INFOMAR Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
An Roinn Aeráide, Fuinnimh agus Comhshaoil Department of Climate, Energy and the Environment
Geological Survey Suirbhéireacht Gheolaíochta Ireland | Éireann
Marine Institute Foras na Mara

Marine Geoscience Report 021

Inch Spit

Overview

Inch Spit is a prominent coastal landform on the inner margins of Dingle Bay, County Kerry. The landform extends into the bay from the base of the Slieve Mish Mountains, forming a long, narrow barrier dune system composed primarily of well-sorted sands and gravels. Oriented SE – NW, it partially encloses Castlemaine Harbour, shaping the local hydrodynamic regime and sediment transport processes.

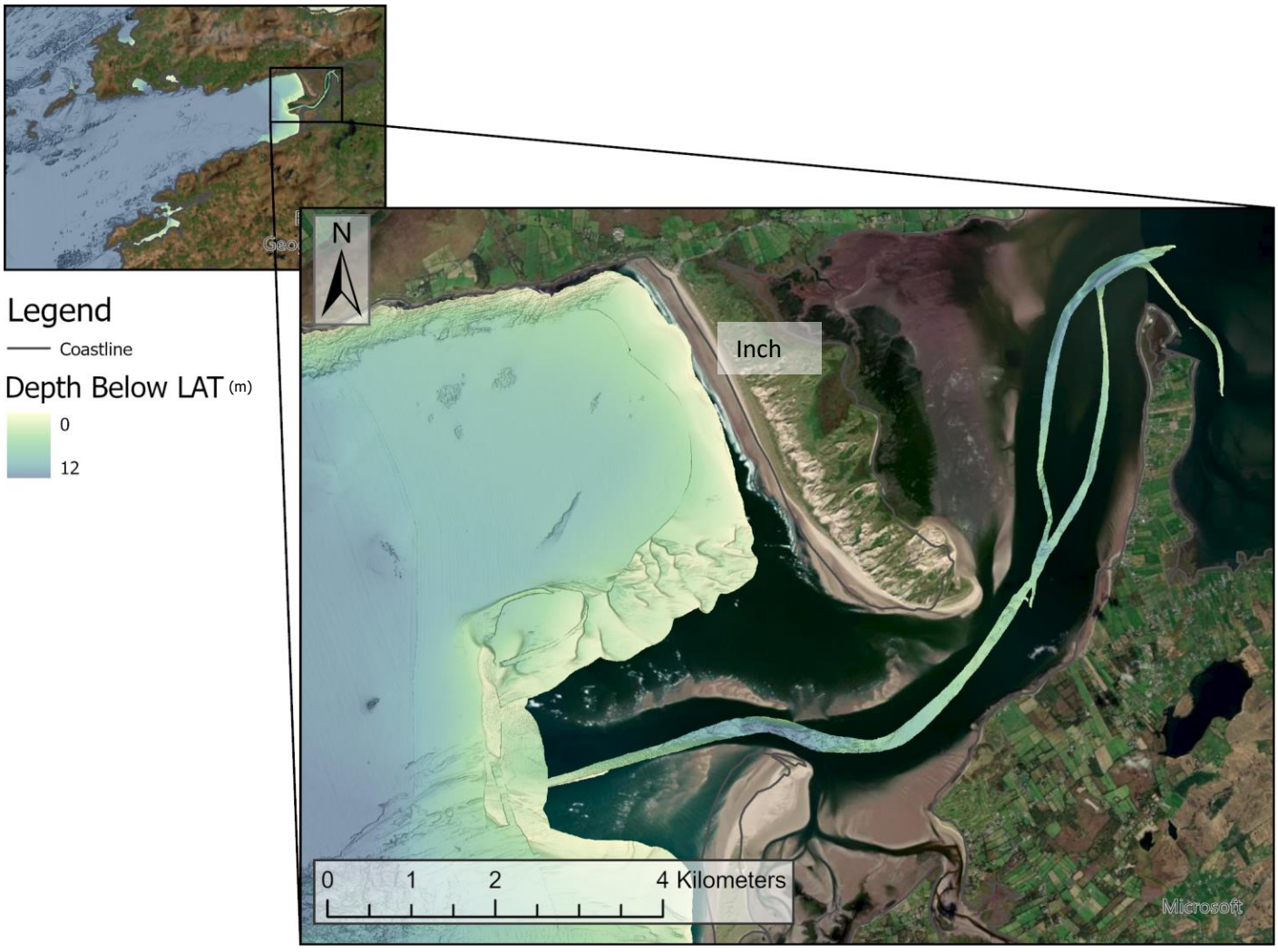

Figure 1: Bathymetry around Inch Spit. Depths are given referenced to Lowest Astronomical Tide (LAT).

