopting a cable and construction method that must be designed to install and bury subsea cables in a manner that reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column. The cable design and installation must include:

- Cable burial in the seabed up to 1.5 metres.
- Bundling the HVDC cables in each subsea circuit to cancel out or greatly reduce EMF.
- Separating each subsea circuit (i.e., the western (ML1) and eastern (ML2) monopoles) to reduce interaction of electromagnetic fields.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on bony fishes

A summary of magnetic field impacts on magnetosensitive bony fishes is presented in Table 7-2 above.

Residual impacts of the the Project-generated magnetic fields on marine bony fishes (Osteichthyes) are summarised below.

- Observed effects of magnetic fields on bony fishes have only been described for species that can sense the geomagnetic field (i.e., magnetosensitive). Such species tend undertake long open-sea migrations using the static (DC) geomagnetic field for functions such as orientation, homing and navigation. Examples include various northern hemisphere migratory species such as salmonids (e.g., Atlantic, sockeye, and chinook salmon), European eels (*Anguilla anguilla*) and yellowfin tuna (*Thunnus albacore*).
- In Australian waters, there are no migratory bony fishes equivalent to northern hemisphere magnetosensitive salmonids that undertake long distance migrations in the sea.
- Studies of European eels have indicated sensitivity to the direction and inclination of cable-generated magnetic fields of the same strength as the geomagnetic field. The eels' ability to keep a constant heading during darkness and in midwater suggests that they can use geomagnetic cues during migration.
- Southern hemisphere eel species are present including both short-finned eels (*Anguilla australis*) and long-finned eels (*A. reinhardtii*), which undertake long distance migrations from Bass Strait rivers to their Coral Sea area spawning grounds. These two species are also likely to possess the same magnetosense as their northern hemisphere counterparts.
- Westerberg and Begout-Anras (1999) studied the orientation of tagged silver eels (Anguilla anguilla) in a disturbed geomagnetic field in the vicinity of an operating subsea HVDC cable (Baltic Cable) with a predicted total magnetic field of 200 µT at the seabed (1 m above the buried cable). The results indicated:
  - some of the tagged eels veered (i.e., small deviations in trajectory) when crossing the cable, which would be expected if the eel was maintaining a constant compass course.

The observations are more consistent with the eels maintaining magnetic orientation by using the vertical component of magnetic field (i.e., inclination compass sense) rather than the horizontal component of the magnetic field (i.e., polarity compass sense).

  – all westward swimming eels crossed the HVDC cable, with some showing minor deviations (offsets) in their line of passage that implied some form of magneto-sensory orientation.
  – the operating subsea HVDC cable did not obstruct the normal westward migration of the eels from the Baltic Sea to the North Sea.

- Since most studies of magnetosense of bony fish have been conducted on tagged northern European eels (*Anguilla anguilla*) crossing subsea HVDC cables (e.g., Westerberg and Begout-Anras, 2000), the magnetic sensing capabilities of this anguillid has been used as a proxy for assessing Project magnetic field impacts on the shortfin eels that migrate from central Pacific spawning grounds to both Victorian and Tasmanian rivers on either side of Bass Strait.
- Based on evidence from northern European eel tagging studies, a similar effect on Pacific eels or other migrating Bass Strait magnetosensitive bony fishes may be expected, that is, a minor deviation when passing over the Project's HVDC cable but with no significant impact on or barrier to migration.
- The predicted total magnetic field for the Project's bundled cable during full power (750 MW) operation is approximately 95 μT, which is half as much as the 200 μT for the Baltic Cable, the impacts of the Project's magnetic fields on Pacific eels may be expected to be smaller or less pronounced. However, the maximum predicted total magnetic field for a single HVDC operating cable within the transition zone (i.e., where the bundled cable ends and the two single HVDC cables separate before landfall) is 193 μT at the seabed, which is similar to the 200 μT of the Baltic Cable used for tracking tagged European eels (Westerberg and Begout-Anras, 2000); hence, similar minor magnetic field impacts on Pacific eels may be expected.
- Typical swimming speeds of 30.8±7.3 km/day or 21.4±5.1 m/minute (Koster et al., 2021), which are similar as the average swimming speeds of 46.3 cm/s (or 27.8 m/minute) noted by Westerberg and Begout-Anras (2000) for the European eels (*Anguilla anguilla*) passing over a HVDC cable (Baltic Cable) in Sweden. Therefore, the daytime passage of short-finned eels through the Project's HVDC cable magnetic fields, which reduce to background geomagnetic field 10 m either side of the cable location (or 20 m in total) until the background geomagnetic field is reached, will be short and around 1 minute.

Overall, the impacts of Project-generated magnetic fields on bony fishes have been assessed to have a residual impact significance rating of ***Low*** given the weaker magnetic fields of the proposed bundles cables of the Marinus Link (0.5% above the local geomagnetic field in Bass Strait) compared to the higher percentages (range 22.4% to 26%) above the local geomagnetic fields in the vicinity of operating European subsea HVDC cables.

Implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on magnetosensitive marine bony fish species such as eels.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on cartilaginous fishes

A summary of magnetic field impacts on magnetosensitive cartilaginous fishes is presented in Table 7-2 above.

Residual impacts of the the Project-generated magnetic fields on cartilaginous fishes (Chondrichthyes) are summarised below.

- Early work on the effects of magnetic fields on fishes demonstrated that cartilaginous fishes could detect magnetic fields (Kalmijn, 1966) and this ability was later found to be widespread amongst electrosensitive cartilaginous fishes.
- In general, when a shark, ray, or skate swims towards or through a magnetic field, it experiences an induced electric field that stimulates its electrosensory system, which serves as an indirect mechanism that can be used for detecting a magnetic field or magnetic stimulus (Newton and Kajiura, 2017).
- Anderson et al. (2017) showed that magnetic field perception was not just associated with the electrosensory system, but they also appear to have a putative magnetoreceptor within their naso-olfactory apparatus.
- Klimley (1993) observed large numbers of scalloped hammerhead sharks (*Sphyrna lewini*) converge by day and aggregate over a basaltic seamount in the northern Pacific Ocean. At night, the sharks swim long distances to their deep-water foraging grounds where they feed on squid, and by dawn the sharks return to the seamount. Klimley (1993) followed the sharks on their return journey while towing a magnetometer behind their research vessel and found that the sharks were following geomagnetic paths back to the seamount. The seamount was a positive magnetic anomaly (higher than the background geomagnetic field), and the sharks were assumed to be following the magnetic gradient to retrace their route.
- The local geomagnetic anomaly map of Bass Strait shows low-amplitude magnetic irregularities that vary between +1.8 µT and -0.9 µT over and below the background total geomagnetic field of 60 µT in Bass Strait (Jacobs 2024; Technical Appendix A, EIS/EES). These small distortions in the local geomagnetic field form a pattern of geomagnetic 'ridges', geomagnetic 'valleys', and geomagnetic contours, which may be tracked by cartilaginous fishes inhabiting or passing through Bass Strait.
- Based on the findings of a literature review, potential Project-generated magnetic field impacts are only likely on those sharks that undertake very long-distance migrations or movements within southeast Australia. Within Bass Strait, resident species such as the white shark (*Carcharodon carcharias*) and the school shark (*Galeorhinus galeus*) undertake shorter distance movements. The school shark is highly migratory and pregnant females are known to occur in the Great Australian Bight during the early and middle stages of pregnancy, but later move to Bass Strait and waters off Tasmania to give birth. Also, non-pregnant adult and sub-adult females and, to a lesser extent, adult and sub-adult males, migrate between the Great Australian Bight and the waters of Bass Strait and Tasmania (Walker, 2001a).
- Elasmobranchs swimming through the project's HVDC cable-generated magnetic fields are anticipated to be exposed to an abrupt change (short but steep gradient) due to the magnetic field being between 17 and 35 µT above the background geomagnetic field (60 µT) at the seabed and reducing to background geomagnetic levels at about 10 m horizontally and 10 m vertically the towards the sea surface. This is anticipated to be detected as a singular anomaly and unlikely to affect their migration path or perceived as a barrier. One potential response is that elasmobranch species moving along the seabed navigating by naturally induced electric fields become disorientated as they approach the induced electric field in the magnetic field of a cable. This could cause short-term confusion to an elasmobranch and most likely affecting epibenthic species (Walker, 2001b).
- Whitehead (2001) investigated elasmobranch distribution within the area of the Transpower HVDC cable system in Cook Strait (New Zealand) and concluded that "*the cable system did not appear to affect the commercial shark fisheries or federally protected sharks' nurseries along the North and South Island*". The results of this study suggested that the operational HVDC multi-cable system does not disturb the general ecology and behaviour of sharks and rays in the waters surrounding the HVDC cable system.

Overall, the predicted impacts of the project's HVDC cable-generated magnetic fields on are assessed to have an impact significance rating of ***Low*** based on elasmobranch fishes' sensitivity of

High due to their conservation status and detection of low amplitude magnetic fields using their electroreceptor system as they swim through the magnetic fields and a magnitude of *Negligible* given their short duration transits through the sharp peaks of the HVDC cables' magnetic fields as shown in Figure 7.16 (nearshore Victoria) and Figure 7.17 (mid Bass Strait of Technical Appendix H (EIS/EES). In the case of near-surface swimming sharks, the HVDC cable- generated magnetic fields are at similar levels as the background geomagnetic field; therefore, no magnetic field impacts to these pelagic sharks are predicted. Overall, the predicted impacts of the project's HVDC cable-generated magnetic fields on magnetosensitive cartilaginous fishes are assessed to have a residual impact significance rating of ***Low*** given their short duration transits through the sharp peaks of the HVDC cables' magnetic fields.

As noted above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on magnetosensitive cartilaginous fish species such as sharks, rays, and skates.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on sea turtles

A summary of magnetic field impacts on magnetosensitive migratory sea turtles is presented in Table 7-2 above.

Based on a literature review, observed impacts of magnetic fields on sea turtles are summarised below.

- Much of what is known about animal response to the geomagnetic field comes from studies of sea turtle migration, and especially loggerhead turtles (*Caretta caretta*). However, based on field and laboratory studies, Putman et al. (2015) assessed the magnetic navigation of the oceanic life stages of loggerhead turtles. The conclusion of these studies was that the navigation behaviour of sea turtles was closely tied to the interactions between oceanic circulation and the dynamics in the geomagnetic field.
- Most of studies and observed impacts of magnetic fields on sea turtles relate to hatchlings and juveniles. However, the results from such studies are less relevant to the mainly sub-adult and adult sea turtles that are known to pass through Bass Strait. Since sea turtles are known to use multiple cues (both geomagnetic and non-magnetic) for navigation and migration (Tricas and Gill, 2011), it is surmised that this will be the case for sea turtles passing through Bass Strait.
- Lohmann and Lohmann (1994) noted that sea turtles appear to rely on an inclination compass that does not distinguish the polarity of field lines (i.e., north versus south); instead, an inclination compass functionally defines 'poleward' as the direction along the Earth's surface in which the angle formed between the total field vector and the gravity vector is smallest (Wiltschko and Wiltschko, 1972).
- There are indications that the geomagnetic sense is critical for primary orientation to approach the general vicinity of a destination (e.g., nesting beaches, feeding grounds), but that fine-tuning is accomplished by using olfactory and visual cues (Tricas and Gill, 2011).
- Tricas and Gill (2011) considered that conclusions about the effects of magnetic fields from power cables were hypothetical as it was not known how sea turtles detect or process fluctuations in the geomagnetic field.
- In the case of a surface or near-surface sea turtles crossing the subsea project alignment in nearshore Victoria and mid-bass Strait and Victoria, the predicted near-surface magnetic fields are 18.7 nT and 5.1 nT, respectively, which represent very low increments above the background geomagnetic field of around 60,000 nT (or 60 μT). These low magnetic fields are not expected to interfere with sea turtles' use of the geomagnetic field for navigation.

Overall, the predicted impacts of the Project's subsea HVDC cables magnetic fields on magnetosensitive sea turtles during their short passage through Bass Strait are assessed to have a residual impact significance rating of ***Low***, given the fact that other non-magnetic sensory cues (e.g., olfactory, auditory and visual cues) are likely to assist their passage through Bass Strait.

As note above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on magnetosensitive and migrating sea turtles.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on phocid and otariid pinnipeds

Based on a literature review magnetic field effects on pinnipeds are summarised below.

- The weak magnetic fields generated by the project's energised HVDC cables are not predicted to have any effects on eared seals (Otariidae), owing to their lack of a magnetosense.
- A literature review indicated a paucity of information on the use of the geomagnetic field by phocid pinnipeds such as seals and sea lions and whether they have a magnetosensory system. However, there are indications that long-distance migratory elephant seals may be capable of sensing the geomagnetic field.
- Very little information on the sensitivity of pinnipeds to the geomagnetic field were available, except for a study by Robinson (2009) who investigated the navigation performance of northern elephant seals (*Mirounga angustirostris*) and observed their homing behaviour during natural migrations and conducted experimental translocations that indicated an acute navigation ability and a positional sense.
  – Northern elephant seals routinely complete continuous migratory movements of more than 1,000 km for periods exceeding two weeks and do so with less than a 6% mean offset from optimal migration 'great circle' paths.
  – Robinson (2009) concluded that, while there was not any clear evidence for geomagnetic navigation in the northern elephant seal, his research suggested a weak association between direction of transit (azimuth) and geomagnetic intensity, and that the vertical component (Z-field) of the geomagnetic intensity explained most of the variation.
- In Bass Strait, the equivalent to the northern elephant seal is the southern elephant seal (*Mirounga leonina*), which migrates south to Antarctica to feed on squid and fish at the edge of the sea-ice (DAWE, 2021a).
- DAWE (2021a) also state that southern elephant seals can navigate very accurately to feed Antarctic waters. This accurate navigation ability is also confirmed by (Bradshaw et al., 2004) who found that long-term fidelity to Antarctic foraging may be assisted by simple navigational cues. Therefore, it is assumed that the northern elephant seal and its weak magnetic sense (Robinson, 2009) can be used as a proxy for the southern elephant seal, given that they are from the same genus and have similar evolutionary biology.

In the case of true seals (Phocidae), the southern elephant seal has been assumed to have a weak magnetosense that could be used for navigation over vast expanses of the Southern Ocean. The predicted impacts on the southern elephant seal are assessed to have a residual impact significance rating of ***Low*** given the likely presence of a magnetosensory system (based on northern elephant seals (Robinson, 2009). This inferred magnetosense is expected to be of limited use in the shallow waters of Bass Strait as other cues (e.g., currents, physical landmarks, bathymetric features, or following the coastline) may assist navigation. Given the known swimming speeds of southern elephant seals of 79.4 km/day and a maximum of 115 km/day (Biuw et al., 2007), exposure to the project's magnetic fields in Bass Strait will be very transitory.

As noted above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on phocid pinnipeds.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on cetaceans

A summary of magnetic field impacts on magnetosensitive cetaceans is presented in Table 7-2 above and only for the known magnetosensitive humpback whale (*Megaptera novaeangliae*), which is the most studied cetacean, and which has been adopted as a surrogate for all cetaceans.

Residual impacts of Project-generated magnetic fields on cetaceans are summarised below.

Cetacean sensitivity to magnetic fields

- There is anatomical evidence (Bauer et al., 1985) and behavioural evidence (Klinowska, 1985) that indicates that cetaceans may have a magnetic sense that is used for orientation during migration.
- Kirschvink et al. (1986) noted that live stranding locations of whales were associated with magnetic field anomalies of less than 50 nT (or 0.05 μT), which implies that the whales can detect these very low levels of the magnetic field. May (2001) stated that that the sensitivity of cetaceans to the geomagnetic field is around 30 nT (or 0.03 μT).

Cetaceans postulated to use their magnetosense for migration

- Certain cetacean species that undertake very long-distance migrations are recognised as being magnetosensitive and using the geomagnetic field for navigation such as those species that migrate between Antarctica and the Australian coast (e.g., humpback whales (*Megaptera novaeangliae*) and southern right whales (*Eubalaena australis*).
- Walker et al. (1992) suggested that fin whales (*Balaenoptera physalus*) possess a magnetic sense and that they use it to travel in areas of low geomagnetic field gradient and possibly low magnetic intensity during migration. The transduction mechanism for responses to magnetic fields has yet to be identified; however, an obvious candidate is particles of single-domain magnetite detected in the anterior *dura mater* of the humpback whale (Fuller et al., 1985).

