

Outline of Presentation

Managing coastal erosion – changing paradigms

- Historic management paradigm
- Move towards working with nature

Coastal erosion at Russell (quick overview!)

- Natural beach and human changes
- Present day erosion processes
- Potential effect of future sea-level rise

High Level Options

- Living with erosion – Managed Retreat
- Sea Wall
- Nourishment

Coastal Erosion

For management purposes, it is VERY important to distinguish between **temporary coastal erosion** and **permanent erosion**

- **Temporary erosion**

- i.e. Periods of erosion followed by periods of recovery
- No net change over time – temporary not permanent erosion
- Associated with natural dynamic shoreline fluctuations

- **Permanent erosion**

- Ongoing and permanent shoreline retreat

Temporary Erosion

- Often associated with “decadal shoreline changes”
 - Periods of some years where erosion dominates
 - Followed by periods where beach recovery dominates
 - Some evidence that Russell Beach may partly follow trends on the open coast
 - Somewhat unexpected and needs confirmation
- Naturally repairs over time – less dramatic & obvious process
- Presently the dominant erosion on Russell Beach
- Can sometimes be managed or mitigated using quite simple and cost-effective options

Permanent Erosion

Erosion that will not naturally repair – permanent when viewed over periods of many decades and longer

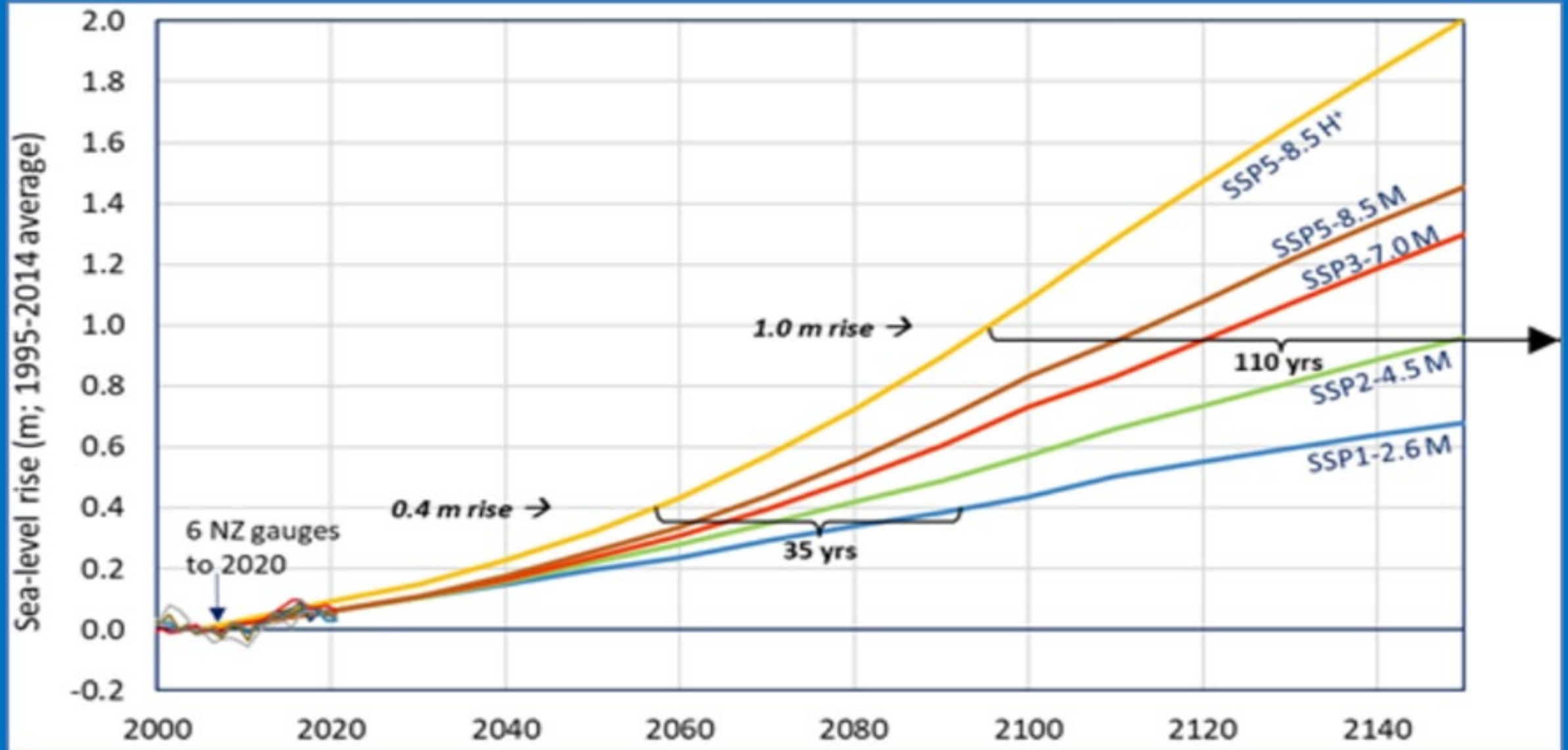
Historic data indicates presently rare/minor on Russell Beach