Although popular with visitors, Inch Spit is not subject to continuous formal monitoring, though it is periodically studied through surveys, coastal management assessments, and research campaigns. The location provides a natural laboratory for understanding sediment transport, spit formation, and dune evolution in a high-energy Atlantic setting.

Regional Geology

The geological framework of the Dingle Bay region is complex, recording over 480 million years of Earth history. The sequence begins with deep marine sedimentation during the Ordovician (485 – 444 Ma) and Silurian (444 – 419 Ma) periods, followed by volcanism and tectonic deformation during the Caledonian Orogeny, a continental collision and mountain building event which occurred between 470 – 400 Ma (Pracht, 1996). In the Devonian period (419 – 359 Ma), fault-controlled basins accumulated Old Red Sandstone (ORS) sediments under semi-arid terrestrial conditions. A subsequent marine transgression during the early Carboniferous, beginning 359 Ma, led to the deposition of shallow marine limestones, siltstones, and mudstones

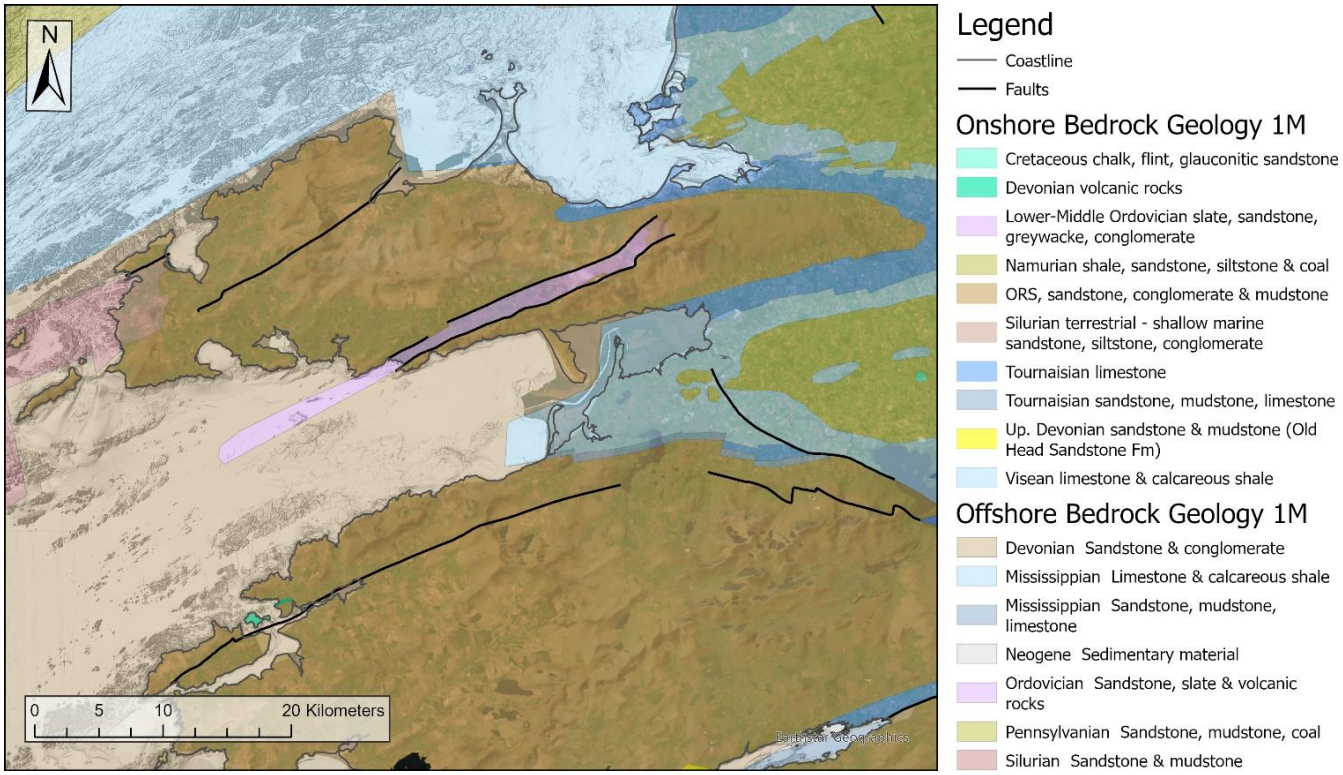

Figure 2: Regional Geology.

The Variscan Orogeny (~300 Ma) subsequently folded and faulted the stratigraphy, producing large-scale structures and reconfiguring the sedimentary basins (Pracht, 1996). Following this event, there is a significant gap in the geological record from the end of the Carboniferous period until the onset of the Quaternary, ~2.58 Ma. This absence of preserved strata is largely attributed to prolonged uplift and subsequent erosion, which removed much of the sedimentary cover that may have accumulated during this interval.

In the Quaternary, glacial advances sculpted the modern coastline and deposited till, fluvioglacial outwash, and raised beach deposits during lower periods of sea level. Sea level rise following the Last Glacial Maximum, ~24,000 years ago, led to the formation of modern coastal landforms like Inch Spit, through reworking of glacial sediment and active sediment transport processes (Ó Cofaigh, et al., 2012).

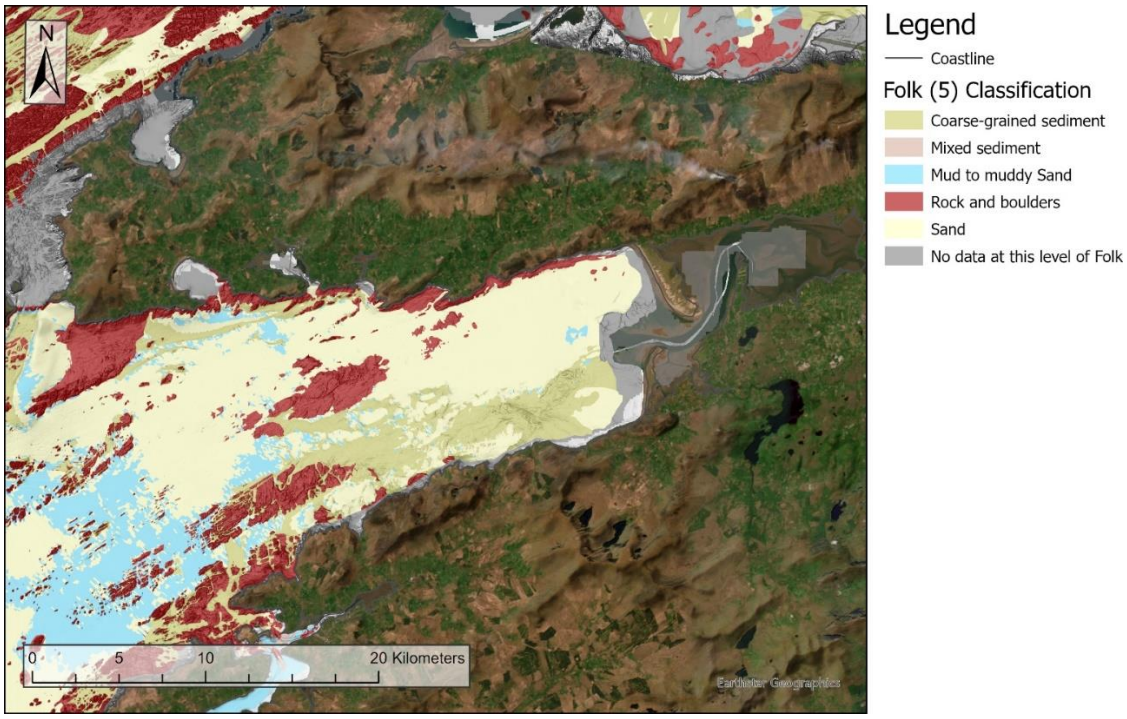

Figure 3: Sediment Classification of Dingle Bay.