Residual magnetic field impacts on cetaceans

- While most humpback whales of the Group E1 (eastern Australian coast) migrate along the east coast of Tasmania, a proportion migrate along the west coast of Tasmania and regularly transit across Bass Strait to follow the east coast of Australia northwards to their breeding grounds in nearshore waters off Mackay in Queensland. The same subset of humpback whales, including mothers and calves, are assumed to follow a similar course in reverse during their southern migration.
- Humpback whales approaching the Project's subsea HVDC cables will sense the gradient of cables' magnetic fields, which will be at a maximum when the whales cross the cables, and the diminishing magnetic gradient as the whales move away from the cables. Since humpback whales are surmised to sense geomagnetic high and low anomalies (i.e., ridges and valleys), they are likely to sense the cables' magnetic fields as a high magnetic anomaly in a similar manner to sensing a ridge.
- A recurring theme amongst the regulatory authority and public concerns about subsea HVDC cables is that the cables' generated magnetic fields, which will be higher than the background geomagnetic field, may create a barrier (a 'magnetic fence') to cetacean migration or other movements. In addition, concerns have also been expressed that cetaceans encountering HVDC cables magnetic field may follow the cables' magnetic field to shore with the potential to live strand.

- A review of the literature on cetacean live strandings associated with magnetic anomalies revealed the following:
  - A series of scientific papers (e.g., Klinowska et al, 1986) have postulated, in the case of some northern hemisphere cetacean live strandings, that whales may follow magnetic valleys that align perpendicular to the shoreline. Klinowska (1985) and Klinowska et al. (1986) argued that, where local geomagnetic anomalies distort the field and cause the magnetic contours to cross coastlines at about 90˚, whales are led directly to shore. However, a critical aspect of this theory is that, where magnetic contours cross the coastline at right angles, live strandings should occur on rocky shore as well as on sandy beaches. This was the case in the United Kingdom, with 29% of active strandings on rocky coasts adjacent to deep water, or 36% if the category 'small sandy cove between cliffs' is included.
  - Kirschvink et al. (1986) investigated the clustering of herd stranding sites on the east coast of the United States and concluded that whales avoided magnetic gradients and tended to strand at points of geomagnetic minima.
- In the case of potential live stranding of cetaceans at or near the landfalls of subsea HVDC cables, the following empirical evidence for a lack of live strandings at such locations is noted:
  - In the case of the Basslink HVDC cable project, the proponent (Basslink Pty Ltd) engaged independent scientists to undertake desktop studies of cetacean live strandings at or in the vicinity of operating subsea HVDC cable landfalls. Warneke (2001a) investigated active cetacean stranding data for Danish HVC cables and concluded that "*none of the active strandings on Danish coasts occurred in close proximity to any HVDC cable, and only two events post-date the commissioning of the nearest cables, there is no evidence of a causal connection between these cables and active strandings of any of the exotic species."*
  - Warneke (2001b) also investigated stranding records in Cook Strait (site of the Inter-Island HVDC system) in New Zealand and concluded "*on the basis of available data on strandings in Cook Strait, there is no evidence that migratory and/or seasonally common species of cetacean that visit or pass through the Strait have been detrimentally affected by HVDC cables operated there since 1964/1965."*
  - A literature review of stranding records for the existing operational Basslink subsea HVDC cable did not reveal any pattern of live cetacean strandings at or near its Victorian landfall (McGaurans Beach and broader Ninety Mile Beach) or its Tasmanian landfall (Four and Five Mile Beaches) over the past 19 years of operation (2005 to 2024).
  - Up to 23 species of cetaceans continue to enter the Baltic Sea at different times of the years and at different frequencies of occurrence. Such cetaceans consistently cross over five subsea HVDC interconnectors with a total of eight HVDC cables. If live cetacean strandings were a feature associated with these subsea HVDC cables, such incidences would have long since been recorded and investigated. The fact is that no correlation with cetacean live strandings and cable locations have been reported (e.g., Warneke, 2001a).
- In the case of subsea HVDC cables' magnetic fields potentially acting as a barrier to cetacean migration, the following is noted:
  - Gales et al. (2012) is the only known scientific study that purports to show an inhibitive interaction of a cetacean with an operating subsea HVDC cable system. The study tracked the eastern movements of electronically tagged long-finned pilot whales (*Globicephala melas*) in Bass Strait and stated that the whales "*stopped and milled around in the vicinity of the operating Basslink subsea HVDC cable*".
  - Based on Figure 5 (combined at sea distributions of five tracked pilot whales) in Gales et al. (2012), the time spent over 40 hours in 10-km grid squares, revealed 4 grids to the west of the Basslink cable, one grid straddling the cable, and 4 grids to the east of the cable. Over a 10-day period, three groups of tracked whales remained within 30–170 km of each other in an area of around 18,700 km^2 in southeastern Bass Strait, which indicates that they were milling around and possibly feeding (foraging). The

Basslink cable intersects this large milling and feeding area and Gales et al. (2012) state that it was "*impossible to determine the extent to which the cable itself was related to the observed behaviours of the tracked long-finned pilot whales*".

- In terms of a potential barrier effect, Gales et al (2012) state that "*clearly, the submarine cable did not represent a physical barrier because the tracked whales swam across it on at least 14 separate occasions during the study period, both singly and in a group, and often twice within 24h".*

- The Basslink HVDC interconnector has been operating almost continuously in Bass Strait since 2006 and a subset of humpback whales regularly pass through within Bass Strait during their northern migration (May to July peak season) to their tropical calving grounds and during their southern migration (October to December) to Southern Ocean feeding grounds near Antarctica. Some southern migrating humpback whale mothers and calves that pass westwards through Bass Strait are known to undertake short resting periods before migrating south along the west coast of Tasmania to Southern Ocean feeding grounds.
- In the case of a surface or near-surface humpback whales crossing the subsea project alignment in nearshore Victoria (30 m water depth), and mid-Bass Strait (70 m water depth), the predicted near-surface magnetic fields 50 nT and 10 nT, respectively, respectively, which represent very low increments to the geomagnetic field of around 60,000 nT (60 μT)and are within the range of natural variability.
  - Given the abovementioned the magnetic sensitivities for whales of between 30 nT (May, 2001) and 50 nT (Kirschvink et al., 1986), the predicted magnetic increments of 50 nT in surface waters at Modelling Location 1 in Waratah Bay (30 m water depth) should readily be detected by humpback whales, whereas as the predicted near-surface magnetic field increment of 10 nT at Modelling Location 2 in mid-Bass Strait (70 m water depth) may not be detected.
- Since humpback whale migration generally occurs in open waters, it is assessed that the effect of the Project's localised and small total magnetic field increment above the background geomagnetic field on humpback whale swimming through the HVDC cables magnetic field will be extremely localised (e.g., 40 m straddling an HVDC cable's position) and short lived given typical swimming speeds for whales of between 1.1 and 4.2 m/s (Clapham and Mead, 1999) with transient passage duration times of between 44 and 84 seconds, respectively. Therefore, altered deviations of a humpback whale's natural migration route or other movements are not anticipated when crossing a buried HVDC cable's location.

The above findings lend evidence to support that whatever correlations may or may not occur between live stranding and natural magnetic anomalies, cetaceans co-exist with (and are not impeded by) anthropogenic magnetic anomalies generated by subsea HVDC cables. Furthermore, the weight of evidence from the accumulative hundreds of years of operating subsea HVDC cables indicates that there is an absence of any significant effects of HVDC cable magnetic fields on cetacean migration and/or other movements navigation. If magnetic field effects on cetacean migration and navigation were found to be associated with operating subsea HVDC cables, such incidences would have long since been recorded and investigated. To date, a literature search did not reveal any 'barrier effect' of subsea HVDC cables' magnetic fields to cetacean migration.

Overall, residual impacts of the Project-generated magnetic fields on cetaceans are are assessed to have a residual impact significance range of between ***Very low*** and ***Low***, depending on the conservation status of the cetacean species being considered.

As noted above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on magnetosensitive cetaceans such as the adopted surrogate (humpback whale).

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Magnetic field impacts on marine resource use

The key Project-generated magnetic field impacts on marine resource are:

- Magnetic field interference of ships' magnetic compasses.
- Potential magnetic field impacts on fisheries

Magnetic field interference of magnetic compasses

During power transmission, the project's HVDC cable magnetic fields have the potential to cause interference with shipboard magnetic compasses; therefore ,impacts are summarised below.

- The magnetic fields generated by the proposed Marinus HVDC subsea cables will not impact GPS or gyrocompass navigational systems.
- During power transmission, the project's HVDC cable magnetic fields have the potential to cause interference with shipboard magnetic compasses. Ships and vessels not equipped with GPS may rely on magnetic compass readings for navigation and localised disturbances in the geomagnetic field can disrupt the accuracy of the compass reading.
- In general, the deeper the water the lesser the compass deviation effect, and conversely, the shallower the water the greater the compass deviation effect. Therefore, transient magnetic compass deviations are only expected when a vessel with a magnetic compass passes directly over the HVDC cables in nearshore shallow waters.
- Localised disturbances in the geomagnetic field can disrupt the accuracy of the compass reading. However, the compass will need to be located very close (within 10 m) to the source of the disturbance to have any significant impact (**Technical Appendix A**, EIS/EES). Therefore, the impact to ships and boats relying on compass-based navigation in the Bass Strait will be negligible as the vessels will not be close enough to the generated fields from the cables to be impacted.

The principal mitigative measure that minimises any risks associated with compass deviations is that the cable alignments will be marked on navigation charts in accordance with **EPR MERU06** (Develop and implement a marine communications plan) presented in Technical Appendix H, EIS/EES. Hence, mariners will be warned that deviation of their magnetic compasses (if present) may be experienced while crossing over the subsea HVDC cable alignments and should therefore be prepared for spurious or anomalous readings when their vessel transits directly over the cable.

Overall, it is expected that any transient magnetic compass deviations in magnetic compass readings of vessels transiting near the shoreline and shallow waters are very unlikely to impact navigation or safety as visual navigation will assist longshore transits.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

Magnetic field impacts on fisheries

Given the absence of predicted impacts of magnetic fields on marine fishes and invertebrates (e.g., crabs, lobsters, squid, and abalones) above having a range of residual impact significance ratings of between ***Low*** and ***Very low***, adverse impacts on commercial or recreational fisheries and shellfisheries are not predicted.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

(b) Electric fields and impact assessment summary

A summary induced electric field impacts on electrosensitive cartilaginous fishes is presented in Table 7-2 above.

The metal armouring of the Project's HVDC cables is grounded to earth to prevent any direct electric field being generated while the cables are in operation. However, seawater (i.e., an electrolyte) flowing through the HVDC cables' generated DC static magnetic fields will induce a corresponding DC static electric field.

Given the lower anticipated levels of natural and induced electric fields addressed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), the following units and subunits are referenced as microvolt/m (µV/m), which is the typical unit used for describing electric fields in the ocean or sea. Units of nanovolt/cm (nV/cm) are typically used for marine organisms with a very high sensitivity to electric fields, which have been converted to µV/m where required to allow comparison with natural background electric fields expressed in units of µV/m.

Induced electric fields and impact assessment summary are presented below.

a) Existing electric fields in Bass Strait

Knowledge of the existing natural electric fields (and variations in space) in Bass Strait is required for comparison with the induced electric fields generated by conductive seawater flowing through the vertical component of the Project's HVDC cable magnetic fields.

Natural and existing anthropogenic electric fields in Bass Strait are summarised below:

- Movements of conductive seawater through the geomagnetic field (by currents and tidal flows) induces electric fields typically between tens and hundreds of nV/cm (Nyqvist et al., 2020).
- Natural electric fields normally range 0.5-50 µV/m (5-500 nV/cm) in marine waters (Kalmijn, 1999; Nyqvist et al., 2020). In the Atlantic Ocean, the Gulf Stream and the North Sea, natural electric field strengths of 35 to 50 µV/m are reported by Buchanan et al. (2011).
- In Bass Strait, natural electric field range from around 0.5 µV/m (e.g., slack water between tides) to a maximum of 184.3 µV/m, which is based on the maximum tidal flow of 3.21 m/s in Banks Strait just to the south of Clarke Island in southeast Bass Strait (Rahimi et al., 2014) and the vertical component of the local geomagnetic field at this location.
- Kalmijn (1974) found that during maximum tidal flow through the English Channel, electric fields of up to 25 µV/m were generated twice a day. Given that the sea currents of Bass Strait (maximum depth of 82 m) are relatively strong and similar in magnitude to the English Channel (maximum depth of 174 m), NSR (2002) adopted a value of 30 µV/m as an average value for the background electric field strength in Bass Strait given that it is shallower than the English Channel. This Project's EIS/EES also adopted a natural background average electric field of 30 µV/m for Bass Strait.
- The electric field of Bass Strait is not uniform, as it will be distorted by the geomagnetic fields of underlying geology, which form magnetic high or low spots and can be readily seen in the magnetic anomaly map for Bass Strait. Sea currents and tidal water movements passing through these anomalous magnetic highs and lows will induce concomitantly higher and lower electric fields, causing local variations in the electric field across Bass Strait. During magnetic storms, the magnetic field can vary five-fold from between 0.0002 to 0.001 µT/s, which can induce electric fields of between 60 and 125 µV/m in the sea (Brown, et al., 1979).
- Bioelectric fields are generated by all living marine organisms, which constantly generate both DC and AC electric fields during their life processes (Crampton, 2019). The weak bioelectrical currents are derived from muscle activity such as respiratory movements, cardiac contractions and locomotion. AC bioelectric fields are emitted due to heart activity and muscle contractions, while DC bioelectric fields occur due to biochemical processes in the body (Olsson et al, 2010).
- The above biogenic electric fields are typically range from 2 to 100 µV/cm (2,000 to 100,000 nV/cm) at a very close distance (Haine et al., 2001) and can be readily detected by most elasmobranchs, with their highly sensitive electrosensory systems.
- Weak electric fields can also be induced as marine animals move through the geomagnetic field. For example, an animal swimming at a rate of 1 cm/s in an ambient magnetic field of 0.5 nT would induce an electric field strength of 5 nV/cm (Walker, 2001).

- Existing anthropogenic electric fields are also present in Bass Strait mainly as line sources, including minor sources such as oil and gas pipelines with anodic or cathodic erosion protection. However, a major anthropogenic source is the induced electric fields due to seawater (an electrolyte) flow through the energised Basslink cable's magnetic field (see below).
- Induced electric fields are generated in the vicinity of the existing Basslink subsea bundled HVDC cable and metallic return cable. Assuming a similar median and maximum seawater flows of 0.110 m/s and 0.646 m/s, respectively, the approximate induced electric fields 1 m above the seabed overlying the Basslink bundled HVDC and metallic return cable at Five Mile Bluff (Tasmania) are 8.47 μV/m and 49.75 μV/m, which compares with the background levels of 6.38 μV/m and 37.45 μV/m for the same seawater flow rates at 1 m above the seabed at the same location.

b) Project-generated induced electric fields

The metal armouring of the HVDC cables is grounded to earth to prevent any direct electric field being generated while the cables are in operation. However, seawater flowing through the vertical component of the Project's HVDC cables' DC static magnetic field will induce a corresponding DC static electric field. The intensity of the induced electric field will depend on the intensity of the HVDC cables' external magnetic field, which itself is directly proportional to the current in the cables and inversely proportional to the radial distance. Therefore, the induced electric field will reduce rapidly with distance from the buried HVDC cables.

- Estimates of induced electric fields were calculated for the Project's buried bundled cables at the seabed and 1 m above the seabed at the bundled cable locations.
- The modelling sites were the same as those used to model the HVDC cables' magnetic fields and included nearshore Victoria (Modelling site1), mid Bass Strait (Modelling site 2), and nearshore Tasmania (Modelling site 3). Data on bottom water seawater flow rates were extracted from Fugro (2020). The calculated induced electric fields for nearshore Victoria (Modelling site 1) were used to assess induced electric fields for impact assessment.
- Estimates of induced electric fields derived by using the formula E (μV/m) = $B_{Vertical}$ (μT) x V (m/s), where E is the induced electric field, $B_{Vertical}$ is the vertical component of the geomagnetic field and V is the velocity of horizontal water movement (Sherwood et al., 2016).
- The predicted induced electric fields at Modelling site 1 (nearshore Victoria) were as follows:
  - under a median seawater flow of 0.130 m/s, the induced electric field at the seabed (0 m) and 1 m above the seabed are predicted to be 11.62 and 8.48 μV/m, respectively, compared to the natural background electric field of 7.33 μV/m.
  - under a maximum seawater flow of 0.646 m/s, the induced electric fields at the seabed (0 m) and 1 m above the seabed are predicted to be 57.78 and 42.14 μV/m, respectively, compared to the natural background electric field of 36.44 μV/m.
- The predicted induced electric fields at the seabed immediately overlying the bundled HVDC cables (maximum range of 11.62 to 57.78 μV/m) are within the natural electric field in Bass Strait (range 0.5 to 184.3 μV/m).
- In proximity to the the buried bundled HVDC cables, natural background electric fields are reached within 10 m both horizontally and vertically from the bundled HVDC cable location.