However, with future projected sea level rise it will progressively become more significant

As a rough initial guide for Russell Beach assume 10m erosion for each 1m sea level rise

No simple or cheap options!

NZ Sea-Level Rise Projection Scenarios to 2150



Historic Management Paradigm

Historically, management of coastal erosion/retreat has been dominated by the “**coastal engineering**” or “**protection**” paradigm

Emphasizes controlling natural coastal behaviour rather than human behaviour

Characterised by “holding the line”

Under this paradigm, successful management = “stopping erosion”

Reflects the fact that the major objective of management was protection of property and infrastructure

In New Zealand, the main method used to “hold the line” has been sea walls

Challenges to Engineering Paradigm

Various factors challenge the sustainability of the traditional “coastal engineering” paradigm, including:

- **Serious adverse environmental effects of engineering structures**
 - **Exacerbation of erosion hazard**
 - **Increased emphasis on sustainability and multiple objectives**
 - **Equity issues**
 - **Potential for future aggravation of coastal erosion and associated issues by projected climate change**
 - **Concerns about resilience (of coastal communities, the natural and amenity values of the coast, and natural coastal features and ecosystems)**
- **So, much more focus being given to working with nature and use of soft solutions (where practicable)**

Russell Beach

- Form of beach known as mixed sand and gravel beach
 - Made up of both gravel and finer sand.
- Behave differently from sandy beaches
 - Gravel does not move as easily as sand, concentrated higher up the beach as waves lose energy
 - Sand washes out more easily, more evident in middle and lower areas of the beach (and offshore)
 - Gravel ridges or berms at the top of the beach (shift or rebuild with tides and waves)
 - A more landward storm ridge - formed by rare and severe storms (often vegetated)
 - These ridges act as a **very effective** natural buffer – dissipating wave energy
 - Grassed reserve & The Strand part of a storm ridge (hence natural shape)
 - Now built up higher by humans over time, which has changed behaviour
 - Sand beaches dissipate wave energy quite differently (sediment carried offshore and deposited on bars – rather than carried onshore and deposited on storm ridge)



2015 – North end – Beach + Ridge

1900 or 1912 (Akld City Libs)



Russell Bay Of Islands EG B 2214

1904



1906



1910-13 – The Gables and Area immediately North



Back beach area and strand



391 (2015)