Inch Spit

Inch Spit is one of the largest and best-preserved sand dune systems in Ireland, formed by the interaction of longshore drift, wave action, and tidal currents. Luminescence dating confirms that the dune system has been actively forming over the past 600 years, with some sands deposited as recently as 150 years ago (Wintle, et al., 1998). Sediment supply originates from both glacial and fluvial sources, including reworking of till and alluvial outwash from the River Maine (Jackson, 1994). Its geomorphology includes transverse and parabolic dune forms, some exceeding 30 m in height, stabilised by marram grass (Wintle, et al., 1998)

Figure 4: 3D Google Earth Image with INFOMAR bathymetry data.

The spit's alignment relative to prevailing south-westerlies enhances aeolian and wave-driven transport. The area is mesotidal, with a spring tidal range reaching 4 m, and often subjected to high-energy storm conditions, with significant wave heights reaching up to 6 m (Gault, et al., 2011). As illustrated in the image below, comparing a GSI geological map from 1850 and aerial imagery from 2020, the overall shape of the spit has remained constant.

Figure 5: Aerial imagery from 2020 (left) and GSI Geological map (right) from 1859.

Though the overall shape has remained constant, there have been significant changes in bedforms, as shown by the comparison of aerial imagery from 1986 and 2020.

Figure 6: Aerial imagery from Google Earth from 1986 (left) and 2020, with areas of significant change indicated.

Bathymetric comparisons between 2013 and 2021 highlight substantial morphological change on the seabed off the southern margin of Inch Spit.

