

Table 5-3: Risk Assessment Matrix.

This risk matrix provides a visual representation of the level of risk the proposal poses to the coastal environment. The matrix is similar to other risk matrices in providing a comparison between the level of risk that the proposal poses to the coastal environment in the absence of mitigation versus the level of risk when mitigation measures are in place, as proposed in this application.

The level of risk associated with each category of effect listed in Table 5-2 is colour coded in accordance with the risk level table below. Each effect was evaluated by South Port in terms of likelihood of the effect occurring and the consequence of that effect occurring with and without mitigation. These are specified in the respective pre-mitigation and post mitigation cells in the risk matrix.

Risk Level Table

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Green	Yellow	Red	Red	Red
Likely	Green	Green	Yellow	Red	Red
Moderate	Green	Green	Yellow	Red	Red
Unlikely	Green	Green	Green	Yellow	Yellow
Rare	Green	Green	Green	Yellow	Yellow
Green, Low Risk: Yellow, Moderate Risk: Red, High Risk					

Risk	Pre-mitigation	Mitigation Measures	Post mitigation as proposed in this application
<p>Effects on marine ecology in the absence of any restrictions on the programming of the works.</p>	<p>Likelihood = Unlikely Consequence = Major</p>	<p>Restricting the drilling, rock breaking, blasting and dredging activities to the period 1 February to 30 September,</p>	<p>Likelihood = Rare Consequence = Minor</p>
<p>Effects of noise and vibration on the local community and neighbourhood that will generate annoyance and potentially generate adverse reaction.</p>	<p>Likelihood = Likely Consequence = Moderate</p>	<p>Restricting drilling operations to daytime hours from 7.30 am to 6 pm, Monday to Sunday due to night time impacts of above water surface noise from drilling rig on Bluff residents.</p> <p>Regular maintenance and up-keep of all drilling and dredging equipment (e.g., lubrication and repair of winches, generators) will be undertaken to lessen above surface noise production.</p> <p>South Port will provide advance notice to all commercial shipping organisations and water based recreational user groups in Southland through a number of communication channels as specified in the Harbour Use Communication Plan (Appendix 17).</p>	<p>Likelihood = Rare Consequence=Minor</p>

Effects on harbour navigation and recreation	<p>Likelihood = Almost certain Consequence = Major</p>	<p>South Port will provide advance notice to all commercial shipping organisations and water based recreational user groups in Southland through a number of communication channels as specified in the Harbour User Communication Plan</p>	<p>Likelihood = Rare Consequence=Less than minor</p>
Sedimentation Effects	<p>Likelihood = Likely Consequence = Moderate</p>	<p>Dredging of the berth basins where fine sediments occur shall take place during outgoing ebb tides to avoid the potential for suspended sediment to migrate into the upper harbour and Awarua Bay.</p> <p>Finer sediment shall be deposited at the sediment disposal site during outgoing tides to avoid sediment affecting the rocky shoreline of the Motupōhue māitaitai.</p> <p>Sediment contamination concentrations are largely well below ANZG (2018) guidelines for the protection of aquatic health.</p>	<p>Likelihood = Unlikely Consequence=Less than minor</p>
Effects of drilling and blasting activities on fish	<p>Likelihood = Almost certain Consequence = Major</p>	<p>Drilling and blasting will occur between March and October to avoid peak feeding and breeding times in the harbour given that a number of fish species migrate from the coastal zone to offshore or northern waters during the late autumn to winter months.</p> <p>A 'warning' open water blast of low peak pressure will be set off to remove fish from the entrance channel area before each blasting operation commences. This will be undertaken in conjunction with a 'soft start', whereby blasting effort begins at a lower rate and increases over the individual operation.</p>	<p>Likelihood = Unlikely Consequence=Minor</p>

Effects of drilling and blasting on seabirds	<p>Likelihood = Almost certain Consequence = Major</p>	<p>The proposed timing of the drilling and blasting programme from mid April to late August is mostly outside of the breeding season for little penguin, shore birds, gulls and cormorants/shags.</p> <p>A 'warning' open water blast of low peak pressure will be set off to remove penguins, cormorants/shags and other seabirds from the area before each blasting operation commences. This will be undertaken in conjunction with a 'soft start', whereby blasting effort begins at a lower rate and increases over each blasting event.</p> <p>These mitigation measures will be supported by monitoring of the MMOZ that applies to Otariids (seals) to ensure blasting does not occur if seabirds are observed in the observation zone.</p>	<p>Likelihood = Rare Consequence=Minor</p>
Effects of invasive species	<p>Likelihood = Moderate Consequence = Major</p>	<p>In accordance with the biofouling management plans prepared by the dredge operators (Appendices 14 & 15), the dredge operators shall provide a list of management actions undertaken, including inspections</p>	<p>Likelihood = Rare Consequence=Less than minor</p>