The above predicted induced electric field of the project's buried bundled HVDC cables are of similar magnitude as the natural background electric field. The generally low induced electric fields at the seabed and 1 m above the seabed are a consequence of a) the bundling configuration of the HVDC cables (i.e., a mitigative measure by design as mentioned in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cable) in Technical Appendix H (EIS/EES), whereby the bundled HVDC cables' magnetic fields are partially cancelled out due to the electric currents flowing in opposite directions within the two HVDC cables); and b) the burial of the bunded cables to a nominal 1 m depth in soft-sediment seabed. The reduction in magnetic fields concomitantly results in reduced induced electric fields as sea currents and tidal flows pass through the cable's lower magnetic fields.

Residual impacts of electric fields on marine ecology and marine resource use after mitigation and management measures have been implemented are summarised below.

c) Marine electrosensitive fauna and electroreception sensitivity

The principal marine fauna with the capability for detecting electric fields are the cartilaginous fishes such as sharks, skates and rays (Elasmobranchii).

- Elasmobranchs possess an electrosensory system, which is based electroreceptors (hair cells located at the end of vase-like structures called the ampullae of Lorenzini) and nuclei within the brain that process information arriving from the nerves in the ampullae. The receptor is a jelly-filled canal that leads from a pore at the skin surface, which exposes seawater to a round vesicle with electro-sensory hair cells at its base.
  - the direction and intensity of electric fields are interpreted in the hindbrain from potential differences between ampullary electroreceptors widely spaced on the body of the fish.
  - ampullary electroreceptors are insensitive to uniform or constant DC electric fields; that is, an external voltage step will evoke a transient response from a receptor at the step; but within a few seconds, the discharge rate of the primary afferent will return to the pre-step value, thus adapting completely (Neiman et al., 2000).
  - ampullary electroreceptors appear to be acutely sensitive to abrupt changes in voltage gradients, especially pulsating sources, such as the AC bioelectric fields emanating from elasmobranch prey species.
- The weak, self-generated electric fields created by an elasmobranch's own swimming movement through the geomagnetic field (including HVDC cable magnetic fields), as well as by other movements such as breathing can activate the electroreceptors. However, electrosensory neurons within an elasmobranch's brain are known to be selectively insensitive to self-generated electric fields while simultaneously retaining their responsiveness to important biological fields, such as electric fields generated by prey movements. Bodznick et al. (2003) carried out electrophysiological and neuroanatomical studies of skates and found that electrosensory neurons within the hindbrain learn to recognise and cancel any stimuli that are consistently associated with an elasmobranch's own movements.

d) Induced electric field impact assessment summary

A summary of induced electric field impacts on electrosensitive elasmobranch fishes is presented in Table 7-2 above.

Residual impacts of the the Project-induced electric fields on elasmobranchs are summarised below.

- In general, induced electric fields in the vicinity of subsea HVDC cables fall within the electrosensory detection range of elasmobranchs, and consequently, there is concern that the the induced electric fields may have the following effects:
  - Behavioural effects (e.g., avoidance, attraction, or repulsion).
  - Effects on navigation/orientation for those elasmobranch species using the geomagnetic field for positioning.
  - Effects on migration and other movements, including induced electric fields acting potentially as a barrier.
  - Effects on predator/prey interactions.

Elasmobranchs such as pelagic and midwater sharks will be least affected by the induced, weak induced electric fields near the bundled HVDC cable, as surface and mid-water sections of the water column will be outside the influence of the induced electric fields. However, benthic and demersal elasmobranchs such as sharks, rays and skates are the most likely elasmobranchs to encounter the induced electric fields in the bottom waters overlying the buried cables.

- Elasmobranchs such as pelagic and midwater sharks will be least affected by the induced, weak induced electric fields near the Project's buried bundled HVDC cables, as surface and mid-water sections of the water column will be outside the influence of the induced electric fields generated by seawater flow through bottom waters.
- Species of benthic and demersal elasmobranchs are the most likely to be exposed to the induced electric fields associated with the Project's buried HVDC cables. Technical Appendix H (EIS/EES) provides an assessment of likely effects of the induced electric fields on bottom living elasmobranchs, which is summarised below:
  - Kajiura and Holland (2002) consider that a shark might well be able to detect an electric field but not exhibit an overt reaction until the electric field intensity exceeds a behavioural-response threshold, and that such thresholds are likely to be species-dependent. Therefore, the response of sharks to an electric field is not simply a reflex or fixed action response.
  - the reaction of an elasmobranch to an electric field only takes place when the electric field strength is within a biological reaction window (Kullnick, 1994). In near proximity to the buried HVDC cable's location, where the induced electric field voltage gradients are very steep, it is expected that some behavioural response in benthic elasmobranchs may occur.
  - elasmobranchs approaching within about a few metres (say, 5 to 10 m) of the buried HVDC cable location may exhibit generic behavioural responses such as moving towards the source (attraction), turning away from the source (aversion) or an acceleration of swimming. However, subsequent approaches may result in responses that diminish with repetitive stimulation (i.e., habituation). Such diminishment with repetitive stimulation to an electric field suggests a learning process in the central nervous system. For example, Pals et al. (1982) demonstrated very fast habituation of the lesser spotted dogfish (*Scyliorhinus canicula*) to electrical stimuli.
  - the wide distribution of shark ampullary electroreceptors, and their responsiveness to low-level bioelectrical signals (emitted by prey species) allows a shark, for example, to sense and capture prey species buried in soft-bottom sediments (Kalmijn, 1974). Therefore, it is anticipated that some benthic elasmobranchs may 'bite' at the soft sediment seabed (surface overlying the Project's buried HVDC cables) in anticipation that a prey item is hidden with the sandy seabed. The wide distribution of shark ampullary electroreceptors, and their responsiveness to low-level bioelectrical signals (emitted by prey species) allows a shark, for example, to sense and capture prey species buried in soft-bottom sediments (Kalmijn, 1974). Therefore, it is anticipated that some benthic elasmobranchs may 'bite' at the soft sediment seabed (i.e., where most of the HVDC cables are buried) in anticipation that a prey item is hidden with the sandy seabed. While the induced electric field stimulates the elasmobranch's electrosensory system, this does not represent a negative impact as the elasmobranch will move on to other areas in search of prey.
- Whitehead (2001) undertook a field study of electric fields in marine waters in the immediate area of the Transpower HVDC cables and electrode system in Cook Strait, New Zealand.
  - The study included a control site (Sinclair Head), which was located 12 km away from the HVDC cables and electrode system. A secondary element of the field study was to document the existence of elasmobranchs (sharks, skates and rays) in the local area of the operational HVDC cable system, since these electroreceptive species will be the most affected by the presence of artificial electrical fields.
  - During HVDC power transmission, the induced electric fields averaged 83.36 μV/m (range 73.37 to 97.53 μV/m) compared to a natural background electric field of 25.65 μV/m (range 17.99 to 37.01 μV/m). Note that these natural and induced electric fields are of similar magnitude as those of present Project's natural background and predicted induced electric fields (see above).
  - the presence of the Transpower cable system did not appear to affect the commercial shark fisheries or federally protected sharks' nurseries along the North and South Island. The results of this study suggest that the operational multi-cable system does

not disturb the general ecology and behaviour of sharks and rays in the waters surrounding the system (Whitehead, 2001).

- In terms of assessing whether the induced electric fields overlying the Project's buried HVDC cables pose a 'barrier effect' (i.e., a barrier to elasmobranch migration or other cross cable movements), a literature search was undertaken to determine levels at which elasmobranchs could be deterred or repulsed by electric fields, and is summarised below:
  - Smith (1974, 1991) reported that sharks will not cross a voltage gradient greater than 5.5 V/m (i.e., 5,500,000 µV/m). However, Charter et al. (1996) stated in a patent that the effective voltage gradient for the most common use of the deterrent ranges from 1 to 10 V/m for sharks.
  - Marcotte and Lowe (2008) demonstrated that scalloped hammerhead sharks (*Sphyrna lewini*) retreated from a mean DC electric field of 18.5 V/m (range 3.58 to 33.96 V/m) and that leopard sharks (*Tiakis semifasciata*) retreated from a field strength of 9.64 V/m (range 3.46 to 36.55 V/m). Comparing the lowest electric field value of 3.46 V/m (i.e., 3,460,000 µV/m) for the leopard shark (Marcotte and Lowe, 2008) and the highest calculated induced electric field of 72 µV/m in nearshore Tasmania, the Project's induced electric field is 0.02% of the value required for leopard sharks to retreat . Therefore, the maximum induced electric field predicted at the Project's buried HVDC cable location is not predicted to act as a barrier to elasmobranch migration or other movements across the cable location in nearshore Tasmania.

Literature reviewed as a part of this assessment indicated that elasmobranchs either appeared to habituate to electric fields or learn that they were not produced by an accessible food source (Orr, 2016). Furthermore, resultant habituation, the lack of a food source, as well as learning, bottom-living elasmobranchs are anticipated to move on to other foraging areas, with no consequential biological impacts (Hutchinson, 2020).

Overall, the predicted impacts of the Project's induced electric fields on benthic elasmobranchs are assessed to have a residual impact significance rating of ***Very low***, given that the induced electric fields are localised at the seabed (above background within 10 m horizontally and vertically) and of insufficient strength to cause displacement of benthic elasmobranchs from the general area of the energised HVDC cables.

As noted above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces the EMF emitted from the subsea cables at the seabed and in the overlying water column, with concomitant reductions of the magnitude of electric fields induced by seawater currents and tidal flows through the cables' lower (reduced) magnetic fields.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Thermal fields and impact assessment summary

During power transmission in the project's HVDC Power cables, heat will generate inside the conductor and the insulation. Some power will be lost as heat by the Joule effect, leading to an increase in temperature at the cable surface and a subsequent warming of the immediate surrounding seawater (if the cable is laid on the seabed) or seabed sediments (if buried).

During operations, thermal fields will be produced by heat generated by power transmission in the HVDC cables. Mitigation measures by design have already been incorporated in the Project's proposed HVDC cables, ensuring that conductor surface temperatures are within the range of 70°C to 90°C, at the required power transmission (up to 750 MW) in each monopole.

The residual impacts of thermal fields associated with heat generated in energised HVDC cables on marine benthic communities are summarised below.

- Jacobs (2024; Technical Appendix A, EIS/EES) undertook a cable heating assessment and calculated seabed sediment temperature rise contours for various project operating scenarios for the buried subsea HVDC cables in different areas along the proposed project alignments.

- In the case of HVDC cables laid directly on the seabed (i.e., exposed and not buried), constant seawater flow around the cable will dissipate thermal energy and confine it to the cable surface (Worzyk, 2009). However, in the case of buried HVDC cables, thermal radiation can significantly warm the surrounding sediment in direct contact with the cable, even at several tens of centimetres away from it, and especially in the case of cohesive sediments (Emeana et al., 2016).
- In general, the HVDC cable's conductor temperature can reach a maximum of 90°C and the sheath temperature a maximum of 70 C. These maximum values were used by Jacobs (2024; Technical Appendix A, EIS/EES) for modelling and the results are summarised below:
  - the model output demonstrates that sediment heating effects are extremely localised within 0.5 m above the HVDC bundled cables.
  - the temperature rise predicted at the seabed surface due to the subsea HVDC cables is indistinguishable from the ambient temperature.
  - the results from modelling of the highest conductor temperature of 90 C (worst case scenario), predict thermal fields above ambient of +9º C, +12º C, and +30º C at 0.1, 0.5 and 1.0 m above the buried HVDC cable.
- The HVDC bundled cable's heat emissions are predicted to raise sediment and sediment pore water in very close proximity to the HVDC bundled cables by 22 °C and 30°C for the modelled conductor temperatures of 70°C and 90°C, respectively, and resulting in highly localised temperatures of 40°C and 48°C. Within this extremely small thermal impact zone, mortality of deep-sediment infauna such as nematode worms may be expected but which will be countered by increased metabolism, and productivity of deep-sediment infauna at the periphery of this thermal impact zone and where some deep-sediment fauna may flourish.

The temperature rise at the seabed surface (i.e., upper 10 cm) due to the project's subsea HVDC cable heat emissions will be indistinguishable from the ambient seawater temperature and, therefore, will not have any negative impacts on benthic (e.g., sessile or seabed surface macroinvertebrates) or epibenthic fauna (e.g., benthic and demersal fishes).

Overall, thermal field impacts on benthic biological communities of the seabed overlying the Project's bundled and individual HVDC cables are assessed to have a residual impact significance rating of ***Very low***, given the the absence of HVDC cable induced heating within the top 10 cm of the seabed sediments, which is the most biologically productive layer of the seabed.

As noted above, implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables) reduces heat generation of the energised cables and restricts the thermal fields within the soft seabed sediments immediately surrounding of the buried cables.

Implications for Environmental Performance Requirements

No changes to the EPR are recommended.

Underwater noise during operation

Underwater noise generated by project vessels such as periodic cable inspection surveys and for remedial works are considered minor in comparison to the large number of ships and vessels that operate in Bass Strait.

The Project's subsea interconnector will ideally operate 24 hours per day, 365 days per year over an anticipated minimum 40-year operational lifespan. However, servicing, testing and repairs includes scheduled minor outages or potential major outages.

During the project's operations, the maintenance activities proposed are:

- Mid-life refurbishment in years 10, 20 and 30.

- Seabed ROV inspection surveys in year two, year four and then every six years over the 40-year operational life.
- Remedial work every six years or as required.

The acoustic impacts of Project vessels during construction are assessed above and are considered the primary vessel noise impact sources. Noise from the few vessels deployed during project operations are therefore not assessed.

Implications for Environmental Performance Requirements

No changes to EPRs are recommended.

7.3 Decommissioning phase impact assessment

The operational lifespan of the project is a minimum 40 years. At this time the project will be either decommissioned or upgraded to extend its operational lifespan. Decommissioning will be planned and carried out in accordance with regulatory and landholder requirements at the time. MLPL will develop and implement a decommissioning management plan, which will be in accordance with future approvals conditions, and will outline how activities will be undertaken and potential impacts managed.

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) considered two decommissioning scenarios, which are summarised below:

(a) Decommissioning with buried subsea cables retained in situ

The main issues of leaving subsea cables in situ are:

- Potential for long-term exposure of buried cable to seabed scour by bottom currents, which may result in anchor hook ups on exposed cable sections.
- The out-of-service cables also pose a risk to future subsea infrastructure projects, which may require to cross the disused cable alignments; however, proponents of such future projects can readily develop and implement cable crossing plans, as was the case for the current Project for cable crossings of existing telecommunication cables and disused pipelines.
- Another issue in the very long term is the corrosion of the metallic components of the buried subsea cables and the consequential slow release of trace metals into seabed sediments and overlying seawater, which is a process that may occur over the centuries or millennia.

The impacts associated with leaving the subsea cable in situ are summarised below:

- Leaving the cables in situ will result in avoidance of seabed disturbance, sedimentation, water turbidity and impacts on flora and fauna communities and their habitats. It will also mean avoidance of impacts at shore crossings and on intertidal zones since the cables in underground HDD ducts (including the ducts) will remain in situ and undisturbed.
- Potential exposure of buried subsea cables by seabed scour:
  - If sections of the buried subsea cables were to be exposed by scouring of soft-bottom seabed sediments, the exposed cable loops could be at risk of anchor hook-up or snagging of bottom-trawled fishing gear.
  - During Project operations, seabed ROV inspection surveys will be carried out in year two, year four and then every six years over the 40-year operational life. Over this timeframe, depth of burial monitoring results from these surveys are expected to either show cable exposure or provide early warning of potential exposure, which will require intervention (e.g., reburial of cables or placement of rock mattresses or rock fill). These monitoring results will be addressed in a future Decommissioning Plan.
  - Fugro (2020) did not identify any areas of megaripples and erosional bedforms in nearshore Victoria.

  - Overall, the risk cable exposure by erosion and scour of soft-sediment seabed covering nearshore Victoria and most of the Project's offshore alignment is anticipated to be ***Low*** but will be further addressed taking account of operational monitoring results in a future Decommissioning Plan (if the subsea cable left in situ decommissioning option is selected).
- Release of contaminants to the seabed and overlying bottom waters:
  - The relatively benign chemical composition of the XLPE-extruded HVDC cables poses a low likelihood of direct chemical contamination to marine or sediment quality in the decommissioning process. However, there is a potential for the release of metallic contaminants (e.g., copper conductor and cable metallic sheathing metals) in the very long term (decades, centuries, or millennia).
  - Taormina et al. (2018) state that while heavy metals can potentially dissolve and spread into the sediment from damaged and abandoned cables, the quantities released are considered insufficient to have significant impacts.
  - Overall, predicted impacts of potential long-term corrosion of the metallic components of the Project's in situ buried subsea cables on surficial sediments, overlying bottom waters and benthic flora and fauna are assessed as have a low risk.

