

# Inverloch Region Coastal Hazard Assessment

## Risk and Vulnerability Report Summary October 2022

Improving our ability to plan, manage and prepare for the impacts of coastal hazards between Cape Paterson and Cape Liptrap, delivered as part of the Cape to Cape Resilience Project.



As part of the Cape to Cape Resilience Project, Alluvium Consulting brought together the technical, strategic and engagement findings to provide an appreciation of risk and vulnerability of values and assets in the Cape to Cape region.



Exploring place-based coastal hazard vulnerability and risk allows us to consider how coastal processes might impact what we value.

Coastal adaptation needs and priorities can then be informed by a sound understanding of the impacts of coastal hazards now and into the future

### Risk and Vulnerability Assessments

In Fact Sheet 5 we provided background on the methods we have used to assess coastal risk and vulnerability for the Cape to Cape Resilience Project.

This Risk and Vulnerability Report has applied the methodology to the data gathered during the project. The report has looked at the coastal erosion and inundation hazard mapping and where the things and places we value (like public and private assets, infrastructure, cultural and social values) are located, and, using spatial analysis, determined when they are likely to be exposed to the hazards.

Consequence (the impact or outcome of being exposed to the hazard/s) categories and ratings were tailored based on local community and stakeholder feedback, including the cultural and community values studies.

A value or asset’s likelihood of exposure (under what storm events/scenarios and when) was then combined with the consequence of that exposure to determine the risk of the impacts.

This approach allows us to:

- assess the risk for individual assets
- identify hot spots
- identify changing exposure and risk profiles for different locations from present day to 2100
- review these cumulative impacts over time; and
- develop a strategic risk assessment to help target areas to plan for adaptation.

### Asset Types & Themes

We grouped assets into types and themes to help us develop a regional risk assessment. See Figure 1 below.

When mapping the hazard layers with the asset/values layers, the exposure analysis results are based on no adaptation interventions – which allows us to work out where best to focus adaptation planning.



Figure 1. Asset types/themes groupings



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## Consequence categories

We reviewed risk management approaches from DELWP, the Victorian Government, and RaSP partner agencies, and looked at similar assessments for coastal adaptation planning around Australia. We combined these with feedback from community and stakeholder engagement and developed the categories listed below. We then assigned consequence ratings (from negligible through to extreme) and described what they might look like for the categories of:

-  Culture & Country (cultural landscapes)
-  Environment (environmental values)
-  Community and Lifestyle (lifestyle, access & public safety)
-  Place & Planning (property & infrastructure, economy & growth)

## Risk Matrix

Based on risk management processes used by DELWP, the Victorian Government, and RaSP partner agencies, a risk matrix was tailored using standard likelihood ratings (likely, possible, unlikely, and rare). This helps to prioritise how and when we might undertake adaptation actions to manage risks.

Different classes of assets (like public infrastructure, buildings, environmental values, and cultural values) were viewed on maps with overlays of the coastal hazard extents (inundation & erosion scenarios) (Figure 2) and assigned likelihood and consequence categories, with risk for each asset calculated.

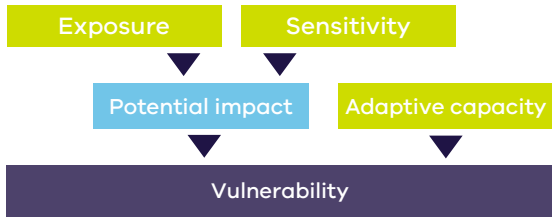


## Vulnerability & Risk Assessment

The vulnerability of coastal assets and values was analysed by assessing how exposed they were to the hazards, how sensitive they were to the exposure, what the impacts of that could be and whether they had some ability to adapt.

This risk analysis provides key information on the different types of hazard risk, and the timing of emerging risks. This is important to inform appropriate adaptation measures, and when and in what order to implement them.

The risk profile is intended to help with the next stage of engagement around adaptation pathways and resilience planning. It will help us to understand the timing of adaptation responses and where they should be prioritised to reduce risk.



