11.0 Geotechnical Hazards Action Plan

11.1 Scope

This action plan addresses hazards associated with weathering and erosion of coastal cliffs and bluffs. The processes affecting the stability and rate of recession of these rock landforms are often referred to as geotechnical processes, because they are heavily dependent on the geology (stratigraphy, geochemistry and structure) of the underlying bedrock. Geotechnical processes can operate on all bedrock landforms, whether coastal or inland. In the coastal context, the geotechnical processes interact with storm events, rainfall, runoff and seepage, and also with marine processes (such as sea levels, wave energy, ocean spray) to determine the form and rate of recession of cliffs and bluffs.

Details about these processes are in Section 16.8 of PART C.

The geology of the Wyong coastline includes indurated sands, interbedded sandstone, conglomerate and claystone units and numerous igneous dykes. The stratigraphy and structure of the geological units make the rocky coast susceptible to a variety of geotechnical processes. Studies of historical cliff and bluff recession due to geotechnical processes demonstrate that geotechnical instability is not a new process along the Wyong coastline. However, some geotechnical processes occur very episodically, so a bluff may appear to be stable for decades, before being affected by slope failure. Patterns of storminess and rainfall affect geotechnical processes which are driven by groundwater flows, differential weathering profiles and undercutting.

Geotechnical hazards generate risks when slope instability caused by geotechnical processes affects landscape values such as residential development, safe recreational access or important ecological, cultural or visual features.

A detailed assessment of the geotechnical processes affecting different sections of the Wyong coastline has been prepared by SCE (2010) and is included in **Appendix 4**. Study method and further details about geotechnical processes are in **Section 16.8** of **PART C**. The SCE geotechnical hazard assessment identifies geotechnical hazards and mechanisms associated with different geology types, to predict rates of recession over various planning periods. It defines hazard zones along the rocky coast and discusses measures to reduce risks affecting structures and human safety.

The mix of geotechnical processes, rate of activity and the spatial focus of geotechnical processes may change as sea level rises. Examples of possible changes to the spatial focus or intensity of geotechnical processes include:

- Processes that are in part driven by wave undercutting of weathering claystones and sandstones may increase in severity as sea level rises, because of changes to the exposure of materials to wave action. The extent of such changes to process hazards is not yet clear and will be reviewed over time.
- The toe of many cliffs and bluffs is protected from direct wave action by rock platforms that have developed at high tide level. Predicted sea level rise to 2100 and beyond will allow waves to pass across the rock platform surface and act directly on material accumulating at the base of the cliff and expose the rock layers in the lower cliff to accelerated weathering.

11.1.1 Locations included in geotechnical hazard assessment

Council's brief required geotechnical assessments of cliffs and bluffs along the Wyong coastline where geotechnical processes are likely to affect residential development, public or private infrastructure or recreational access. These locations include:

- Jenny Dixon Beach and Noraville
- Cabbage Tree Harbour. **Section 11.2** provides additional information about actions that Council is already taking to reduce risks at Cabbage tree Harbour.
- Norah Head
- Soldiers Point
- Blue Bay and The Entrance Headland
- Toowoon Bay and Bateau Bay
- Yumbool Point and Crackneck Point

Figures 11.1 to **11.19** show the areas that are, or are predicted to be, affected by geotechnical hazards in the immediate, 2050 and 2100 planning periods. These figures also show specific locations where actions to reduce geotechnical risks are recommended.

The term "coastline recession zone" has been used to describe the land on and immediately adjacent to cliffs and bluffs along the coastline that is likely to be affected by recession driven by geotechnical processes, during the period to 2100.

The Geotechnical Hazards Action Plan identifies planning controls to minimise risks to development in geotechnical coastal recession zone areas. The Action Plan also highlights actions that should be taken by Council and landholders to ensure that geotechnical process hazards in coastal areas are not exacerbated by local land management. For instance, both Council and landholders (owner and or resident living at the property) can contribute to hazard management by carefully designing and managing stormwater drainage.

The geotechnical or slope instability hazard areas affect rocky terrain – the headlands and bluffs that separate coastal beach compartments. In some cases, weathering bedrock that may be affected by geotechnical hazards lies beneath a variable mantle of beach or dune sand and may be exposed at the surface in the future. In these areas where there are potential complex interactions of coastal erosion and geotechnical hazards, further investigations are required to provide certainty about the nature and extent of future hazards (for 2050 and 2100 planning horizons).

At a few locations, such as Toowoon Bay, slopes that are affected by geotechnical hazards lie landward of coastal landforms that will be affected by coastal erosion and recession in the 2050 and 2100 planning periods. These areas are not included in the mapping of geotechnical coastal recession zones.

This Plan does not address geotechnical hazards that may affect development and infrastructure in other parts of Wyong Shire.



Legend Low Hazard Line Immediate High Hazard Line Contechnical Hazard Zone

Geotechnical Hazard Zone Bluff Recession Hazard Mechanism FIGURE 11.1

2007 Immediate Geotechnical Hazards, Yumbool Point



FIGURE 11.2

2007 Immediate Geotechnical Hazards, Crackneck



FIGURE 11.3

2007 Immediate Geotechnical Hazards, Bateau Bay



FIGURE 11.4

2007 Immediate Geotechnical Hazards, Toowoon Bay



FIGURE 11.5

2007 Immediate Geotechnical Hazards, Blue Bay



Legend Low Hazard Line Immediate High Hazard Line ZZZZZZ Geotechnical Hazard Zone SMEC Area of Advice -a- Bluff Recession Hazard Mechanism File Name (A4): R03_V1/1869_096.dgn

FIGURE 11.6

2007 Immediate Geotechnical Hazards, Karagi Point





FIGURE 11.7

2007 Immediate Geotechnical Hazards, Soliders Point



FIGURE 11.8

2007 Immediate Geotechnical Hazards, Norah Head



Legend Low Hazard Line

Immediate High Hazard Line ZZZZZ Combined Bluff, Beach and Dune Zone Geotechnical Hazard Zone -a- Bluff Recession Hazard Mechanism File Name (A4): R03_V1/1869_099.dgn

FIGURE 11.9

2007 Immediate Geotechnical Hazards, Cabbage Tree Harbour



File Name (A4): R03_V1/1869_100.dgn

FIGURE 11.10

2007 Immediate Geotechnical Hazards, Noraville