Decommissioning impacts in the marine environment will be managed through **EPR EM06** (Develop and implement a marine decommissioning management plan) that is documented in Chapter 2 – Environmental Management Framework, Volume 5 of the IES/EES). The objectives of the decommissioning manage plan is to leave a safe, stable and non-polluting environment if the option of leaving the subsea cables in situ is selected as the preferred decommissioning option. The marine decommissioning management plan will be developed in consultation with landholders, relevant stakeholders and regulator/s and meet the relevant requirements of legislation and guidelines at the time of decommissioning.

Implications for Environmental Performance Requirements

No changes to the EPR EM06 are recommended.

(b) Decommissioning involving subsea cable removal

In general, practical experience in removing decommissioned power cables is very limited. Two removal decommissioning options are available: a) partial removal of buried subsea cables and b) total removal of the buried subsea cables.

The partial removal option involves removing most of the buried subsea cables across Bass Strait except for the few sections where the Project's cables cross existing third-party seabed infrastructure (e.g., telecommunication cables and disused pipelines). The cable crossings will have been protected by rock mattresses or rock fill, which will have developed as hard bottom marine habitats of higher biodiversity than surrounding soft-bottom sediments of Bass Strait and as such may merit conservation. The subsea cable under this partial option will be cut and removed either side of the crossings.

The partial removal of the buried subsea cables (except cable crossings) suboption has been selected for assessment and the predicted impacts are summarised below.

- The removal of the Project's subsea cables is essentially a reverse of the cables' installation and burial during construction:
  - A similar spread of vessels is required for the removal process. Instead of a large cable lay ship, a medium-sized cable removal vessel such as an offshore supply vessel (OSV) may be used as a cable recovery vessel to retrieve the bundled cable from the seabed and bring it to the surface.
  - A similar cable wet jetting trenching machine may be used to fluidise the sediments around the buried subsea cables so that they may be pulled to the sea surface by the cable recovery vessel. This cable deburial operation is essentially a reverse of the cable installation and burial process.
  - Overall impacts of cable deburial on water quality, seabed habitats, and benthic marine flora and fauna are assessed to have residual impact significances ranging between

Very low to ***Low***, which would be in line the assessment of residual impacts of cable installation and burial.

- The cable recovery vessel will include one or two guard vessels, which will alert other third-party vessels and maritime users (e.g., fishing trawlers) to the restricted manoeuvrability of the cable recovery vessel and the suspended underwater cable bundle catenary between the vessel and sea floor.
  - A temporary fixed exclusion zone of 1.5 km by 1 km will be established around the cable recovery vessel.
  - During the cable recovery operation passing ships and fishing vessels will detour around the cable recovery vessel. Such small deviations from their planned routes are likely to be of minor nuisance value to navigation officers rather than a negative (potentially adverse) impact.
- Cable recovery underwater noise impacts:
  - Underwater noise generated by the cable removal vessel (e.g., an offshore OSV) is predicted in **Attachment D** (Underwater noise–supplementary information) in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) typically has a typical underwater noise source level of **180 dB re 1 μPa at 1 m**.
  - Since the residual impact significance ratings for the cable lay ship (with a noise source level of 185 dB re 1 Pa at 1 m) on marine fauna ranged from ***Very low*** and ***Low***, similar residual impact significance ratings can be expected for the cable recovery vessel, given the small 5 dB re 1 Pa at 1 m difference between the two vessels noise source levels.
  - Overall, impacts of vessels used in cable removal operations are anticipated to have residual impacts significance ratings ranging between ***Very low*** and ***Low***, and perhaps tending towards ***Very low***. Detailed assessments of cable removal will be part of a future, more detailed analyses to assist a Decommissioning Impact Assessment Report towards the end of Project life.
- Cable recovery from the seabed will have a beneficial impact on the commercial fishing industry by eliminating any potential future snagging hazard for bottom trawling or other fishing gear should the cable left in situ become exposed for any reason. However, cable exposure has been assessed as a low risk if the cables are left buried in situ (see above).

Overall, the residual impacts of subsea cable removal (if this option is selected for decommissioning) will relate primarily to temporary seabed disturbance. The seabed disturbance impacts are expected to be within the range of seabed disturbance construction impacts (range from ***Very low*** to ***Low***) and will be managed under **EPR EM06** (Develop and implement a marine decommissioning management plan) that is documented in Chapter 2 – Environmental Management Framework, Volume 5 of the IES/EES), and which will be updated towards the end of Project life.

Implications for Environmental Performance Requirements

No changes to the EPR EM06 are recommended.

7.4 Project vessel collisions with megafauna

The risks of Project vessel collisions with marine megafauna can occur during the construction, operation, and decommissioning phases when vessels are deployed or are transiting to and from marine construction activities and/or sites. An assessment of the risks of Project vessel collisions with marine megafauna such as slower moving or stationary large cetaceans and sea turtles is summarised below.

(a) Project vessel collisions with large cetaceans

The two main large cetacean species vulnerable to vessel strikes in Australian waters are the humpback whale (*Megaptera novaeangliae*) and the southern right whale (*Eubalaena australis*) with 41 and 10 strike records, respectively over the period 1997 to 2015. (Peel et al., 2016). This equates to approximate annual mean ship strikes of 2.3 strikes per year and 0.56 strikes per year for humpback whales and southern right whales, respectively.

There were only three locations within the project's baseline study area and adjoining central Bass Strait waters. Two vessel strikes were recorded seaward of The Heads of Port Phillip Bay, with one vessel strike recorded in southern Bass Strait located about 50 km northwest of Devonport. These Bass Strait records represent three ship strikes over a 28-year period (1986-2015), with an averaged ship strike rate of 0.11 strikes per year. Considering humpback whales as the most vulnerable large cetacean to vessel strikes, the very low incidence of ship strikes in Bass Strait may be attributable to Bass Strait being a minor migratory pathway for migrating humpback whales (i.e., the E1 subpopulation).

In Australian marine waters, the risk of vessel strikes is greater along the seasonal migration route along the east coast of Australia from Cape Howe (Victorian/New South Wales border) to the breeding area in Queensland for the Australian E1 subpopulation of humpback whales. Similarly, the risk of vessel strikes to southern right whales is greater along nearshore coastal areas such as the biologically important areas (BIAs) such as connecting corridors and resting areas along the coasts of Victoria and Tasmania.

Project vessel-large cetacean collision risks have been assessed for the project’s slow-moving vessels (Scenario A) and fast-moving vessels (Scenario B) during the construction phase.

Scenario A: Slow-moving Project vessel-large cetacean collision risks

Project slow-moving Project vessel-large cetacean collision risks are summarised below:

- The low speeds of the cable lay during cable laying operations is about 1.0 to 1.5 knots (1.8 to 2.78 km/h), while that of the offshore support vessel (OSV) and tethered ROV trenching machine is between 0.22 and 0.4 knots (0.4 and 0.8 km/h). Both these speeds are unlikely to cause mortalities or serious injuries to large cetaceans.
- Behavioural avoidance of the underwater noise gradient radiated around the slow-moving cable lay ship and/or OSV further reduce the likelihood of vessel strikes. The presence of bridge crew watching for sea surface obstacles (including cetaceans) and the presence of onboard marine mammal observers or crew assigned as marine mammal lookouts also reduces the risks of Project vessel-large cetacean collisions.
- Overall, operation of either the cable lay ship or the OSV with a tethered ROV burial machine are assessed to have an overall vessel strike risk rating of ***Very low***. This is based on a likelihood of occurrence of ***Rare*** given the very low vessel speeds and the impact is not anticipated to occur over the duration of the project’s marine construction activities, and a *Negligible* consequence (a localised effect that is temporary and does not extend beyond operational areas) and could be effectively mitigated through standard mitigation and management controls (see below)

Implementation of the management measures in **EPR MERU07** (Develop and implement a marine fauna management plan) and **EPR MERU08** (Develop and implement a cetacean interaction management plan), approach guidelines and visual monitoring for the presence of cetaceans are anticipated to avoid and/or reduce Project vessel-large cetacean collisions. In addition, the management measures in the abovementioned EPRs comply with requirements of the Draft National Recovery Plan for the Southern Right Whale (DCCEEW, 2022) and the Conservation Management Plan for the Blue Whale (DoE, 2015).

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

Scenario B: Fast-moving Project vessel-large cetacean collision risks

The Project's fast-moving vessels relate primarily to their transits from home ports and the sites of cable laying, cable installation and burial, or cable decommissioning (if the cable removal option is selected), and vice versa.

Based on EIS/EES Volume 1, Chapter 6: Project description and a marine traffic assessment (Marine Traffic Assessment, Stantec (2023)), the Projects fast -moving vessels include the cable lay ship and OSV transits to and from site (12-18 knots), as well as transits of smaller vessels such as guard vessels (12- 16 knots), dive boats (13-15 knots) and a variety of small boats for cable pulling to shore (14- 18 knots). Within 1-km radial distance of sites of cable laying, cable installation and burial, or cable removal (if this option is selected), transiting vessels will slow down and maintain low speeds (5-6 knots) within 1 km of the marine activity. Therefore, only fast-moving vessels in transit were assessed for potential collisions with large cetaceans in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES).

Project fast-moving Project vessel-large cetacean collision risks are summarised below:

- Within one day and at any one point along the alignment where bundled cable being laid, installed and buried, or removed (if this decommissioning option s selected), there will typically be between one to three vessels present, which represents between 2% and 6% of the daily transits of other maritime traffic crossing the project's north-south alignment in Bass Strait, which is estimated at about 50 vessels per day (Stantec, 2023).
- Project marine construction and other activities in Bass Strait will be of short duration such as 10 days in nearshore waters (cable pulling operations) and 20 days (for the first 175-km long cable lay). Therefore, the number of vessels in transit will be limited to the same number of days.
- Overall, fast-moving Project vessels in transit between home ports to site (and vice versa) are assessed to have an overall vessel strike risk rating of ***Low***. This is based on a likelihood of occurrence of *Unlikely* given collision impacts have been known to occur in Bass Strait but are not expected to occur over the short duration of project construction activities such as 10 days in nearshore waters (cable pulling operations) and 20 days (for the first 175-km long cable lay). This is also due to the existing low density of background shipping in the project area (50 vessels passing per day), and a consequence of *Minor* (i.e., a localised effect that is short term and could be effectively mitigated through standard mitigation and management controls (see below).

Implementation of the management measures in **EPR MERU07 (Develop and implement a marine fauna management plan) and EPR MERU08 (Develop and implement a cetacean interaction management plan),** approach guidelines and visual monitoring for the presence of cetaceans are anticipated to avoid and/or reduce fast-moving Project vessel-large cetacean collisions. In addition, the management measures in the abovementioned EPRs comply with requirements of the Draft National Recovery Plan for the Southern Right Whale (DCCEEW, 2022) and the Conservation Management Plan for the Blue Whale (DoE, 2015).

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

(b) Project vessel collisions with sea turtles

Vessel strikes are recognised as a potentially significant threat to sea turtles since sea turtles use shallow coastal waters frequented by existing high-density vessel traffic and are often unable to avoid vessels travelling at high speeds. A review of the literature did not reveal any statistics on vessel strikes to sea turtles in Bass Strait; however, some vessel strike data are available from Queensland (Shimada et al., 2017) and Greenland et al., 2004)

The principal species in descending order of abundance based on sighting records are the leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), and green turtle (*Chelonia mydas*), which are known to have foraging, feeding or related behaviour in Bass Strait. However, there are no critical habitats listed under the EPBC Act or Biologically Important Areas (BIAs) for sea turtles in Bass Strait.

Sea turtles passing through Bass Strait are mainly vagrant adults and sub-adults, which are at the southern limit of their global roaming and foraging range. Notwithstanding, sea turtles may rest and forage while passing through Bass Strait with herbivorous green turtles feeding on seagrass and macroalgae in shallow-water nearshore areas, omnivorous loggerhead turtles feeding on benthic algae, sponges and invertebrates, and leatherback turtles feeding opportunistically on jellyfish and ascidians.

Impacts of fast-moving Project fast-moving vessel-sea turtle collision risk are summarised below:

- Mortality where a sea turtle is killed directly or succumbs to serious injuries (delayed mortality), especially when sea turtles are at the sea surface while basking or coming up for air. Potential mortality may arise from head trauma from impact, cracking or crushing of the carapace, /or loss of one or more limbs.
- Vessel strikes resulting from potential vessel propeller injuries to sea turtles include abrasions, lacerations, fractures and increased risk of debilitation and/or exposure to diseases from wounds.
- The likelihood or probability of a vessel strike on sea turtles depends on the number, size, and speed of transiting Project fast-moving vessels, as well as the distribution, abundance, and the behaviour of the three main sea turtle species known or expected to occur in Bass Strait.
- Greenland et al. (2004) confirmed mortality of sea turtles to boat strikes in Queensland waters and found 49.4 strikes/year for green turtles and 9.0 strikes/year for loggerhead turtles. The mean rate of boat strikes on all sea turtles ranged from 1.2 to 49.4 strikes/year is expected to be much higher than would be the case for Project vessel-sea turtle collisions in Bass Strait, where the population densities of migrating adult and sub-adult sea turtles are very low, sea turtle BIAs are absent, and there is a lower prevalence of a high-value foraging habitats (e.g., seagrass beds).
- Overall, fast-moving transiting vessel-sea turtle strike rates are anticipated to be much lower within the project's study area and wider Bass Strait. The low numbers of Project construction vessels (one to three offshore vessels in any one day such as the cable lay ship plus two guard vessels during cable laying) will not add significantly to the existing maritime traffic rate of 50 vessels/day in Bass Strait (Stantec, 2023).
- Overall, fast-moving project vessels in transit are assessed to have an overall vessel-sea turtle collision risk rating of ***Low***. This is based on a likelihood of occurrence of ***Unlikely*** given collision impacts have been known to occur in Bass Strait and higher vessel speeds are known to increase the risk of sea turtle strikes (Shimada et al., 2017) but are not expected to occur over the short duration of project construction activities associated with the first 175-km long segment (e.g., about 20 days for cable laying). This is also based on a consequence of *Minor* (i.e., a localised effect that is short term and could be effectively mitigated through standard mitigation and management controls (see below)).

The implementation of the management measures in **EPR MERU09** (Develop and implement a plan for managing interactions with sea turtles), **EPR MERU07** (Develop and implement a marine fauna management plan), and visual monitoring for the presence of sea turtles are anticipated to reduce Project vessel interactions with sea turtles, as well as avoiding collisions. **EPR MERU09** is also in compliance with the the Recovery Plan for Marine Turtles in Australia (DoEE, 2017), which is a national plan which aims to aid in the recovery of six of the world's seven species of sea turtles.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

7.5 Nighttime artificial lighting risks

Nighttime artificial lighting impacts may occur during the Project's construction, operation, and decommissioning phases.

Potential impacts of nighttime artificial lighting from project vessels may affect terrestrial and marine birds and near surface marine fauna (e.g., sea turtles, fishes and squid).

Possible lighting impacts on birds include:

- Attraction to illuminated sources such as the cable lay ship and other large project vessels outside daylight hours.

- Bird collisions with ship and vessel superstructures, resulting in injury of mortality.
- Light-induced disorientation with possible deviations in the flight paths of nocturnally migrating birds.
- Light entrapment by vessel illumination of nocturnally migrating birds and their reluctance to continue their migration.
- Resting (i.e., temporary harbourage), habitual roosting sites, and foraging sites for seabirds and/or temporary refuge for migrating land birds.
- Lighting may provide an enhanced capability for seabirds to forage at night.

Studies by Johnson et al. (2011) indicated that most interactions between birds and illuminated offshore vessels or platforms were at dawn and dusk, rather than during the middle of the night.

The National Light Pollution Guidelines for Wildlife provide information on the management of artificial light on marine turtles, seabirds, and migratory shorebirds (DCCEEW, 2023). The guidelines also provide technical information to guide the management of artificial light for the EPBC Act listed threatened and migratory species, species that are part of a listed ecological community, and species protected under state or territory legislation for which artificial light has been demonstrated to affect behaviour, survivorship, or reproduction.

(a) Nighttime lighting risks to birds

Many nocturnal seabird species are highly attracted to nighttime artificial lighting on offshore vessels and structures. The principal light-sensitive bird species in the project area are seabirds, shorebirds and nocturnal migratory terrestrial birds.