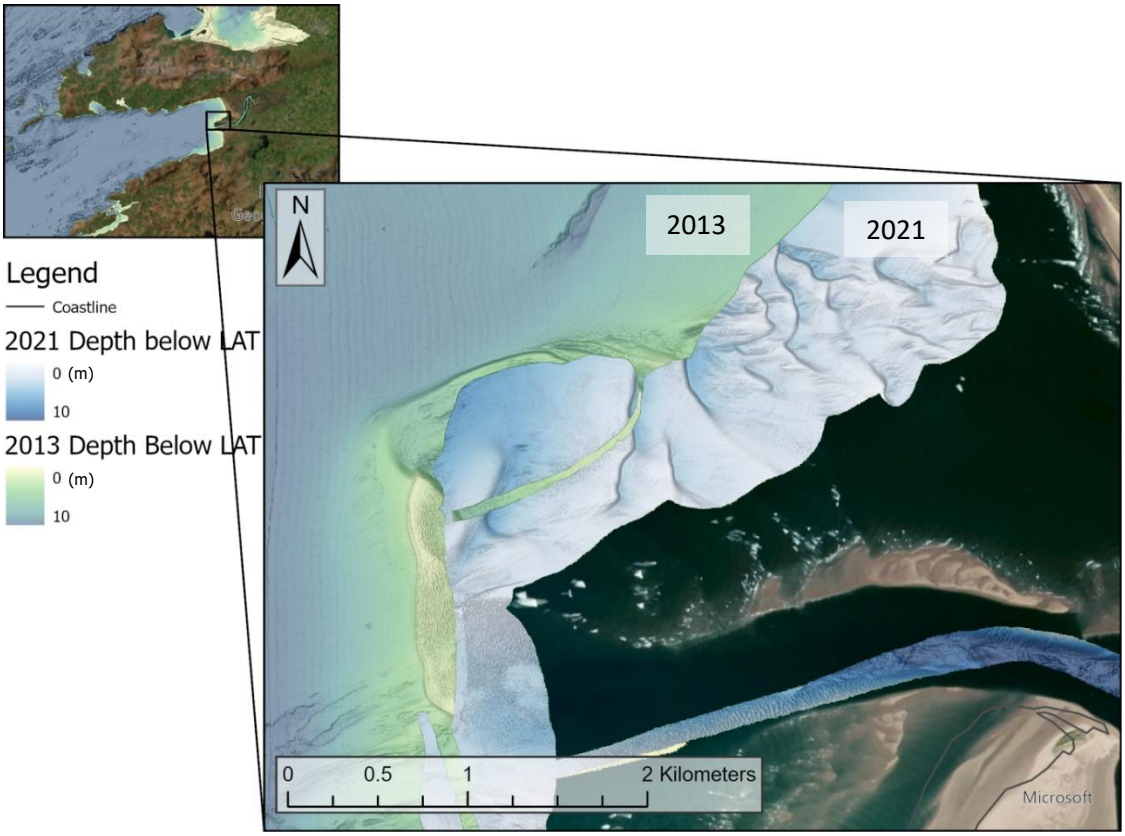

Figure 7: Comparison between 2013 and 2021 bathymetry data showing change in bedforms.

These surveys reveal evolving bedforms and sediment pathways, indicating active cross-shore transport and demonstrating the ongoing geomorphic adjustment of the shoreline (Gault, et al., 2011).

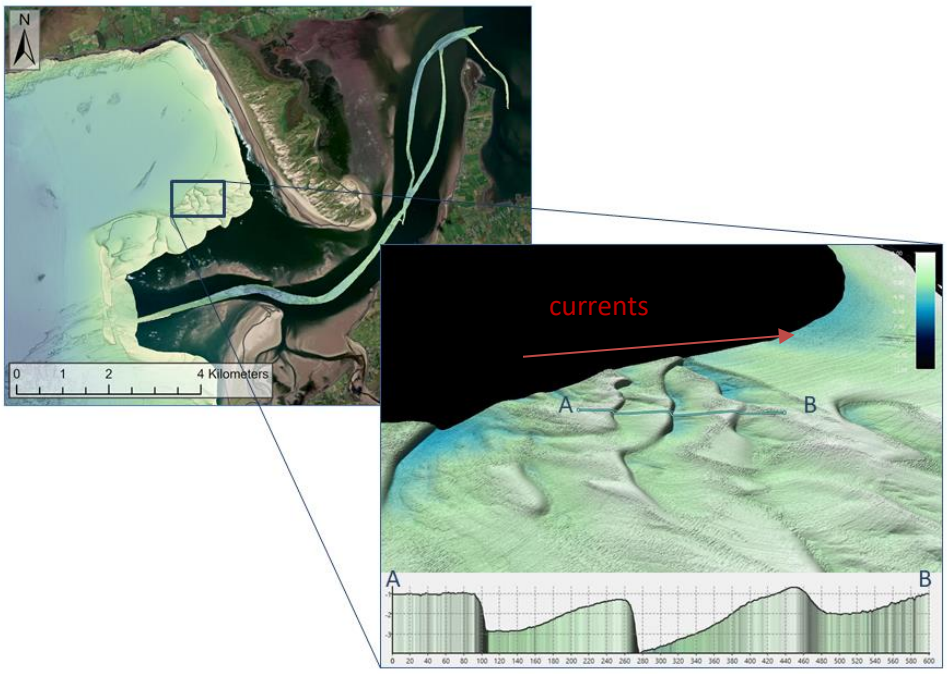

Figure 8: Profile of bedform system, with prevailing current direction indicated.

The spit lies within a high-energy tidal delta system, interacting with neighbouring Rossbehy Strand. Both represent large barrier-dune systems connected via a high-energy tidal delta. Rossbehy, while narrower and more linear, mirrors Inch's sedimentary and erosional pattern. Currents of up to 3 knots (Admiralty chart 2789) occur between the southern end of the spit and the adjacent barrier beach at Rossbehy on the southern shores of Dingle Bay, resulting in visible sandwaves and bedforms.