## Risk Assessment: Regional

The vulnerability and risk assessment was applied at a region-wide scale for erosion, permanent inundation and temporary (storm tide) inundation, with three main reporting areas: Inverloch; other parts of Bass Coast Shire within the study area (but excluding Inverloch); and South Gippsland Shire. The Inverloch coast was further divided into sub-localities.

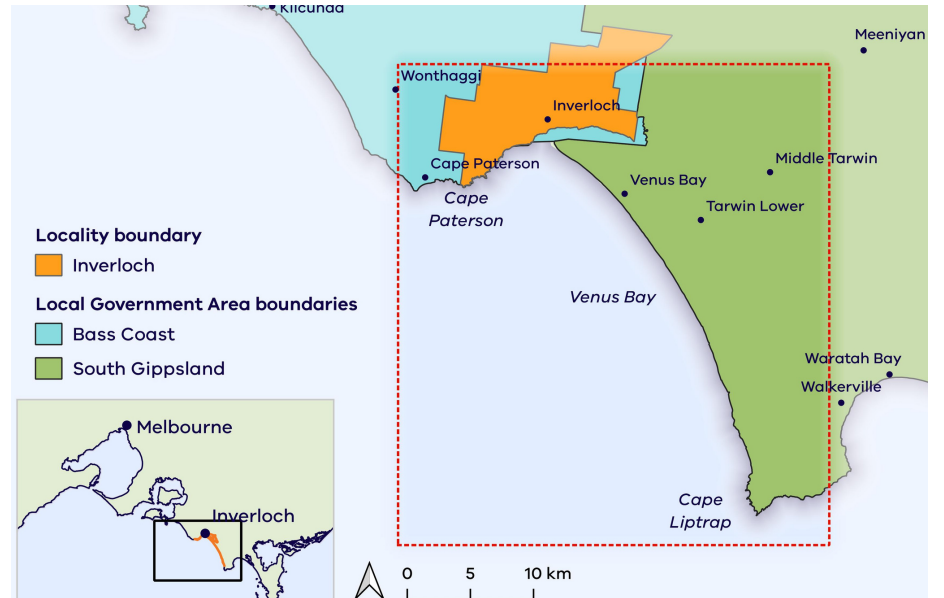


Figure 2. Sub-region split for risk and vulnerability assessment with red dotted line indicating approximate extent of exposure and risk analysis.

Table 1. Risk rating for regional locations

	Erosion				Permanent inundation				Temporary inundation			
Sea Level	Present day	2040	2070	2100	Present day	2040	2070	2100	Present day	2040	2070	2100
Planning horizon	0.0m SLR	0.2m SLR	0.5m SLR	0.8 m SLR	0.0m SLR	0.2 m SLR	0.5m SLR	0.8 m SLR	0.0m SLR	0.2m SLR	0.5m SLR	0.8m SLR
Inverloch	Med*	Sign*	Sign*	High	Low	Low	Med	Med	Med	Med	Sign	Sign
Bass Coast Shire (excl. Inverloch)	Low	Low	Low	Med	Low	Low	Low	Med	Low	Med	Med	Sign
South Gippsland Shire	Low	Low	Med	Med	Med	Med	Sign	Sign	Med	Med	Sign	Sign

SLR Sea level rise  
\* at some locations within the area

Risk rating:	Low	Medium	Significant	High
	Low	Med	Sign	High

# Inverloch Region Coastal Hazard Assessment

## Summary of regional risk assessment

### Inverloch

- Notable increases in coastal hazard risk at Inverloch for all three hazard types by 2070.
- Erosion is generally the dominant risk for Inverloch.
- Known erosion hot spots in the present day, with risk significantly increasing by 2070, posing risks to built-up areas and its utilities, roads, buildings and environmental values. This also puts reliable access and services at risk, and this risk continues to increase to 2100.
- Existing risk from temporary inundation, again impacting built up areas and utilities, with risk set to increase. Permanent inundation poses a lower risk now but increases to medium risk by 2070.