The risks of nighttime lighting on nocturnal seabirds and migrating terrestrial birds are summarised below:

- In nearshore waters, the cable lay ship will maintain its position for 10 days in DP mode for the purposes of cable pulls to the HDD marine exit hole ducts near landfall in Victoria or Tasmania.
- In nearshore waters, the cable lay ship will maintain its position for 10 days in DP mode for the purposes of cable pulls to the HDD marine exit hole ducts near landfall in Victoria or Tasmania:
  - Cable pull operations at landfall will be conducted in daylight hours only, owing to the need for good visibility and safety reasons (e.g., divers in the water).
  - The cable lay ship's light spill during the hours of darkness will be normal navigation and reduced deck lighting necessary to maintain deck crew safety will be of similar magnitude as other large ships at anchor.
  - Normal nighttime lighting is not expected to be a significant source of artificial light and, therefore, the risks of reduced light spill to nocturnal seabirds and overflying migratory terrestrial birds have been assessed to be ***Very low***.
  - The risks of nighttime light spill risks to the nocturnal shorebirds have also been assessed to to be ***Low***. This is based on sensitivity of *High* (i.e., accounting for the presence of endangered shorebird species presence) and a *Negligible* risk given that the cable lay ship lighting will be restricted to navigation lights and subdued deck lighting necessary for crew safety.
- In offshore waters, the cable lay ship will be the principal source of nighttime artificial lighting at sea from dusk to dawn:
  - Offshore nighttime marine construction is anticipated as the cable lay ship will conduct cable laying operations across Bass Strait on 24-hour and seven days per week basis, and therefore will be a mobile source of light spill.
  - The cable lay ship will lay the first cable length of approximately 175 km in about two-and-a-half days based on a lay speed of 1.5 knots (2.8 km/h). This duration is short and nighttime lighting impacts are likely to potentially affect only a small subset of nocturnal seabirds and migrating terrestrial birds over Bass Strait in the vicinity of the point source of artificial lighting as the cable lay ship traverses along along the 175 km.

– Overall, predicted nighttime light spill risks to nocturnal seabirds and overflying migrating terrestrial birds are assessed to have a risk rating of ***Low***. This is based on sensitivity of *High* (i.e., numerous nocturnal and/or terrestrial birds are classified as endangered species) and a *Negligible* consequence ((a localised effect that is temporary and does not extend beyond operational areas) given the mobile and short-term nature of reduced light spill from the cable lay ship during cable laying operations at night and the numerous management measures to reduce light spill impacts to birds are included in various EPRs and other management controls (see below).

The reduced lighting of the cable lay ship should be placed in perspective with numerous other more brightly lot nighttime lighting sources in Bass Strait that may coincide with cable lay operations, such as passing cruise ships, the MV *Spirit of Tasmania I* and MV *Spirit of Tasmania II* ferries, and the offshore Yolla Platform and which will perceived as light-sensitive nocturnal seabirds and migrating terrestrial birds.

Artificial light spill from the cable lay ship and other project vessels will be reduced by minimising lighting and light spill during construction under **EPR MERU10** (Develop and implement measures to minimise impacts on marine fauna and avifauna due to lighting). These light mitigation measures are designed to meet the project EPR objectives for reducing nighttime lighting impacts on albatrosses and petrels to an acceptable level.

EPR MERU10 complies with the National Light Pollution Guidelines for Wildlife provide information on the management of artificial light on marine turtles, seabirds, and migratory shorebirds (DCCEEW, 2023) provide technical information to guide the management of artificial light for the EPBC Act listed threatened and migratory species, species that are part of a listed ecological community, and species protected under state or territory legislation for which artificial light has been demonstrated to affect behaviour, survivorship, or reproduction. Key measures in **EPR MERU10** for reducing Project vessel light spill include:

- Minimising lighting where practicable and where safety is not compromised, minimise the number of lights, the intensity of lights, and the amount of time lights are turned on.
- Directing lighting to where it is needed and avoid general area floodlighting.
- Limiting area and deck lighting to the amount and intensity necessary to maintain deck crew safety.
- Directing lighting inboard and downward (where possible) to reduce the potential for seabird attraction.
- Avoiding direct lighting of the sea surface and minimising indirect lighting on the sea surface to the extent practicable.

The above management measures would include routine inspections of lighted areas of the cable lay vessel and other night-time operating vessels for birds that may have been attracted.

The National Recovery Plan for Albatrosses and Petrels (DCCEEW, 2022b) identifies artificial lighting as a threat to albatrosses and petrels due to interactions with offshore installations and ships, which can lead to avoidance behaviours and collisions with vessel decks and superstructure potentially resulting in a bird being killed or injured. However, in terms of threats from interactions with offshore installations and ships (including lighting), the National Recovery Plan indicates that the number of affected albatrosses and petrel species, and prioritisation within Australia's jurisdiction, was zero.

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) provides more detailed risk analyses of nighttime article lighting risks to nocturnal seabird species.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

(b) Nighttime lighting risks to sea turtles

Most studies on sea turtles in relation to nighttime lighting on offshore platforms found that artificial lighting impacts to sea turtles were conducted at nesting sites, where artificial lighting effects were related hatchling orientation success during migration from nests to the open ocean.

In the case of the sparse distribution and low density of sea turtles in the Project area and wider Bass Strait, reduced light spill from the cable lay ship to these predominantly subadult and adult sea turtles are not predicted. Therefore, potential project artificial lighting impacts on sea turtles passing through Bass Strait have been excluded and are not considered further.

As noted above, artificial light spill from the cable lay ship and other project vessels will be reduced by minimising lighting and light spill during construction under **EPR MERU10** (Develop and implement measures to minimise impacts on marine fauna and avifauna due to lighting). These light mitigation measures are designed to meet the project EPR objectives for reducing nighttime lighting impacts on sea turtles to an acceptable level.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

7.6 Invasive Marine Species risks

Invasive marine species introductions and spreading impacts may occur during the Project's construction, operation, and decommissioning phases. The principal risks assessed include the potential introduction of new IMS or the translocation of existing IMS between ports and different areas of Bass Strait between Tasmania and Victoria.

(a) Potential IMS introduction sources

Based on the National Introduced Marine Pest Information System (DAWE, 2021b), 21 species have been recorded in Victorian waters, 15 species in Tasmanian waters and nine species in the Commonwealth waters of offshore Bass Strait.

The principal sources and consequences associated with the unplanned introduction of IMS include:

- Vessels to be used during project construction have the potential to carry IMS via their ballast waters and hulls, depending upon the origin of the vessels or previous ports.
- Discharges of ballast water that may contain the planktonic stages of organisms, free swimming juveniles or adults, fouling organisms attached to the vertical walls of the ballast compartments, and benthic organisms in deposits of sediments that accumulate at the bottom of ballast tanks (Carlton, 2001).
- Release of IMS attached to the exterior hulls and nooks and crannies (e.g., thruster tunnels, rudder specie and water intake port) of the cable lay ship or other project vessels when on location in Bass Strait.
- Construction vessels moving between southeastern Australian ports may translocate existing IMS, which are typically found at higher numbers of species and densities within ports and harbours.
- Targeted rock placement and/or the use of concrete mattresses to cover exposed or shallow buried cables (i.e., less than 1 m) and at cable crossings of third-part seabed infrastructure provide hard substrate seabed that has the potential to be colonised by both native and introduced IMS (or spread of existing established IMS) that prefer hard substrate for attachment.
- If introduced IMS become established and disperse within new habitats in the Project area, they have the potential to outcompete local species for space and resources, prey directly on local species, or introduce pathogens.
- IMS also have the potential to introduce pathogens that may infect native fauna.

Pertinent IMS mitigation and management measures are summarised below.

(b) Key IMS mitigation and management measures

Key mitigation and management measures are summarised below for ballast water discharge IMS and biofouling IMS.

Compliance with ballast water management requirements

During project construction, operation and decommissioning, vessel owners must comply with the:

- Australian Ballast Water Management Requirements (DAFF, 2020).
- *Biosecurity Act 2015* (Cwlth).
- International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).
- Maritime and Aircraft Reporting System (MARS) and the Vessel Compliance Scheme (VCS).
- Prepare and submit a Pre-arrival Report (PAR) for answering the ballast water questionnaire from DAFF.
- Non-First Point of Entry (NFP) application v16.
- Ballast Water (BW) report v108.

Ballast water management measures are outlined in **EPR MERU11** (Develop and implement a plan to avoid the introduction of invasive marine species). These ballast discharge water mitigation management measures are designed to meet the project EPR objectives for reducing Project potential introductions of IMS to Bass Strait via ballast water discharges, including potential IMS in ballast tank sediments.

Compliance with Australian biofouling mitigation measures

Compliance of project-contracted vessel owners with the Australian biofouling requirements is viewed and considered as a key mitigation and management measure to reduce the risk of the introduction and spread of IMS. The Biosecurity Amendment (Biofouling Management) Regulations 2021 (Cwlth) requires operators of all vessels to provide information on biofouling management practices prior to arriving in Australia.

The Australian Biofouling Management Requirements (DAFF, 2023) set out vessel operator obligations for the management of biofouling when operating vessels under biosecurity control within Australian territorial seas to comply with the *Biosecurity Act 2015*. Compliance of Project-contracted vessel owners with the Australian biofouling requirements is viewed and considered as a key mitigation and management measure to reduce the risk of the introduction and spread of IMS. The Biosecurity Amendment (Biofouling Management) Regulations 2021 (Cwlth) requires operators of all vessels to provide information on biofouling management practices prior to arriving in Australia.

Project vessel operators can demonstrate proactive management of biofouling by implementing one of the three accepted proactive biofouling management options (DAFF, 2023):

- Implementation of an effective biofouling management plan.
- Cleaned all biofouling within 30 days prior to arriving in Australian territory.
- Implementation of an alternative biofouling management method pre-approved by the department.

Documentary evidence must be available upon request by DAFF and the information will be used to target vessel interventions.

Biofouling standards are set under the Australian Biofouling Management Requirements (DAFF, 2023), Biosecurity Amendment (Biofouling Management) Regulations 2021 (Cwlth), Maritime and Aircraft Reporting System (MARS) and the Vessel Compliance Scheme (VCS).

Anti-fouling of ships and other vessel are managed under the Australian national Antifouling and In-water Cleaning Guidelines (DoA and DoE, 2015). The Commonwealth and state governments are currently working on the development of requirements for managing biofouling.

Project vessel biofouling management measures are outlined in **EPR MERU11** (Develop and implement a plan to avoid the introduction of invasive marine species). These biofouling mitigation management measures are designed to meet Project EPR objectives for reducing potential introductions of IMS to Bass Strait via biofouling vectors.

(c) Assessment of Project-related IMS risks

Residual risks of IMS introductions from Project vessel ballast water discharges and hull biofouling are summarised below.

Residual risks of IMS introductions via ballast water discharges

In general, the discharge of ballast waters constitutes a significant entry route (vector) for IMS introductions to Australian temperate waters, particularly from ships coming from similar temperate water ports in the Northern Hemisphere and arriving in Bass Strait. However, given the abovementioned legislative requirements, guidelines, and standard control measures for managing vessel ballast water, the residual impact of IMS being introduced has been assessed to be a ***Low*** risk. This low risk is based on a likelihood of occurrence of *Possible* (i.e., while a pathway exists, and harm has occurred in similar environments and circumstances elsewhere and may occur over the duration of the Project) and a consequence of *Minor* (i.e., given that IMS introduction could be effectively mitigated through standard management controls).

The assessed low risk of IMS introductions may be also considered in the light of the limited number of overseas ships (e.g., the cable lay ship) that will be involved in the project compared to the much larger numbers of maritime traffic from varied overseas ports to southeast Australian port including those in or near Bass Strait. In addition, adherence to the BWM Convention's requirement to exchange ballast water at least 200 NM from land and in water at least 200 m deep reduces the potential for IMS introductions when the ships arrive in the Commonwealth and state waters of Bass Strait.

Residual risks of IMS introduction via vessel biofouling

Hull biofouling is likely to be a significant vector for translocation of existing IMS in Bass Strait and and potential new IMS introductions to Bass Strait. However, risks associated with Project vessel hull biofouling and IMS are difficult to assess and quantify. There will only be a small number of Project vessels when compared to the intense maritime traffic of merchant ships, fishing vessels, specialised vessels, recreation craft, fishing vessels, cruise ships and ferries that ply the waters of Bass Strait and visit ports where most biofouling organisms are found. Project vessels in local ports will generally have short stays, which reduces their exposure to port biofouling organisms including those IMS that prefer underwater habitats structures such as pier pilings and walls, which may be adjacent to ships' hulls.

Overall, given the abovementioned legislative requirements, guidelines, and standard control measures for managing vessel hull cleaning, he potential for IMS being introduced and becoming established (or an existing IMS being spread) and harming native marine fauna has been assessed to be a ***Very low*** risk. This is based on a likelihood of occurrence of *Unlikely* (i.e., a pathway exists, and harm has occurred in similar environments and circumstances elsewhere but is unlikely to occur over the duration of the Project) and a consequence of *Negligible* (i.e., a localised effect that is temporary and does not extend beyond operational area).

Residual risks of IMS colonisation of new habitat

Most of the project's subsea infrastructure (i.e., individual or bundled HVDC cables and optical fibre cables) are buried in soft-sediment seabed and do not present a source of hard substrate for colonisation by native benthic fauna or IMS that prefer for hard substrates (e.g., exotic molluscs). However, targeted rock placement and/or concrete mattresses will be used at the crossings of third- party subsea assets (e.g., pipelines or telecommunication cables) or at locations where the cables are insufficiently buried (i.e., less than 1 m burial depth). The presence of new habitat presented by rock placement and/or rock mattresses has the potential to be colonised by both native and existing IMS, which prefer hard substrates.

Nearshore Victoria

Given the low presence and diversity of existing IMS in nearshore Victoria, most colonisers are anticipated to be native benthic fauna, which may be expected to outcompete potential introduced IMS.

IMS such as the European shore crab with established nearshore populations may take advantage of project areas of newly formed hard substrate habitats. However, given the sparse distribution and very low densities of the European shore crab in nearshore Victoria (Waratah Bay), the very small areas of rock placement and/or rock mattresses required by the Project, it is assessed that there is a ***Low*** risk of IMS introduction and colonisation of newly formed hard substrates at Project cable crossings of third-party subsea infrastructure. This is based on a likelihood of occurrence of *Possible* (i.e., while a pathway exists, and harm has occurred in similar environments and circumstances elsewhere and may occur over the duration of project life) and a consequence of *Minor* (i.e., given that IMS colonisation of new hard substrates could be effectively mitigated through standard IMS introduction management controls).

Offshore Bass Strait

There are few records of IMS in the seabed of offshore central Bass Strait, though it is likely that European shore crabs may occasionally occur as they are continuing to spread naturally by their planktonic life stages to the nearshore seabed of the offshore islands of Bass Strait. For example, the Atlas of Living Australia (CSIRO, 2022) shows a sighting for this species on southern Flinders Island near the port of Lady Barron.

New hard seabed habitat will be created by the rock fill or rock mattresses that the project will place at the two crossings of Alcatel's Indigo Central telecommunications cable by the bundled cables of the ML1 and ML2 monopoles. These represent two small areas (about 300 m^2 each) in a vast expanse of surrounding sandy seabed. Given the inferred very low presence of deepwater IMS in offshore Central Bass Strait, most colonisers of the hard substrate of the project's cable crossings in offshore Bass Strait are anticipated to be native benthic fauna, which may be expected to outcompete any potential IMS settling on the newly formed hard substrate habitat at the Alcatel cable crossing.

Overall, it is assessed that there is a ***Very low*** risk of IMS introduction and colonisation of newly formed hard substrates in offshore waters given the very small areas of rock placement and/or rock mattresses required by the Project's bundled cable crossings of the Telstra Bass Strait 1 cable in Waratah Bay (nearshore Victoria) and the Alcatel Indigo Central cable. This is based on a likelihood of occurrence of *Unlikely* (i.e., a pathway exists, and harm has occurred in similar environments and circumstances elsewhere but is unlikely to occur over the duration of the project life) and a consequence of *Negligible* (i.e., given that IMS colonisation and spread to new hard surfaces in offshore waters could be effectively mitigated through standard IMS introduction management controls).

Residual risks of translocation and spread of existing IMS

The presence of the principal existing IMS in Victorian nearshore waters and seabeds was assessed for potential translocation and spreading impacts, which are summarised below. There are few offshore IMS except the European crab (*Cancer maenas*) that has spread to some of the offshore islands in Bass Strait.