2015



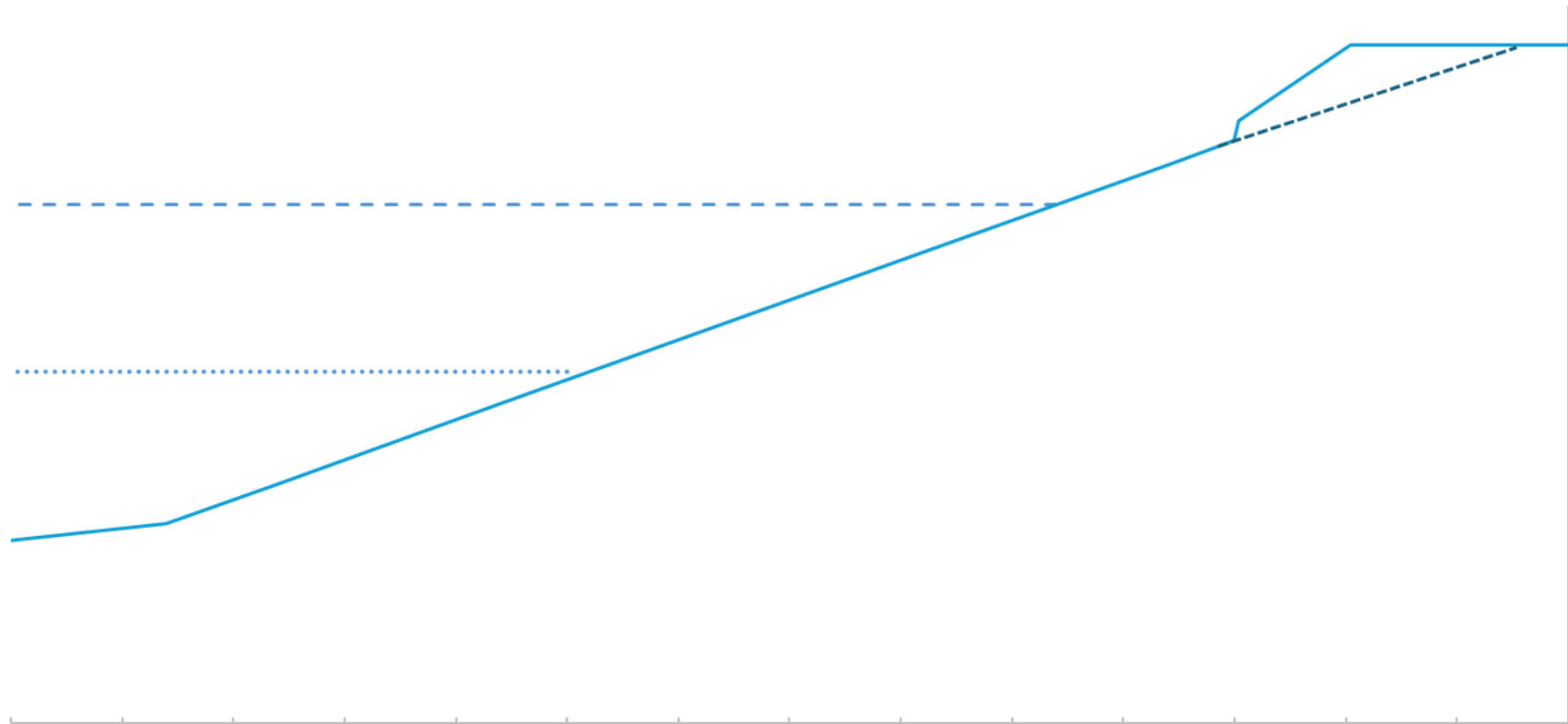
2025





2022

Typical Cross-Section - SKETCH ONLY



1932 Storm

ROADS FLOODED IN NORTH.

SEVERAL SMALL CRAFT SUFFER

[BY TELEGRAPH.—OWN CORRESPONDENT.]

RUSSELL, Thursday.

Some of the craft in the Russell Harbour, although sheltered from the full force of the heavy north-east and easterly gale which blew last night, suffered considerably.

Two passenger launches belonging to A. E. Fuller and Sons, the Knoxie II. and the Alba, broke away from the wharf and when it was discovered that they were missing no trace could be found of them owing to the heavy rain. They were finally located by Mr. F. Arlidge in the launch Alma G., about 8 a.m. piled upon the beach at Waitangi. Because of the heavy seas which were running the amount of damage is not yet known, but it is thought to be serious.

One dinghy is reported to be smashed and seven or eight are missing. These had been washed off the Russell Beach by the unexpectedly high tide which accompanied an exceptionally heavy backward surge from the west, although the gale was from the opposite direction.

1937 Storm

EROSION AT RUSSELL

RELICS UNCOVERED

[BY TELEGRAPH—OWN CORRESPONDENT]

RUSSELL, Tuesday

Rain amounting to 5.80in. fell in Russell during the 24 hours ending at 9 o'clock this morning. The rain was accompanied by a south-easterly gale, and the heavy surf which pounded on the beach at Russell caused a considerable amount of erosion, uncovering a number of interesting relics of early days in Russell. These included a medalion commemorating the visit of the United States Navy to New Zealand in 1908, an old lead bullet, and a coin of the reign of William IV.