### Bass Coast Shire (excl. Inverloch)

- Temporary inundation is the dominant risk, with risk currently low, but increasing by 2040 and again by 2100.
- Risk from erosion and permanent inundation remains low, until 2100

### South Gippsland Shire

- Temporary inundation and permanent inundation are the dominant risks, currently at medium for each of these, increasing to significant by 2100.
- Risk from erosion remains low, until 2070 when it increases to medium.
- Temporary and permanent inundation put large areas at increasing risk, with risks to land use (including conservation and farming areas) and environmental values (including mangroves, saltmarsh and other coastal and estuarine vegetation).
- Key access routes and some utilities are also at risk.

## Risk Assessment: Inverloch Sub-localities

Inverloch coast has been assessed throughout the Cape to Cape Project in greater detail than the broader study area. This is to enable responses to the recent erosion on the foreshore which, for some of the area, also has greater exposure of values and assets and higher risk ratings. To do this in a more detailed way, and inform the development of adaptation response, the area was split further into six sub-localities.

## Summary of Inverloch sub-localities risk assessment

### Flat Rocks to Wreck Creek (Bunurong Rd)

- Erosion risks medium to 2040, then increasing to significant in 2070 and 2100.
- Permanent inundation risks are low out to 2100.
- Temporary inundation risks are medium out to 2100.
- Key value/use/asset at risk of impacts are access (roads), public/traffic safety, linear utility infrastructure in road reserve and a reduction or loss of visual amenity

### Inverloch Surf Beach

- Erosion risks medium to 2040, then increasing to significant in 2070 and high at 2100.
- Permanent inundation risks are low out to 2100.
- Temporary inundation risks are low at present day increasing to medium at 2040 to 2100.
- Key value/use/asset at risk of impacts are reduction in amenity and recreation of sandy beach, reduction/loss of hazard buffer in parts, ecosystems, public utilities (services & roads) and facilities (surf life saving club), access disruption (roads) and private property/assets (flooding via Wreck Creek and erosion at Surf Parade).

### Coastal Reserve (inlet entrance to The Glade)

- Erosion risk low at present day, increasing to medium at 2040 and 2070, and significant at 2100.
- Permanent inundation risk low out to 2100.
- Temporary inundation risks are medium out to 2100.
- Key value/use/asset at risk of impact are access disruption (roads), ecosystems (including freshwater systems), public utilities (services, roads, sewerage) and facilities (carpark, amenities).

### Inverloch Boat Ramp

- Erosion risk low out to 2100.
- Permanent inundation risk low to 2070, then medium to 2100.
- Temporary inundation risks low at present day, increasing to medium out to 2100.
- Key value/use/asset at risk are access disruption (ramp/roads/parking), public utilities (services, sewerage pump station), ramp functionality during storm/high tide events.