Nearshore Victorian existing IMS and spreading risks

Existing IMS known to occur in Waratah Bay or along the coastal waters west of Wilson Promontory include the European shore crab (*Carcinus maenas*), Northern Pacific seastar (*Asterias amurensis*), New Zealand screw shell (*Maoricolpus roseus*) and the Pacific Oyster (*Crassostrea gigas*). The latter three IMS occur along the western coast of Wilsons Promontory and located between 13 and 18 km from the Project's nearest eastern (ML2) alignment and are unlikely to be disturbed by Project vessels. However, the European shore crab is recognised as an established marine pest of national significance (ABARE, 2019) and this species is found in Waratah Bay. Based on the above IMS distributions, the potential for translocation appears to be a higher risk only for the European shore crab and the assessment of risk is summarised below.

European shore crab translocation and spreading risks

- the European shore crab is an established IMS in Victoria and this species may be considered as a continuing threat to native fauna with the potential for further rapid expansion of both its geographic range and population densities.
- It is possible that this species spread naturally from ports in Victoria (Port Philip Bay and Westernport) via introductions by ships from Europe and has subsequently spread along the Victorian southeast coast by natural larval dispersal from established populations (Thresher et al., 2003).
- The European shore crab occurs in waters up to 60 m deep and prefers bays, inlets, subtidal seagrass areas, and intertidal rocky platforms and reefs. This crab is a benthic species so is unlikely to come into direct contact with Project vessels, and only likely to be disturbed by cable installation and burial during construction and disturbed during cable removal (if this decommissioning option is selected) which result in highly localised displacements only.

Overall, given the sparse distribution and very low densities of the European shore crab in nearshore Victoria (Waratah Bay), this species has been assessed to have a ***Low*** risk of being translocated and spread by the Project's proposed marine construction activities in nearshore Victoria. This is based on a likelihood of occurrence of *Possible* (i.e., while a pathway exists, and harm has occurred in similar environments and circumstances elsewhere and may occur over the duration of Project) and a consequence of *Minor* (i.e., given that shore crab translocation could be effectively mitigated through standard management controls).

The spread of the European shore crab is anticipated to be mainly by natural larval propagation, which is independent of the Project's fleet vessels during construction, pertain and decommissioning.

Implementation of the mitigation and management measures outlined in **EPR MERU11** (Develop and implement a plan to avoid the introduction of invasive marine species) are designed to meet the project EPR objectives for reducing Project potential introductions of IMS to Bass Strait via ballast water discharges and biofouling.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

7.7 Update to cumulative impact assessment

Since EIS/EES publication in May 2024, there has been an update to the offshore wind energy Feasibility Licence (FL) areas, which now number 12 compared to the proposed five offshore wind energy projects assessed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix EIS/EES). However, not all updated FL areas have been considered, only the Gippsland Skies FL area has been addressed at this late stage of the EIS/EES process, owing to its intersection by part of the route of the Marinus Link alignment. The Gippsland Skies FL area is described and assessed in **Section 5.1** (Departures from the findings or opinions) of this witness statement.

(a) Cumulative impacts

Cumulative impact assessment considers the additive impact of the primary activity (i.e., the current project) and third-party activities. This report assessed the cumulative impacts of the project in relation to existing third-party seabed assets (e.g., pipelines and telecommunication cables) and foreseeable future third-party projects (e.g., currently proposed oil and gas projects and offshore wind farm projects). The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) considered five third-party projects that could interact with the Project; however, this has now been increased to six third-party projects:

- Star of the South Offshore Wind Project (SOTS).
- Great Eastern Offshore Wind Project (Corio Generation).
- Greater Gippsland Offshore Wind Project (BlueFloat Energy).

- Seadragon Wind Project (Flotation Energy).
- Gippsland Skies Offshore Wind Energy Project (Gippsland Skies).
- Yolla Infield Well Project BassGas Project (Beach Energy).

During project construction, cumulative impacts may occur in relation to general maritime traffic (i.e., continuation of existing background traffic) and future third-party offshore wind project vessel traffic (transiting across Marinus Link on the way to those projects) creating a cumulative increase in underwater noise with Marinus Link construction vessels.

Given the large distances of more than 78 km between Marinus Link and those offshore wind projects located in the Commonwealth Declared Area (Part 1) and the temporary nature of project construction vessel noise overlapping with vessels transiting to those other projects, cumulative low frequency underwater noise impacts to marine fauna are assessed as between ***Low*** and ***Very low***. As noted in Section 5.1 of this witness statement, potential underwater noise cumulative impacts of the Project with the construction of the Gippsland Skies FL area Licence area (refer to Figure 5-1 in this witness report), communications between the two projects' proponents/owners and potential cumulative impacts could be avoided by:

- MLPL consulting with Gippsland Skies Pty Ltd (and vice versa) to work around the very short periods when the Marinus Link subsea cables are laid (maximum of around 10 hours per monopole) or the bundled cables installed and buried (maximum of 72 hours per monopole).
- Gippsland Skies Pty Ltd consulting with MLPL regarding its proposed timing for seabed surveys and marine construction activities.

Given the likely timeframes (e.g., late 2028 for ML1 and 2031 for ML2) and relatively short duration of Marinus Link construction activities within the Gippsland Skies FL area, cumulative impacts of the two projects can be avoided or minimised by developing and implementing EPR management plans from both proponents/owners and by clear consultation and communications between the two proponents/owners.

No electromagnetic field interactions between the Project's HVDC cables and the inter-array field cables within the offshore wind farms or export cable(s) within nearshore Victoria are predicted or, given that there will likely be a required separation distance of at least 1 km between the current project and any future wind farm project (as per the separation buffer between Star of the South and Basslink).

One of the proposed export power cables from the Gippsland Skies FL to Cape Liptrap crosses the Marinus Link alignment. In this case, it is anticipated that Gippsland Skies Pty Ltd will develop an EPR for its cable crossings of third-party seabed infrastructure (in this case the Marinus Link), which includes consulting with MLPL to agree on an export cable crossing method.

Relevant Marinus Link EPRs and their mitigation and management plans that serve to minimise interaction with offshore wind energy projects and minimise cumulative impacts include:

- **EPR MERU06** (Develop and implement a marine communication plan), which includes:
  - A protocol for notifying the AMSA of the proposed locations, timing and duration of proposed marine construction activities. The information given to AMSA would be available as a notice to mariners and therefore Gippsland Skies Pty Ltd.
  - A protocol for informing the Australian Hydrographic Office of the locations, dates, times and duration of proposed marine construction activities.
  - An approach for compliance with AMSA Marine Orders Part 30 (Prevention of Collisions), AMSA Marine Orders Part 59 (Offshore Support Vessel Operations) and the convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs).
- **EPR MERU13** (Notification of the final subsea project alignment), which includes at the completion of marine construction:
  - MLPL must inform the Australian Hydrographic Office and the Victorian Department of Energy, Environment and Climate Action of the locations and coordinates of the final

subsea project alignment to enable the Australian Hydrographic Office to publish Notices to Mariners to inform maritime users of the presence of seabed power cables and mark them on navigation charts. These navigation charts will be available to the captains and skippers of vessels contracted by Gippsland Skies Pty Ltd for its offshore wind energy project.

Overall, cumulative impacts have been assessed to have residual impact significance ratings ranging from ***Low*** to ***Very low***.

Implications for Environmental Performance Requirements

No changes to the EPRs are recommended.

7.8 Amendments arising from the Supplementary Report

The Supplementary Report in Section 5.1 included a reference to MLPL's Marinus Link Information Update #1 (timing of Stage 2), which made changes to the timing of Stage 1 and Stage 2 of the Project.

Based on my Supplementary Report entitled "Marinus Link supplementary impact assessment - revised timing of stage 2, Letter Report prepared by EnviroGulf Consulting" and dated 26th June 2024, is attached as **Annexure C**. The findings of this letter report were that construction of the marine components of Stages 1 and 2 are physically separate and do not coincide in time (i.e., 2 to 3-years or longer apart) and cumulative impacts are not predicted.

The letter report states that no changes to the thirteen proposed EPRs and their specific associated avoidance, mitigation and management measures presented in the published EES/EIS (Technical Appendix H) are envisaged due to the changed timing of Stage 2.

In conclusion, no amendments to the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) are required.

7.9 Overall impact assessment and EPR adequacy summary

The overall impact and risk assessments and EPR adequacy are summarised below.

(a) Overall impact and risk assessment

In the **Marine Ecology and Resource Impact Assessment** (Technical Appendix H, EIS/EES) the approach taken to assess impacts using the Significant Assessment Method and risk assessments are standard methods for environmental impact/risk assessments of subsea HVDC cable projects. The Significance Assessment Method and qualitative risk assessment method are consistent with the significant impact criteria for various MNES included in the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE 2013).

The overall assessment is based on assessing the residual impacts/risks of the Project to the marine environment, which assumes that all avoidance, mitigation and management measures will be implemented and that the management plans outlined in the EPRs will be developed and implemented.

Overall impact assessment findings

The assessments undertaken in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) show that marine ecology and resource use residual impacts of the Project during construction, operation and decommissioning are mainly restricted to within proximity of the subsea cable alignments and are manageable.

Most of the predicted impacts to the marine biophysical environment have residual impact significance ratings of between ***Very low*** and ***Low***. There were no residual impact significance ratings assessed as ***High*** or greater, which would have corresponded to an adverse environmental impact under the significant impact criteria for various MNES included in the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE 2013). However, a residual impact significance rating of ***Moderate*** was assessed for high frequency (HF) hearing cetaceans to cumulative underwater noise in proximity to the cable lay ship (i.e., the Project's loudest noise source and worst-case scenario), which is discussed further below.

In general, the residual impact significance of ***Moderate*** would initiate a review of the management measures outlined in **EPR MERU08** (Develop and implement a cetacean interaction management plan) to examine whether additional management measures or other mitigations would be needed to reduce the underwater cumulative sound exposure level (SEL_{cum}) impacts to HF cetaceans. However, this was not the case as the problem as NMFS (2018) recommends a maximum accumulation period of 24 hours for a stationary receptor (e.g., an HF cetacean) and maintains a constant distance from a stationary noise source, which is an unlikely scenario. MDA (2023; **Attachment G**: Underwater Noise Modelling in Technical Appendix H of the EIS/EES) selected a shorter cumulation period of one hour to assess cumulative sound exposure level impacts on permanent hearing loss of HF cetaceans but which still resulted in an impact significance rating of **Moderate**. A review of the literature on how other scientists addressed this anomaly in the NMFS (2018) cumulate SEL, as an HF cetacean is unlikely to remain stationary or swim at a constant distance from the cable lay ship as it transits Bass Strait. It is expected that free-ranging and highly mobile HF cetaceans will detect the underwater noise gradient surrounding project marine concentration vessels and, as such, are not expected to closely approach the construction vessels. In the case of a HF cetacean moving away or 'fleeing' from the cable lay ship noise source, rather than remaining stationary or at a constant distance from the cable lay ship, the PTS onset distance is less than 1 metre (Nedwell et al., 2012; Sweeny, 2018; Subacoustech, 2021a,b), which would then be assessed to have a residual impact significance rating of ***Low*** rather than ***Moderate***.

Given the anomaly of NMFS (2018) SEL accumulation period of 24 hours for HF cetaceans and the requirement for HF cetaceans to maintain a constant distance from a Project noise source (i.e., an unlikely scenario), no changes to **EPR MERU08** (Develop and implement a cetacean interaction management plan) as this EPR already takes account of all approaching cetaceans including HF cetaceans.

Overall risk assessment findings

Risk assessments were carried out for invasive marine species (IMS) introduction and nighttime artificial lighting impacts. Analysis of the impact pathways for IMS introduction and nighttime lighting impacts depended heavily on known and proven management measures outlined in the various EPRs for avoiding and reducing risks of IMS and nighttime artificial lighting to the marine fauna and overflying terrestrial migratory birds.

Based on this knowledge and assumed full implementation of these management measures and associated EPRs, the risks were assessed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) assessed the residual risks as ranging from ***Very low*** to ***Low***. No adverse impacts or risks were predicted during Project construction, operations, or decommissioning.

7.10 Overall EPR adequacy

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) presented 13 EPRs, which list mitigation and management measures to avoid or reduce potential impacts/risks of the Project to marine fauna and marine resource uses.

In general, most of the EPRs contain a commitment to "*develop and implement*" the various management plans outlined in each EPR. This indicates that the EPR management measures will be revisited and may be further developed on a case basis with the potential to include additional management measures. This is to be expected given that if the Project is approved, MLPL will engage and consult with its preferred contractors to develop the Project, and the EPRs will be enhanced to take account of new knowledge gained when the Project's fleet of vessels, cable installation and burial methods, and specialised equipment are made known.

For the purposes of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES), the various key mitigation and management measures outlined in the EPRs are based on a solid foundation and knowledge base of marine construction activities and what management measures have been shown to be effective in avoiding or reducing potential impacts and/or risks arising from pipeline or electric transmission cable installations in Australia and worldwide.

8 Submissions

I have been requested to review those public submissions provided to me by Herbert Smith Freehills as relevant to my area of expertise.

8.1 Submissions received

Herbert Smith Freehills (HSF) provided me with six submissions for responses (i.e., submissions numbers 2, 4, 8, 19, 20 and 21). The submissions are presented in Annexure D and have been redacted to conceal sensitive information.

I have read the HSF-nominated submissions and identified those that are relevant to the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and relevant to my area of expertise. Given the small number (six) of submissions received, the issues raised, and my responses are presented separately under each submission number.

8.2 Summary of issues raised and responses

The comments and issues raised in the submissions are summarised below with my responses to the issues.

(a) Submission 2

Issue#1

Comment/quote:

"Energy development for whole of community benefit should override individual property owner concerns. Issues with potential negative consequences for the ecology of the environment should be carefully managed."

Response to Issue#1:

This submitter's issue relates to "*potential negative consequences for the ecology of the environment"* and appears to be referring to 'terrestrial ecology' rather than 'marine ecology', as the context is land related ("*individual property owners*"). Notwithstanding, management measures for marine ecology and relevant EPRs are presented in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) should the submitter wish to refer to marine ecological and resource use issues.

(b) Submission 4

Only references to marine issues are addressed below and which require a response.

Issue#1

Comment/Quote:

This submitter is "*strongly opposed to the Marinus Link project due to its potentially devastating impact on birdlife, wildlife, and marine mammals in the areas where it is proposed to be established."*

Response:

The potential for *"devastating impacts on birdlife, wildlife and marine mammals"* is highly unlikely given that residual impact significance ratings of between ***Very low*** and ***Low*** were assessed for seabed disturbance impacts on marine habitats and associated benthic biological communities, as well as residual impacts on the water column and associated pelagic marine fauna in the **Marine Ecology and Resource Use** Assessment (Technical Appendix H, EIS/EES).

No significant adverse impacts on marine fauna from underwater noise during construction, operations, and decommissioning are predicted. During operations, no adverse impacts from magnetic fields, induced electric fields, and thermal fields are predicted on marine fauna.

For all phases of the Project, no significant adverse impacts from nighttime artificial lighting from Project vessels are predicted, risks from introductions of invasive marine species (IMS), are assessed to be low, and risks due Project vessel-collisions with slow-moving marine fauna such as whales and sea turtles are assessed to below.

Issue #2

Comment/Quote:

"*The placement of this infrastructure on foreshores, beaches, and in water bodies where fish swim, birds feed, and marine mammals such as whales, sea lions, and penguins live, would expose these environments to noise, vibrations, and other disturbances from heavy equipment."*

Response:

No Project infrastructure will be placed on foreshores and beaches, as the use of horizontal direction drilling (HDD) will avoid impacts on the foreshores and beaches by the undergrounding of the cable in the HDD ducts at landfall.

The underwater noise and physical impacts on water quality of subtidal HDD duct breakthroughs and the installation and burial of cable within the Waratah Bay nearshore environment on marine mammals (e.g., whales, sea lions) and Little Penguins) have been assessed to have residual impact significance ratings of between ***Very low*** and ***Low*** in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H of the EIS/EES), which is in compliance of the MNES Significance Impact Guidelines (DoE, 2013) and therefore no adverse impacts on these marine fauna are predicted.

A residual impact significance rating of ***Moderate*** for auditory damage (onset of Permanent Threshold Shift, PTS) was assessed for cable lay ship underwater noise cumulative impacts to high-frequency (HF) hearing cetaceans; however, this was an anomaly of the NMFS (2018) cumulative exposure method, which requires a receiver (i.e., an HF cetacean) to remain at a constant distance from the noise source for 24 hours, which is an unlikely scenario. In a more reasonable scenario, an HF cetacean would turn away or 'fleeing' from the cable lay ship noise field, rather than remaining stationary or at a constant distance from the cable lay ship, the PTS onset distance will be less than 1 metre (as demonstrated by Nedwell et al. (2012), Sweeney (2018), and Subacoustech, (2021a,b)). In the latter case, a residual significance impact rating of ***Low*** would then be more plausible assessment.