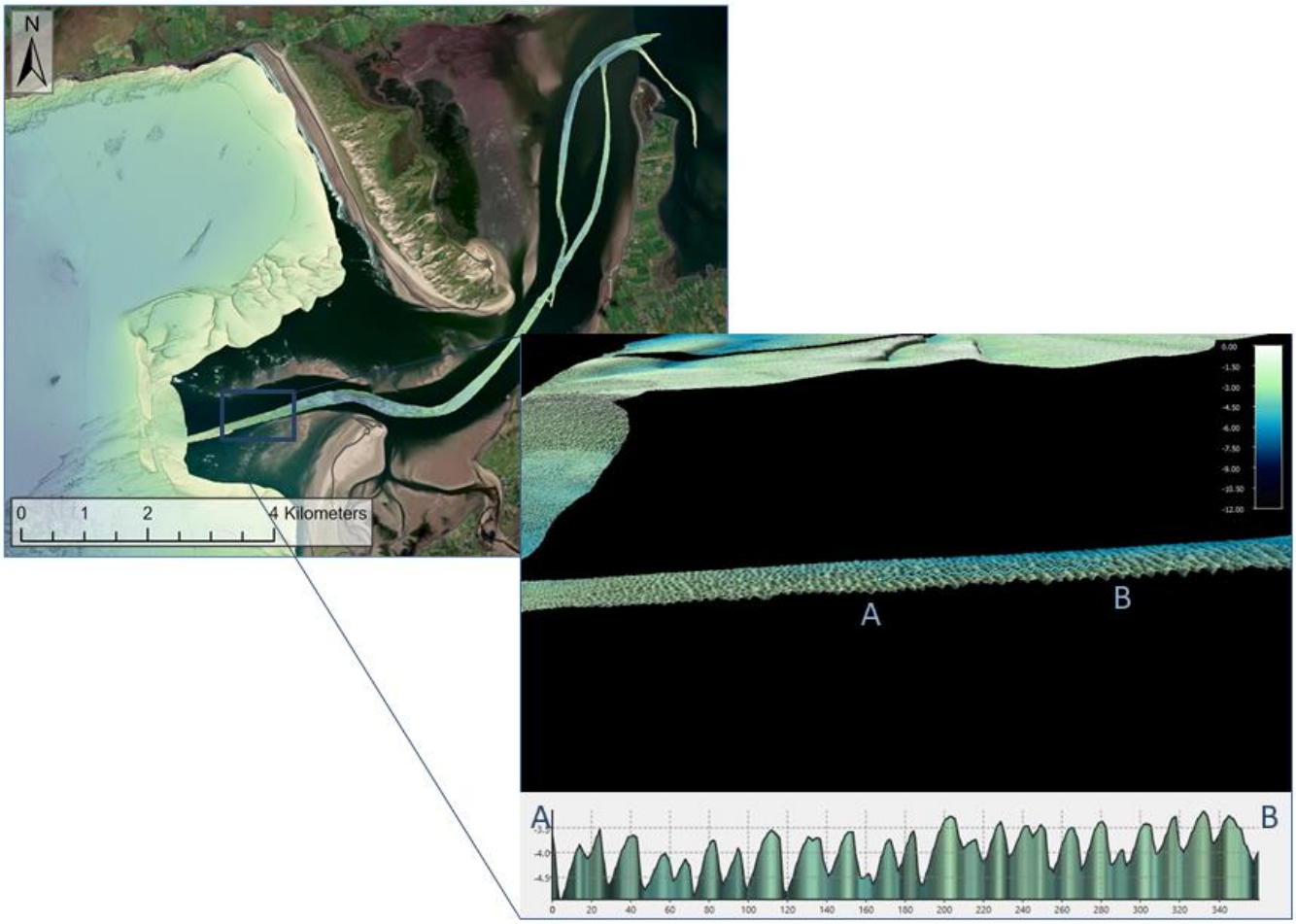

Figure 9: Profile of sandwaves in the channel between Inch and Rossbehy.

Formation

The name "Inch" comes from the Irish 'Inse', meaning island, reflecting its origins as an isolated feature in Castlemaine Harbour (Irish Naturist Association, 2020). Inch formed through the accretion of sediments delivered by the River Maine and Atlantic tides, eventually connecting to the Dingle Peninsula. Aeolian processes and the colonisation by marram grass allowed dune development and stabilisation, forming a prominent dune ridge (Irish Naturist Association, 2020).