		of vessels for fouling organisms in advance of arrival at Bluff Harbour.	
Physiological injury to marine mammals due to underwater noise during blasting operations	Likelihood=Likely Consequence=Major	Blasting will be limited to the period March to October to avoid the late spring and summer months when marine mammals are more likely to enter the harbour. Direct on-site monitoring of the MMOZs for each marine mammal group (Low frequency cetaceans, Medium frequency cetaceans, High frequency cetaceans and Otariids) by marine mammal observers to ensure blasting does not occur if marine mammals are observed in the MMOZs. Further details are provided in the marine mammal management plan (Appendix 9).	Likelihood=Rare Consequence=Less than minor
Physiological injury to marine mammals due to underwater noise during drilling and dredging operations and from eco-sounders	Likelihood=Unlikely Consequence=Less than minor	Regular maintenance and up-keep of all dredging equipment and vessel (e.g., lubrication and repair of winches, generators) will be undertaken to lessen underwater noise production.	Likelihood=Unlikely Consequence=Less than minor
Behavioural disturbance to marine mammals caused by underwater noise generated by:			
Blasting	Likelihood=Moderate Consequence=Moderate	Direct on-site monitoring of the MMOZs for each marine mammal group (Low frequency cetaceans, Medium frequency cetaceans, High frequency cetaceans and Otariids) by marine mammal observers to ensure blasting does not occur if marine mammals are observed in the MMOZs. Further details are provided in the marine mammal management plan.	Likelihood=Rare Consequence=Less than minor

Drilling and dredging	Likelihood=Unlikely Consequence=Less than minor	Regular maintenance and up-keep of all dredging equipment and vessel (e.g., lubrication and repair of winches, generators) will be undertaken to lessen underwater noise production.	Likelihood=Rare Consequence=Less than minor
Presence of vessels	Likelihood=Moderate Consequence=Less than minor	Project induction around appropriate vessel operator behaviour around marine mammals.	Likelihood=Rare Consequence=Less than minor
Moderate to fast moving vessels	Likelihood=Unlikely Consequence=Less than minor	Project induction around appropriate vessel operator behaviour around marine mammals.	Likelihood=Rare Consequence=Less than minor
Habitat exclusion and/or displacement of marine mammals due to underwater noise from:			
Blasting	Likelihood=Likely Consequence=Moderate	Direct on-site monitoring of TTS MMOZs for each marine mammal group (Low frequency cetaceans, Medium frequency cetaceans, High frequency cetaceans and Otariids) by marine mammal observers. Further details are provided in the marine mammal management plan.	Likelihood=Rare Consequence=Less than minor
Drilling	Likelihood=Unlikely Consequence=Minor	Direct on-site monitoring of TTS MMOZs for each marine mammal group (Low frequency cetaceans, Medium frequency cetaceans, High frequency cetaceans and Otariids) by marine mammal observers. Further details are provided in the marine mammal management plan.	Likelihood=Rare Consequence=Less than minor

Due to moderate to fast moving vessels	Likelihood=Unlikely Consequence=Minor	Project induction around appropriate vessel operator behaviour around marine mammals.	Likelihood=Rare Consequence=Less than minor
Dredging	Likelihood=Unlikely Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Presence of vessels	Likelihood=Unlikely Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Eco-sounders	Likelihood=Unlikely Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Effects of sediment plumes on marine mammals	Likelihood=Unlikely Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Entanglement of marine mammals due to loose or slack lines, rubbish and marine debris.	Likelihood=Unlikely Consequence=Major	Avoid loose ropes or lines dangling between the tug and hopper barges due passage to the offshore rock disposal site. Ensuring there is only one riser line for the detonation wires for each blast event.	Likelihood=Rare Consequence=Less than minor

		Ensuring proper waste management is in place.	
Vessel strike due to fast moving vessels	Likelihood=Unlikely Consequence=Major	Project induction around appropriate vessel operator behaviour around marine mammals, including adoption of best boating practice guidelines for marine mammals including speed limits to further reduce any chance of mortality from vessel strikes.	Likelihood=Rare Consequence=Less than minor
Direct toxic effects due to sediment plume	Likelihood=Rare Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Indirect toxic effects due to sediment plume	Likelihood=Rare Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Trophic effects due to sediment deposition and underwater noise from drilling, blasting and dredging.	Likelihood=Rare Consequence=Less than minor	None recommended.	Likelihood=Rare Consequence=Less than minor
Effects on Coastal Water Quality		Dredging of the berth basins where finer sediments occur shall take place during slack and outgoing tides to avoid the potential for suspended sediment to migrate into the upper harbour.	

	<p>Likelihood=Likely Consequence=Moderate</p>	<p>Fine sediment dredged from the berth basins shall be deposited at the sediment disposal site during outgoing ebb tides to ensure sediment suspended in the water column is rapidly dispersed and transported out into Foveaux Strait.</p> <p>The employment of a “Green Valve on the TSHD to reduce turbidity in the harbour during the dredging operations by facilitating settlement of the suspended sediment onto the seabed close to the dredging area as opposed to being carried towards the surface.</p>	<p>Likelihood = Rare Consequence=Less than minor</p>
<p>Effects on Marine Aquaculture Operations</p>	<p>Likelihood=Likely Consequence=Major</p>	<p>Dredging of the berth basins where finer sediments occur shall take place during outgoing ebb tides to avoid the potential for suspended sediment to migrate into the upper harbour where crayfish pots may be placed on a temporary basis (refer Figure 3-5).</p> <p>No marine aquaculture farms are currently operating in Bluff Harbour.</p>	<p>Likelihood = Rare Consequence=Less than minor</p>
<p>Effects on Cultural Values</p>	<p>Likelihood=Likely Consequence=Major</p>	<p>A MOU has been formalised between South Port and Te Runanga o Awarua that sets in place shared obligations that provide for an improvement in the health of Bluff Harbour (Awarua) for cultural use, including for mahinga kai and tauranga waka.</p>	<p>Likelihood = Rare Consequence=Less than minor</p>