In relation to *"the placement of infrastructure"… in water bodies*", the impacts of cable laying, cable installation and burial, and other marine construction activities on marine fauna are assessed in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) and includes seabed disturbance impacts and underwater noise impacts on marine fauna in Section 7.2.2 and 7.2.3, respectively. Residual impact significance ratings were all between ***Very Low*** and ***Low***, signifying an absence of adverse impacts as defined in the MNES Significance Impact Guidelines (DoE, 2013).

During Project operation, the buried energised HVDC cables will generate direct current (DC) magnetic fields that may be detected by magnetosensitive fauna such as marine fishes (e.g., eels and sharks), whales, sea turtles). The generated magnetic fields from the Project's buried bundled cable are between 17 and 35 μT higher than the natural geomagnetic background level of around 60 μT for power transfers of 375 MW (half transmission capacity) and 750 MW (full transmission capacity), respectively. The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) assessed that impacts on magnetosensitive fauna had residual impact significance ratings of between ***Low*** and ***Very low***. and the HVDC cables' magnetic fields did not act as a barrier to marine fauna movements or migration.

In terms of electric fields, the metal armouring of the HVDC cables is grounded to earth to prevent any direct electric field being generated while the cables are in operation. However, seawater flowing through the HVDC cables' generated DC static magnetic field will induce a corresponding DC static electric field. The induced electric field will reduce rapidly with distance as the HVDC cables' external magnetic field itself is directly proportional to the current in the cables and inversely proportional to the radial distance. In nearshore Victoria, induced electric fields at the seabed and 1 m above the seabed at median seawater flows were between 11.62 and 8.48 μV/m, which ae of similar magnitude to the local natural electric field of 7.33 μV/m at medina flows. The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) assessed that impacts on electrosensitive marine fauna (e.g., elasmobranchs such as sharks, rays, and skates) had residual impact significance ratings of between ***Low*** and ***Very low***.

Issue #3

Comment/Quote:

"The corrosive nature of saltwater is a major concern for the longevity and safety of the Marinus Link equipment. Saltwater corrosion can lead to equipment failures and leaks, posing serious risks to Global Goal SDG 15 (Life on Land)."

Response:

It is noted that in relation to saltwater corrosion, the submitter has referred to the Global Goal SDG 15 (Life on Land), which indicates that the saltwater corrosion issue is related to the land and not the marine environment for Marinus Link equipment. Notwithstanding, the response to Issue #5 below addresses the long-term corrosion of the seabed cables left in situ (if this decommissioning option is selected) and its potential to introduce pollutants, such as chemicals, copper, and electrical components, into the marine environment.

Issue #4

Comment/Quote:

"Moreover, the project conflicts with Global Goal 14 (Life Below Water), which aims to conserve and sustainably use the oceans, seas, and marine resources for sustainable development."

Response:

Marinus Link has developed a sustainability framework to clarify the vision and objectives of the project regarding sustainability, to understand strengths and weaknesses in this area, and to ensure progress, transparency, and accountability by tracking performance against the objectives. The Project's sustainable development issues are addressed in Chapter 9 (Volume 1 of the EIS/EES).

Mitigation and management measures to avoid and/or reduce potential impacts on marine ecology and marine resource uses are presented in the 13 Environmental Performance Requirements (EPRs) described in the Marine Ecology and Resource Use Assessment (Technical Appendix H (EIS/EES).

The impact assessment in Technical Appendix H (EIS/EES) is also in compliance with the EPBC Act Policy Statement 1.1 – Significant Impacts Guidelines – Matters of National Environmental Significance, MNES (DoE, 2013), as no adverse marine ecology impacts are predicted.

Issue #5:

Comment/Quote:

"The Marinus Link Project has the potential to introduce pollutants, such as chemicals, copper, and electrical components, into the marine environment."

Response:

The Marinus Link marine infrastructure is comprised mainly of the subsea cables (two HVDC cables and one fibre optic cable), which will be buried to a nominal 1 m depth in soft seabed sediments (mainly sands). These cables are armoured, insulated and waterproof, and are designed to last for duration of the Project (~ 40 years) and beyond. Saltwater intrusion of the cables is an unlikely scenario.

After Project life, in about 40 years time, the decommissioning options include a) leaving the cables in situ and b) removing the cables.

In the case of leaving the cables in situ (option a), the relatively benign chemical composition of the XLPE-extruded HVDC cables poses a low likelihood of direct chemical contamination to marine or sediment quality. However. in very long-term corrosion of the metallic components of the cables may occur over decades, centuries or millennia. The impacts of long-term corrosion and metal release and consequential effects on bottom water quality and benthic biological communities have been dismissed as an issue by Taormina et al., (2018) who state that heavy metals can potentially dissolve and spread into the sediment from damaged and abandoned cables, but the quantities released are considered insufficient to have significant impacts. Section 7.4.2.1 (Potential impacts if cables are left in situ) of Technical Appendix H of the EIS/EES assesses the residual impacts of this decommissioning option (if selected).

(c) Submission 8

Submission 8 is from [redacted], which was formed in 1989 as a not-for-profit, non-government organisation. It is the peak representative body for Victorian commercial fishing licence holders with a broad membership base encompassing multiple sectors within the seafood supply chain. SIV strives to continue building and informing an ecologically sustainable and thriving seafood industry.

Issue #1

Comment/Quote:

"The proposed 255 kilometres of high voltage undersea cables associated with the Marinus Link Project transition through sensitive habitats important to the life cycle for several species integral to the economic and social benefits derived from Victorian fisheries. Of particular concern is the paucity in knowledge regarding potential impacts of electromagnetic fields (EMFs) associated with transmission cables to the behaviour, migration and recruitment of species such as Southern Rock Lobster (Jasus edwardsii), Giant Crab (Pseudocarcinus gigas), Shortfin Eel (Anguilla australis), Longfin Eel (Anguilla reinhardtii), Gummy Shark (Mustelus antarcticus) and School Shark (Galeorhinus galeus)."

"Several studies have been undertaken globally on the interaction between EMF's associated with offshore electricity production/transmission and physiological and/or behavioural characteristics of marine fauna (2,3,4,5,6. For example, lobsters and crabs that use geomagnetic fields for navigation and homing behaviour have been shown to demonstrate varied responses to EMFs of particular strengths. These behavioural impacts hold implications not only for natural migration processes, but also for commercial fishing yields reliant on decades of experience that has led to a more efficient catch i.e., established fishing grounds where operators return to fish. Other examples of demonstrated impacts of EMFs on marine fauna include disrupted circadian rhythm, altered metabolic cycles and reduced haemocyte counts."

Response:

It is acknowledged that there still a paucity of information on the effects of electromagnetic fields (EMFs) associated with subsea HVDC and HVAC power transmission cables to the behaviour, migration and recruitment of the six commercial fishery target species, this paucity is partially due to a lack of Australian and southern hemisphere laboratory and/or field studies on these six abovementioned species. Given the general absence of such studies, the **Marine Ecology and Resource Use Assessment (**Technical Appendix H, EIS/EES) had to have recourse to the results and findings of EMF effects on marine fauna from northern hemisphere studies as surrogates to assess EMF effects on Australian marine environment and specifically Bass Strait. The following responses to the submission relate to i) decapod crustaceans (southern rock lobster and the giant crab), ii) migratory eels (short-fin and long-finned eels), and iii) cartilaginous fishes (gummy and school sharks).

i) EMF effects on decapod crustaceans

The **Marine Ecology and Resource Use Assessment (**Technical Appendix H, EIS/EES) assessed EMF impacts on marine invertebrates (including decapod crustaceans) separately under magnetic field impacts (refer Section 7.3.1) and induced electric field impacts (Section 7.3.2).

Magnetic field impacts to decapod crustaceans

Magnetic field impacts to marine invertebrates are outlined in Section 7.3.1.2.12 of Technical Appendix H.

In the northern hemisphere scientific literature, magnetic field impacts on decapod crustaceans have been assessed using both laboratory experiments and field studies with caged decapod crustaceans at subsea HVDC cable locations.

Based on the laboratory studies with a high artificial DC magnetic field of 2,800 μT, which is representative of the magnitude of magnetic fields measured at the surface of an unburied HVDC cables (i.e., 2.8 milliTesla (mT), the European lobster (*Homarus gammarus*) revealed deformities and reduction in growth of stage 1 lobster larvae and edible crab (*Cancer pagurus*) zoea stage 1 (Collins, 2020) (refer Table 7-44, Technical Appendix H). In a similar laboratory study Harsanyi et al. (2022) using European lobsters, there were no significant effects on total number of hatched larvae per lobster, no effects on swimming speeds but larval deformities were higher in the 2,800 In a similar laboratory study Harsanyi et al. (2022) using European lobsters, there were no significant effects on total number of hatched larvae per lobster, no effects on swimming speeds but larval deformities were higher in lobster larvae exposed to the same 2,800 μT magnetic field, but mortality rate was significantly lower than the control. However, larval growth was affected (smaller total length). Overall, while there is an indication of some magnetic field effects on European lobsters and edible crabs exposed to these high magnetic fields (2,800 μT and higher), the magnetic field at the seabed overlying the buried subsea HVDC cables of the Marinus Link is considerably lower with a total magnetic flux densities range 77 to 95 μT, compared to the background geomagnetic field of around 60 μT in Bass Strait. The lower magnitude of Project-generated magnetic fields stems from the Project's implementation of the mitigation and management measures outlined in **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cables), which reduces the magnetic fields emitted from the subsea cables at the seabed and in the overlying water column, with consequential reductions of potential magnetic field impacts on magnetosensitive marine fauna.

Table 7-45 (Experimental effects of low DC magnetic fields to marine invertebrates) in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) presents the results of overseas studies using lower magnetic fields that are of similar magnitude as the predicted Marinus Link DC magnetic fields (i.e., 77 to 95 μT range), In summary, findings of these overseas studies indicated that their distribution and exploratory/sheltering behaviour were not adversely impacted by the HVDC cables' magnetic fields, and all test decapods crossed the cables' magnetic fields. A subtle but significant change of American lobster's (*Homarus americanus*) use of space during exposure to 65.3 μT was noted by Hutchison et al. (2018) and that the cable's magnetic field did not present a barrier to movement.

In a more recent field study, Scott et al. (2021) investigated the effects of different strength DC magnetic exposures (250 μT, 500 μT, and 1000 μT) on a commercially important decapod (the edible crab, *Cancer pagurus*). At magnetic field exposures of 500 μT and 1000 μT, stress-related parameters (e.g., disruption of the l-Lactate and d-Glucose circadian rhythm) and altered total haemocyte counts were found in the crabs. The crabs also showed a clear attraction to the magnetic field exposed shelters with a significant reduction in time spent roaming. However, Scott et al (2022) found that magnetic field strengths of 250 μT had limited physiological and behavioural impacts on the crabs. Given the lower predicted DC magnetic fields (maximum range 77 to 95 μT) at the seabed overlying the Marinus Link's bundled HVDC cables, magnetic field impacts on Bass Strait decapod crustaceans (i.e., rock lobsters and giant crabs) are not predicted based on the findings of Scott et al. (2022).

The principal decapod crustaceans showing a magnetosense are those lobsters that undertake very long-distance spawning migrations and suspected of using the geomagnetic field for orientation. The Caribbean spiny lobster (*Panulirus argus*) is a migratory crustacean indigenous to the Caribbean and the southeastern U.S.A. and has a remarkable homing ability, and this species has been demonstrated to sense the geomagnetic field using magnetic map (Boles and Lohmann, 2003). The spiny ornate lobster (*Panulirus ornatus*) in Papua New Guinea also undertakes long-distance migrations from northern Torres Strait coral reefs to spawning grounds in the east of the Gulf of Papua near Yule Island, which is located 510 km to the east of the strait (Moore and MacFarlane, 1984) and is assumed to also have a magnetosense. The southern rock lobster

(*Jasus edwardsii*) in Bass Strait only undertakes short distance movements and has a high site fidelity (Prescott et al. 1997), whereas the giant crab (*Pseudocarcinus gigas)* is more nomadic and undertakes longer distance offshore movements. The abovementioned two Bass Strait decapod species do not belong to the migrating lobster family (Palinuridae), and both these species are unlikely to sense the geomagnetic field for orientation purposes. Their ability to move directly offshore to the continental shelf break in western Bass Strait is based on other sensory cues, such as orientating themselves by way of the ever-present, long period southwesterly swell, which is a major oceanographic feature throughout their range Levings, 2008) and other sensory cues (e.g., olfaction) as well as using hydrographic and geoelectric information could all be used for spatial orientation. In terms of decapod early larval stages (pueruli or zoea) within zooplankton, exposure to the Marinus Link magnetic field will be very transient and no adverse effect are expected.

Induced electric field impacts on decapod crustaceans

A literature review of marine decapod crustaceans and other marine invertebrates did not reveal the presence of electrosensory systems. However, all living organisms generated weak AC and DC electric fields, which can be detected by the electroreceptors of elasmobranchs.

ii) EMF effects on migratory eels

EMF effects on migratory eels are based solely on magnetic field effects since eels do not have electroreceptors that can sense the ambient natural electric field or HVDC cable induced electric fields.

Most studies on the effects of subsea magnetic fields on migratory eels are based on field studies of European eels (*Anguilla anguilla*) migrating across HVDC subsea power transmission cables. A literature review did not reveal any similar studies for migratory southern hemisphere, principally due to a lack of operating long distance HVDC cables. An exception is Basslink cable in Bass Strait (operating for 19 years since commissioning in 2006); however, no specific field experiments have been carried over the last 19 years of operation, despite the opportunities of governments and universities to gain funding to initiate and/or undertake relevant EMF field studies.

In a study by Westerberg and Begout-Anras (2001) undertook a field study of tagged European eels passing over the Baltic Cable (Sweden to Germany) and found a minor course deviation of eels when passing over cable during outmigration from Baltic Sea. The Baltic Cable's DC magnetic field was not a barrier to outmigration of the eels. Based on this field study, Technical Appendix H of the EIS/EES predicted impacts of the Marinus Link's generated magnetic fields on migratory short-finned and long-finned eels may be summarised as:

- Short-finned and long-finned eels passing over the cable near the seabed during daylight hours will be exposed to higher magnetic fields between 17 and 35 µT above the geomagnetic field at the cable locations.
- Both short-finned and long-finned eels are expected to cross the Project's HVDC cable' magnetic fields.
- Short-finned and long-finned eels passing over the cable near the surface at night-time hours will be the least affected by the project's magnetic field, as the predicted levels are at or near background levels.
- The magnetic fields of the project's energised HVDC cables are unlikely to present a barrier to the migration.

As short-finned and long-finned eels approach the Project's buried HVDC cable locations, they will sense the gradient of the magnetic field, which will increase steeply over the cable and then reduce rapidly as the eels' swim away from the cable locations. It is anticipated that short-finned and long-finned eels migrating in deeper waters during daylight hours will perceive the HVDC cable's magnetic field as an anomaly and continue their migration. All eels are expected to cross the cable locations when migrating from the offshore spawning grounds to the rivers as elvers and when leaving the rivers again as adults when migrating to the spawning grounds again.

Overall, the predicted impacts of the project's magnetic fields on short-finned and long-finned eel migrations are assessed to have a residual impact significance rating of ***Low*** based on a sensitivity of *Moderate* due to not being listed as an EPBC Act threatened species and the presence of their magnetosensory system and a magnitude of *Negligible* given that the Project's HVDC cables' magnetic fields reduce to background geomagnetic field levels within about 10 m.

iii) EMF effects on gummy and school sharks

Magnetic field effects

- Sharks can induce an electric field (range 5 to 50 μV/m) around their bodies as they swim through the static DC geomagnetic field, which may allow them to detect their magnetic compass headings. Sharks do this through use of their highly specialised electrosensitive receptors (called 'ampullae of Lorenzini), which are spread across their body surfaces and can detect very low levels of induced electric fields (e.g., 5 nV/cm Kalmijn, 1971, 1978). The detection of these weak electric fields induced around their bodies by swimming through the geomagnetic field is postulated to provide magnetic pointers to help them navigate through their local environment.
- Small distortions in the local geomagnetic field form a pattern of geomagnetic 'ridges', geomagnetic 'valleys', and geomagnetic contours, which may be tracked by cartilaginous fishes. In combination, all these magnetic components and variability could provide a cartilaginous fish with a low-resolution 'magnetic' map (Walker, 2001). The induced electric fields in bottom waters overlying the Marinus Link subsea HVDC cables are expected to be readily sensed by benthic and epibenthic sharks. However, their transient exposure while swimming through the HVDC cable's induced electric field is unlikely to interfere with migration or other long-distance movements of sharks, given the wide range and variability of natural electric fields encountered in Bass Strait.