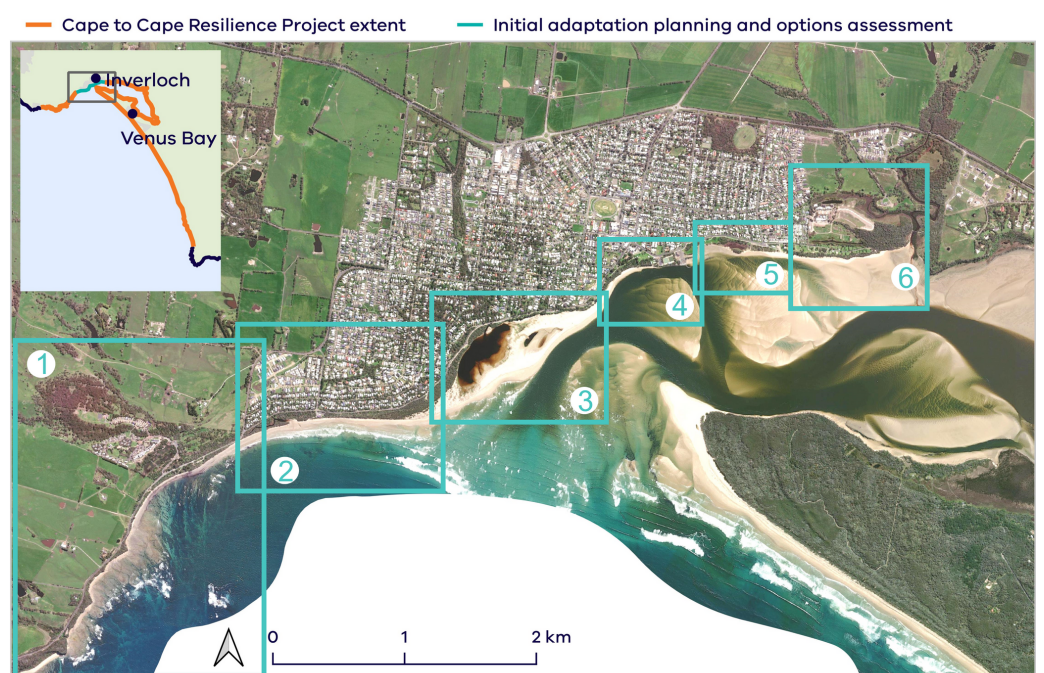


Figure 3. Inverloch sub-localities

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## Inverloch Foreshore Dog Beach

- Erosion risks medium to 2070, then increasing to significant to 2100.
- Permanent inundation risks are [K(1) [C(2)] low out to 2100.
- Temporary inundation risks are low at present day increasing to medium at 2040 to 2100
- Key value/use/asset at risk are public safety (erosion scarp), reduction in amenity and recreation, reduction/loss of hazard buffer, public utilities, erosion of reserve & impact on low value assets, access disruption, erosion impacts on private property by 2100.

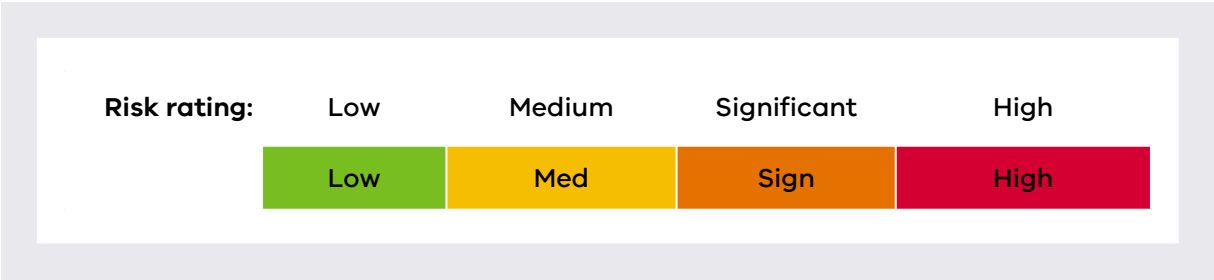
## Inverloch Foreshore Holiday Park to Screw Creek

- Erosion risk low out to 2100.
- Permanent inundation risks are low at present day, increasing to medium 2040 to 2070, then significant to 2100.
- Temporary inundation risks are medium out to 2100.
- Key value/use/asset at risk are access disruption, public utilities (services, sewerage pump station), private property and asset impacts from flooding, including holiday park cabins and new development areas, loss of commercial viability of foreshore camping from temporary then permanent inundation.

Table 2. Risk rating for each Inverloch sub-locality

	Erosion				Permanent inundation				Temporary inundation			
Sea Level	Present day	2040	2070	2100	Present day	2040	2070	2100	Present day	2040	2070	2100
Planning horizon	0.0m SLR	0.2m SLR	0.5m SLR	0.8 m SLR	0.0m SLR	0.2 m SLR	0.5m SLR	0.8 m SLR	0.0m SLR	0.2m SLR	0.5m SLR	0.8m SLR
1. Flat Rocks to Wreck Creek (Bunurong Rd)	Med*	Med	Sign*	Sign	Low	Low	Low	Low	Med*	Med*	Med	Med
2. Inverloch Surf Beach (Bunurong Rd to Ozone St)	Med*	Med	Sign	High	Low	Low	Low	Low	Low	Med*	Med	Med
3. Coastal reserve (Ayr Creek) – Inlet Entrance to the Glade	Low	Med*	Med*	Sign*	Low	Low	Low	Low	Med*	Med*	Med*	Med*
4. Inverloch Boat Ramp	Low	Low**	Low**	Low**	Low	Low	Low	Med	Low	Med*	Med*	Med
5. Inverloch Foreshore Dog Beach	Med*	Med*	Med	Sign	Low	Low	Low	Low	Low	Med*	Med*	Med
6. Inverloch Foreshore – Holiday Park to Screw Creek	Low	Low	Low	Low	Low	Med*	Med*	Sign*	Med*	Med*	Med	Med