High-energy storm events on 60-year cycles have historically driven large-scale sediment mobilisation, but sediment recovery typically follows through natural re-deposition (Gault, et al., 2011). The area's broad intertidal flats and consistent onshore winds provide ideal conditions for spit growth.

Longshore drift is the primary sediment transport mechanism at Inch, with SW waves driving sediment NE along the shore. This process, facilitated by angled wave approach and backwash, causes sediment to accumulate and shape the spit (Geological Survey Ireland, n.d.). Tidal currents also play a role in

sediment transport, further shaping the beach and contributing to its formation. Over time, the accumulated sediment extends out into the bay, forming a sand spit like Inch Beach, which is a natural bridge across the bay.

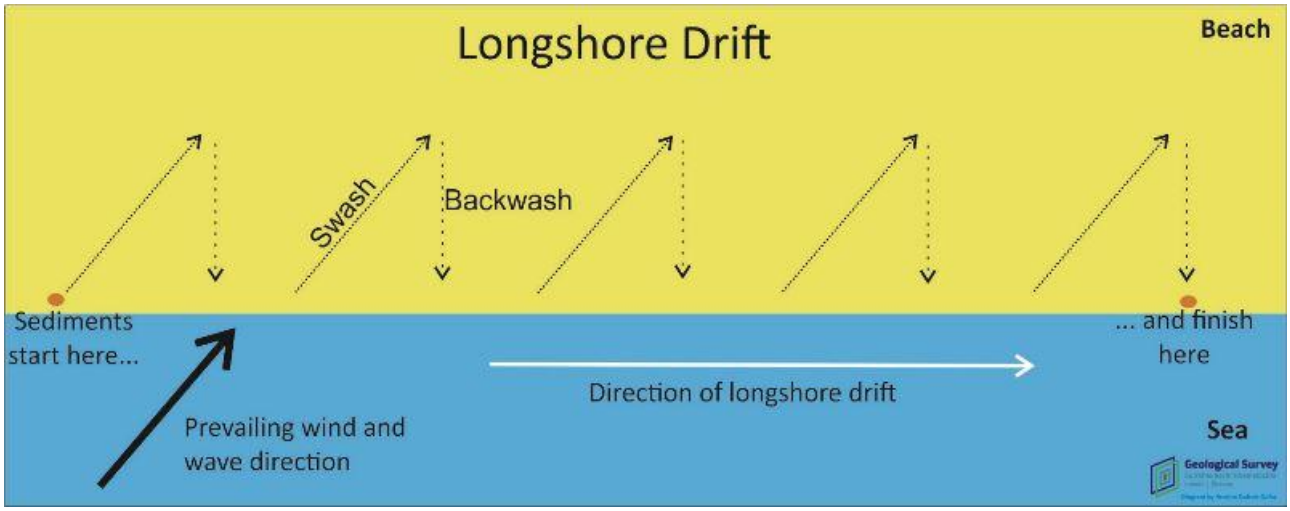

Figure 10: Diagram illustrating longshore drift processes along the coastline of Inch Spit. (Geological Survey Ireland, n.d.).

Sediment transport is influenced by both tidal and storm-driven processes. Holocene sea-level rise reworked glacial deposits, creating a foundation for barrier features like Inch Spit. The system is also sensitive to wave energy, sediment availability, and seasonal conditions.

Biodiversity

Inch Spit forms part of the Castlemaine Harbour SAC recognised for its ecological diversity. It contains a mosaic of habitats including fixed dunes, shifting dunes, foredunes, and humid dune slacks. Strandline and shingle zones host specialised vegetation, and the dune-to-saltmarsh transitions offer refuge for coastal birds and invertebrates (National Parks & Wildlife Service, 2015). The site's ecological richness underscores the importance of continued monitoring and conservation.

Conclusion

Inch Spit illustrates the interaction of glacial legacy, coastal processes, and modern environmental dynamics. High-energy wave events, longshore drift, and tidal currents drive sediment reorganisation, particularly along its southern margin.

Though the spit undergoes periodic erosion, its overall structure remains stable. Ongoing monitoring highlights its resilience but also points to the need for integrated coastal management strategies. Inch is not only a key site for geological and ecological research but also an indicator of how soft coasts may respond to future climate and sea-level change.

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