Electric field effects

- The electric fields induced by ions moving with currents and tidal flow through the DC magnetic fields generated by the Marinus Link HVDC cables overlying bottom waters will be detected by elasmobranch species such as gummy and school sharks. However, the induced electric fields will not be strong enough to repel these species.
- The magnitude of the induced electric fields will fall within the range of the high variation in the naturally occurring electric fields normally experienced by marine elasmobranchs, depending on their location and the time of day with respect to the tidal cycle.
- Other than perhaps some distortion to the electrosensory information received by the elasmobranch for navigation purposes, the effects of these induced electric fields on elasmobranch species in the immediate vicinity of a cable are expected to be minimal (Walker, 2001).
- The wide distribution of shark ampullary electroreceptors, and their responsiveness to low-level bioelectrical signals (emitted by prey species) allows an electrosensitive elasmobranch to sense and capture prey species buried in soft-bottom sediments (Kalmijn, 1974). Therefore, it is anticipated that some benthic elasmobranchs may 'bite' at the soft sediment seabed (surface overlying the Project's buried HVDC cables) in anticipation that a prey item is hidden with the sandy seabed. While the induced electric field stimulates the elasmobranch's electrosensory system, this does not represent a negative impact as the elasmobranch will move on to other areas in search of prey.

Other field studies (e.g., Taormina et al., 2018 and Hutchison et al, 2018) have demonstrated increased exploratory behaviour of caged sharks and other electrosensitive elasmobranch species in the vicinity of subsea HVDC cables. In the case of free-ranging shark that may show an initial attraction to a local distortion in the natural electric field by anthropogenic induced electric field (i.e., sensing a buried prey), they are likely to move on and continue foraging.

Implications for Environmental Performance Requirements

Overall, no changes to **EPR MERU12** (Adopting a HVDC cable design that minimises the electromagnetic fields and heat emitted from the subsea and land cable) are recommended.

Issue #2

Comment/Quote:

"*Appendix H of The Marinus Project EIS includes summaries of available literature from other regions/species as a proxy for assessing likely impacts of EMFs in Australia's Southeast bioregion. This has resulted in a series of assumptions that various Australian species will perceive an abrupt change when passing over cables 'as an anomaly and continue their regular migration path'. Making such assumptions can be problematic when available literature on the impacts of EMFs suggests species specific responses linked to various stages of a species life cycle."*

Response:

A literature review did not reveal any similar EMF studies in the southern hemisphere from subsea HVDC cables or on Australian fauna exposed to anthropogenic EMF in the marine environment. This is not due to a lack of interest by the scientific community or the absence of subsea HVDC cables, as the Basslink HVDC interconnector across Bass Strait has been operating for 19 years since commissioning in 2006. However, during this extended period, no specific laboratory or field experiments have been carried out, despite opportunities of Commonwealth or State governments and universities to gain funding to initiate and/or undertake relevant EMF field studies.

Northern hemisphere analogues such as European eels (*Anguilla anguilla*) and Japanese eels (*A. japonica*) and their southern hemisphere equivalents(e.g., short-finned eels (A. australis) and long-finned eels (*A. reinhardtii*) all belong to the same family (Anguillidae); therefore, their biology and sensory systems should be comparable, including their magnetosensory systems. Similarly, the Bass Strait school shark (*Galeorhinus galeus*) and gummy shark (*Mustelus antarcticus*) both belong to the family Triakidae for which northern hemisphere species share evolutionary history.

In terms of sensing the Marinus Link's magnetic field, Section 7.3.1.2.1 (page 426) of the Technical Appendix H (EIS/EES) states that *"However, sharks swimming through the Project's HVDC cable-generated magnetic fields are anticipated to be exposed to an abrupt change (short but steep gradient) due to the magnetic field being between 17 and 35 μT above the background geomagnetic field at the seabed and to background geomagnetic levels near the sea surface. This is anticipated to be detected as a singular anomaly and unlikely to affect their migration path or perceived as a barrier."* This statement appears reasonable in relation to the gummy shark (a small to medium sized bottom-dwelling shark) and the school shark that is often found near the seabed, as both species are likely to encounter the Marinus Link's bundled HVDC cables' magnetic fields at or near the seabed.

Issue #3

Comment/Quote:

"We ask that careful consideration is given to the lack of knowledge regarding potential impacts of EMFs when assessing the relevance of the impact significance ratings provided in the EIS for bony fish, elasmobranchs and invertebrate species in Victorian coastal waters and the Bass Straight ['Strait'] *region."*

Response:

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) acknowledges either the absence or paucity of field experimental information, data and observations at energised subsea HVDC cable projects or operations. However, existing information has been reviewed, particularly the results from recent studies at the sites of operating HVDC cable systems, most of which are in the northern hemisphere.

Numerous marine animals of the northern hemisphere also belong to the same families or genera of southern hemisphere marine fauna (i.e., marine fauna in Victorian coastal waters and Bass Strait in this case). For example, migratory anguillid eels such as the European eel (*Anguilla anguilla*) and Japanese eel (*A. japonica*) in the northern hemisphere and the Short-finned eel (*A. australis*) and long-finned eel (*A. reinhardtii*) in the southern hemisphere (Bass Strait) share a common evolutionary history and may reasonably be anticipated to respond to geomagnetic fields and artificial magnetic fields magnetic fields in a similar manner. The same applies to the various subpopulations of humpback whales (*Megaptera novaeangliae*), and the North Atlantic right whale

(*Eubalaena glacialis*) in the northern hemisphere and its counterpart the southern right whale (*Eubalaena australis*).

(d) Submission #19

[redacted] provides this submission to inform the Marinus Link Victorian Inquiry and Advisory Committee (IAC) of potential implications of the partial co-location of the Marinus Link Project on land to be occupied by the [redacted]

This submission's issues are all strictly land related with no reference to marine ecology or marine resources uses. Consequently, no response is given to Submission #19.

(e) Submission #20

Submission #20 is from a private individual.

Issue #1

Marinus Link Project's use of ports

Comment/Quote:

Queries on Marinus Link use of ports and onshore laydown and stockpile areas. "*There exists a great concern that ports within Ramsar sites are proposed to be used to facilitate the Marinus Link."*

Response:

This issue is outside my remit and will be responded to by others.

Issue #2

The Marinus link puts at risk the possible resurgence of the export lobster industry.

Comment/Quote:

"It may be deemed by some that the Marinus Link activities are minor, but the issue is not so much direct displacement of the fishing industry, but rather perception by overseas markets, in particular China.

There exists overseas a desire for uncontaminated marine creatures and marine flesh, in particular lobsters.

All that is required is the suggestion of the triple taint of ELECTROMAGNETIC FIELDS, TOXIC, and RADIATION (all words found in the Marinus Link documents) for adverse decisions to be made in China.

The project, as described in the documentation, represents a contribution to the cumulative complexity that many shared marine space developments present to the fishing industry."

Response:

Most rock lobsters are found on both low- and high-profile reefs, all of which are present more than 10 km from the Marinus Link alignments, which are located wholly in sandy seabed. Rock lobsters migrating or moving across the seabed at the Project's buried bundled HVDC cables will experience only transient exposure weak DC magnetic fields of between 77 to 95 μT, compared to the average background natural geomagnetic field of 60 μT. No 'tainting' of rock lobster flesh is expected from such transient or longer exposures to weak magnetic fields.

Issue #3

Electromagnetic fields.

Comment/Quote:

"In addition to the above [i.e., Issue #2], *the subject of Volume 1 Chapter 10 and Appendix A are activities that may lead to physiological or behavioural impacts or mortality to threatened species.*

The intensity, duration and magnitude of the proposed activities will be long-term and likely to lead to a long-term population decrease.

Lifecycle habits are likely to be disrupted at population levels.

Response:

No mortalities to threatened species listed under the Victorian FFG Act or Commonwealth EPBC Act are predicted.

Predicted impacts of the Projects' magnetic fields and induced electric fields are presented in Section 7.3.1 (Magnetic field impacts) and Section 7.3.2 (Electric field impacts), respectively, In the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES). All magnetic and induced electric field impacts on marine fauna had residual impact significance ratings of between ***Very low*** and ***Low***, (refer Table 0-2 (page xiii) in the Executive Summary of Technical Appendix H of the EIS/EES.

The above residual EMF impact significance rating of ***Very low*** to ***Low*** comply with the Matters of National Environmental Significance – Significant impact guidelines 1.1 (DoE 2013). Only residual impact significance ratings of ***High*** or greater in the EIS/EES would indicate significant adverse effects on MNES threatened species but none were predicted.

Issue #4

Underwater noise impacts on pygmy blue whale and other species.

Comment/Quote:

"Noise emissions could disrupt feeding and searching behaviours of pygmy blue whales, limiting an individual's energy reserves and survival.

Noise will prevent individuals of other species from continuing to forage, in terms of both searching for food and actual feeding.

Individuals displaced from foraging areas, and the noise, will impact their ability to meet their resource requirements for reproduction and survival.

Offshore construction over an extended period of time will result in increased noise emissions, and increased turbidity etc.

The activities above may lead to physiological or behavioural impacts or injury/death to migratory species, and lead to behavioural changes in marine fauna or to injury/death of marine species."

Response:

Most of the central and eastern parts of Bass Strait are classified as a possible foraging area for pygmy blue whales (*Balaenoptera musculus brevicauda*), while the western section is a known foraging area. The Marinus Link alignment is in the central part of Bass Strait and therefore intercepts possible foraging areas of the pygmy blue whale. Given the large number pygmy blue whales of the South East Indian Ocean (SEIO) subpopulation occurring at the Bonney Upwelling and the presence of the eastward flowing South Australian Current, the pygmy blue whales from the SEIO subpopulation are the most likely to occur in western and central Bass Strait, and therefore the Project area.

The impact of underwater noise on cetaceans is presented in Section 7.2.3.5 (Acoustic impacts to cetaceans) in the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES). Management measures to avoid or reduce potential underwater noise impacts on cetaceans are included in **EPR MERU07** (Develop and implement a marine fauna management plan.) and specifically in **EPR MERU08** (Develop and implement a cetacean interaction management plan). Therefore, interactions with pygmy blue whales in Victorian nearshore waters and adjoining Commonwealth marine waters are anticipated to be low or very low given their likelihood of occurrence assessed as *Possible*.

The pygmy blue whale belongs to the cetacean family Balaenopteridae, which are all classified as Low Frequency (LF) hearing cetaceans. The predicted acoustic impacts to LF cetaceans in Technical Appendix H of the EIS/EES were all assessed to have residual significance ratings of ***Low***. Overall, adverse acoustic impacts to pygmy blue whales are not predicted.

Issue #5

Erosion and turbidity at Waratah Bay

Comment/Quote:

In Appendix H (Marine Ecology and Resource Use) it is stated, "There is potential for buried project cables becoming exposed due to seabed scour, especially in the more hydrodynamic nearshore environments" (page 448), and the following is identified, "the high-energy hydrodynamic environment of the shallow waters of Waratah Bay" (Page 253).

However, no consideration has been given to the erosion impact of wave action by the installation and presence of a cable.

In addition, there has been little consideration of the plume and increased turbidity from drilling at Waratah Bay.

Response:

The comment that "*There is potential for buried project cables becoming exposed due to seabed scour, especially in the more hydrodynamic nearshore environments"* (page 448 of Technical Appendix H, EIS/EES), is followed by the statement that "*this potential risk will have been evaluated over the 40 years of operations based on periodic surveys or inspections of the cables*." As noted earlier in this witness statement, while strong bottom currents could locally remove the sediment cover and expose the cable, Fugro (2020) noted a lack of megaripples and erosional bedforms, which are generally indicative of strong bottom currents, in nearshore Victoria (Waratah Bay). Therefore, buried cable scour and exposure in nearshore Victoria is assessed as a very low risk.

In response to the submitter's comment relating to, "*the high-energy hydrodynamic environment of the shallow waters of Waratah Bay"* (Page 253), this relates to the effects of turbulence generated by waves and tidal flows in the the nearshore environment of Waratah Bay, which can cause wave-generated orbital velocities that penetrate the water column to the seabed in more shallow waters less than the 10 m depth where the HDD marine exit hole breakthroughs occur. In waters shallower than the 10 m, the Marinus Link cables will be undergrounded (i.e., located within the HDD ducts) and therefore not exposed to potential erosion and scour in this shallow water zone.

In response to *"no consideration has been given to the erosion impact of wave action by the installation and presence of a cable",* the Project's cable will be installed and buried in the seabed by a Helix T-1200 trencher operating in burial mode (or equivalent remotely operated vehicle (ROV) machine), and the cable installation and burial operation does not interfere with wave action at the sea surface. The presence of the buried cable does not affect bottom currents or seawater flows. Erosion by active surf and wave action in nearshore waters less than 10 m water depth (i.e., location of HDD marine exit holes) do not affect the Projects cables that will be undergrounded in their respective HDD ducts within this active surf and wave action zone.

In response to the statement that *"there has been little consideration given of the plume and increased turbidity from drilling at Waratah Bay",* the impacts on water quality and turbidity from HDD drill breakthrough at 10 m water depth (including remnant drilling fluids) are addressed in Section 7.2.2.1.2 (Long trajectory HDD impacts on nearshore environment) in Chapter 7 (Impact Assessment) of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES. Given the very small volumes of drilling fluid released and turbidity plumes from HDD breakthrough in the subtidal nearshore environment, detailed numerical modelling of turbidity plumes is not generally required compared with much longer-term discharges of sediment plumes associated with, say, a dredging operation.

(f) Submission #21

Submission from the Victorian Department of Energy Environment and Climate Action (DEECA)

Comments/Issues:

The seagrass present within the project area is the Tasman grass-wrack Heterozostera tasmanica which is a listed species under the FFG Act, a permit under the FFG Act will be required for any impact to this species.

Response:

It is noted that a permit under the FFG Act will be required for any impact on the Tasman grass wrack (*Heterozostera tasmanica*).

9 Environmental Performance Requirements

The **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) recommended 13 EPRs as relevant to the marine environment of the Project. The various EPRs have been referred to in previous sections (Section 6 above) of this witness statement and are not repeated here.

Overall, the EPRs and contained explicit avoidance, mitigation, and management measures are considered adequate for avoiding or reducing potential impacts and/or risks of the Project to marine ecology and marine resource uses. The mitigation and management measures outlined in the EPRs were adequate for the purposes of assessing the environmental impacts and risks of the Project.

None of the public submissions reviewed have identified any specific marine ecological or resource use impacts that should be considered unacceptable or require modification of the avoidance, environmental management and mitigation measures proposed to underpin the marine EPRs presented in the published **Marine Ecology and Resource Use Assessment** (Technical Appendix H in EIS/EES).

I have no recommendations or amendments to update the 13 EPRs at this juncture. However, given that the EPRs intend to “develop and implement” various mitigation and management measures in line with present environmental law and regulations, it is inevitable that the mitigation and management measures may be further enhanced as more detailed information on the Project’s construction vessels and equipment are gathered.

10 Conclusion

Overall, the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) determined that the impacts associated with construction, operation and decommissioning of the Project will be manageable, given the implementation of standard management and mitigation measures to comply with EPRs. A high level of confidence has been given to the assessment conclusion that no short-term or long-term adverse impacts to threatened species under the Commonwealth EPBC Act, Victorian FFG Act, and Tasmanian TSP Act are anticipated from the construction, operation, or decommissioning of the Project. This concurs with the observations and findings of similar projects that observed no adverse biophysical impacts, including Basslink (Tasmania to Victoria) and the Swepol Link (Sweden to Poland interconnector).

A high level of confidence can be placed on the findings of the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) based on experience gained at other subsea HVDC cable projects and operating HVDC interconnectors.

Overall, the **Marine Ecology and Resource Use Assessment** (Technical Appendix H, EIS/EES) has assessed that Project construction, operations and decommissioning impacts are not predicted to adversely impact upon on any threatened species of flora and fauna listed under the Commonwealth EPBC Act’s threatened species, threatened ecological communities, listed migratory species and listed species, as well as the threatened species listed under the Victorian FFG Act.

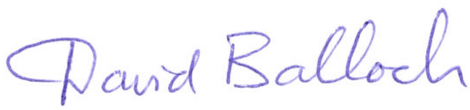
11 Declarations

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

If I am presenting evidence from a different location by video conference, I confirm that:

- I will be alone in the room from which I am giving evidence and will not make or receive any communication with another person while giving my evidence except with the express leave of the Panel.
- I will inform the Panel immediately should another person enter the room from which I am giving evidence.
- During breaks in evidence, when under cross-examination, I will not discuss my evidence with any other person, except with the leave of the Panel.
- I will not have before me any document, other than my expert witness statement and documents referred to therein, or any other document which the Panel expressly permits me to view.

Signed by David Balloch



Signed: ______________________________

27 August 2024

Dated: ______________________________