SLR Sea level rise  
\* at some locations within the area  
\*\* XXXXXXXX





# Inverloch Region Coastal Hazard Assessment

## Risk and vulnerability of community values across the region

We also considered risks as they related to the community values.



*The Community Values Study, a key piece of the Cape to Cape Resilience Project is available via the Cape to Cape Resilience project webpage.*

## Cultural, historic and spiritual connections to the coast

There are culturally important sites, places, landscapes and ecosystems that are likely to be increasingly exposed to coastal hazards, possibly leading to their destruction or degradation.

Some significant locations are sensitive and irreplaceable, and have limited capacity to adapt, but still retain values, even if they are physically lost.

## Coastal landscapes, seascapes, characters and views.

Coastal areas are becoming increasingly exposed to coastal hazards and further change or loss of Inverloch Surf Beach may impact the beach vibe and coastal village feel of the region.

It is unlikely that the dynamic beaches and coastlines can be retained in the form that our communities currently know. However, community attachment to the coastal areas can also continue to adapt and evolve with changing conditions.

## Healthy coastal and marine ecosystems & abundant and diverse native coastal and marine flora and fauna

Some natural values and coastal, estuarine and catchment ecosystem services are already threatened by the impacts of coastal hazards.

High ecological value areas are increasingly vulnerable and there is uncertainty about the ability for some ecosystems to respond to change. Infrastructure and development can restrict the ability for key species to migrate or may threaten water quality and productivity.

## Natural resilience to coastal hazards and sea-level rise impacts

Natural resilience (like that provided by sandy dunes and vegetation) is likely to decline in some areas, increasing the exposure of values and assets to coastal hazards.

Development of townships and infrastructure in the dynamic dunes limits their natural adaptive capacity. We can strengthen and enhance the dune systems through adaptation.

## Water quality that is safe and reliable for human consumption, recreational use, healthy ecosystems and primary industry

There are increasing inundation and erosion risks to infrastructure networks across the region, potentially impacting on sewerage, water supply and water quality.

Saline intrusion may impact on bore water (e.g at Venus Bay). Monitoring, well-planned maintenance and upgrades will be needed to ensure reliability

## Safe, reliable, and ecologically sensitive access to coastal areas

Increasing coastal hazard risks are likely to impact access in some areas, and how they can be used, impacting activities and broader lifestyle.

Temporary access disruptions to roads are likely to increase in frequency and extent in the future. Some areas may have more permanent disruption.

Access to previously public areas may become unsafe. This includes steep and unstable erosion scarps, complete loss of land/beach, cliff and land instability and building and infrastructure damage

## Desirable places to live, work, visit and play, with reliable public services and amenities & the ability to live in a coastal community

Proximity to the coast is a key drawcard for living in the region, but also increases exposure to coastal processes and effects of climate change. Coastal hazards pose increasing risks especially in developed areas, including where services and facilities support communities.

Potential impacts on tourism and the local economy, especially from changes in recreational use and visitation.

Parts of all infrastructure networks that support each coastal community are increasingly at risk across the region, especially from 2070, including reliability. Disruptions may impact the broader community.

Adaptive capacity of existing infrastructure networks is moderate; future networks have higher adaptive capacity. Maintenance, upgrade and extension to networks provide opportunities to increase resilience by avoiding or managing risk.

## Clarity, consistency and confidence in foreshore management and responsibilities

The risk assessment shows multiple values, uses and assets are vulnerable to exposure from coastal hazards.

Planned, proactive, and collaborative management approaches provide the time to work through appropriate adaptation pathways and resolve perceived challenges and barriers.

## Accessibility

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