1939 Storm

* * *

Heavy Seas Pound Bay Beaches.

Heavy seas have been running in the Bay of Islands harbour during the past few days, and waves of unusual severity have been pounding on Paihia beaches and round the shores of Waitangi. So heavy has been the swell that motorists desiring to barge cars across the harbour have been compelled to embark or disembark at the Waitangi beach, where the heavy swell does not interfere with the loading or unloading of barges. The swell has also been particularly heavy on the Russell beach, and heavy breakers have been pounding in on Longbeach.

Duke Area 1951 (WA 30089)

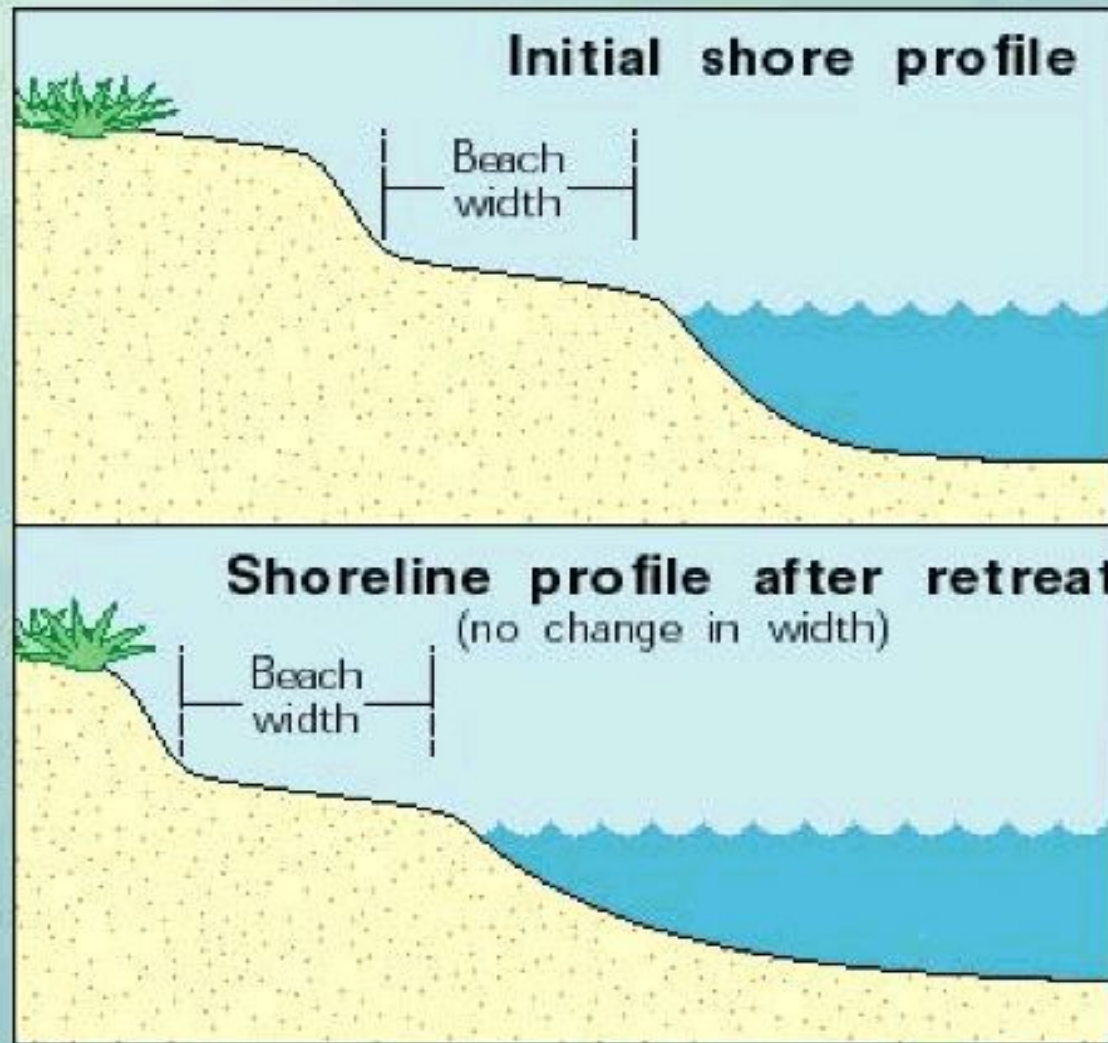




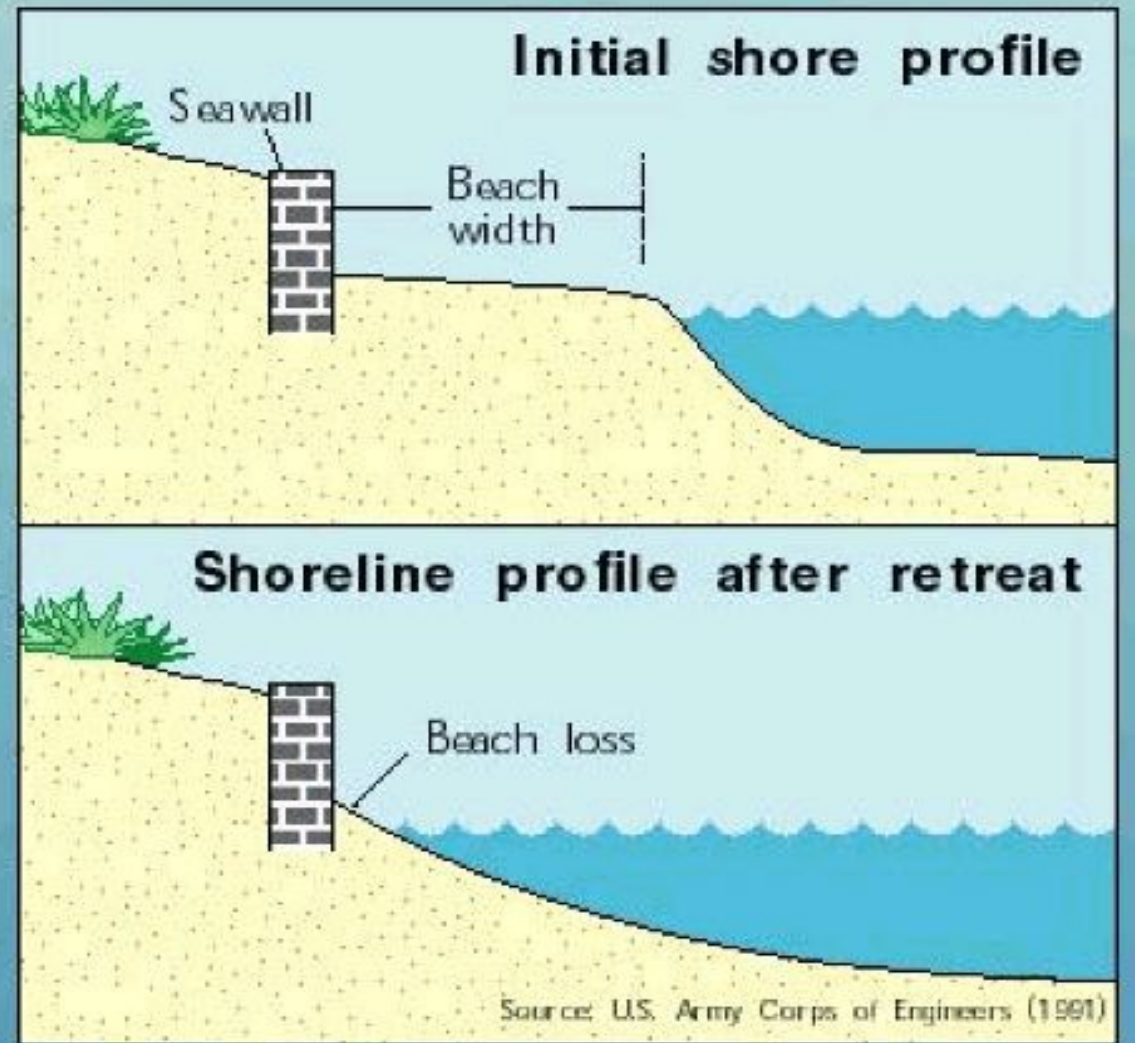
Duke Area mid-late 1950s

Effect of Seawalls on Retreating Beaches

Natural sand beach



Sea Walls

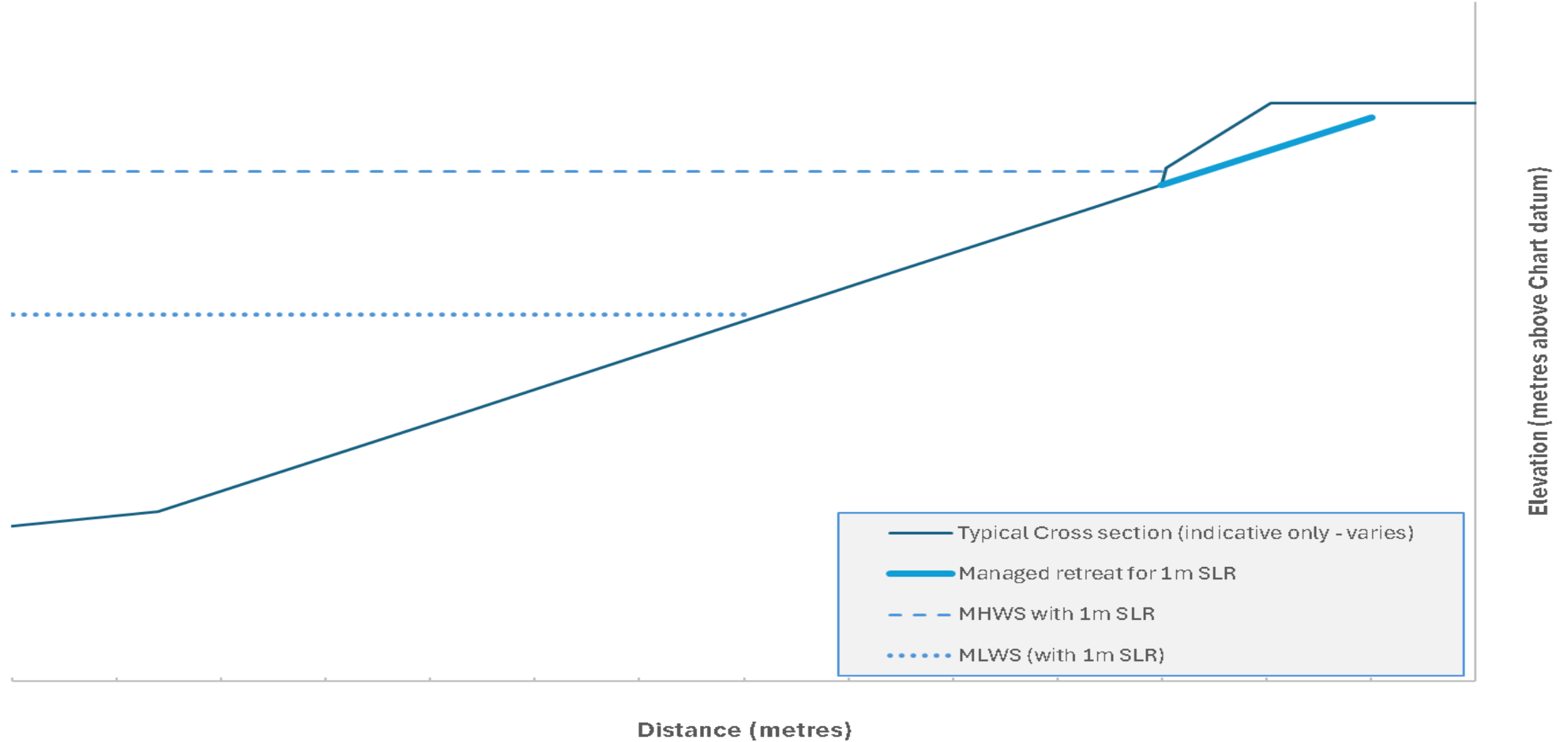




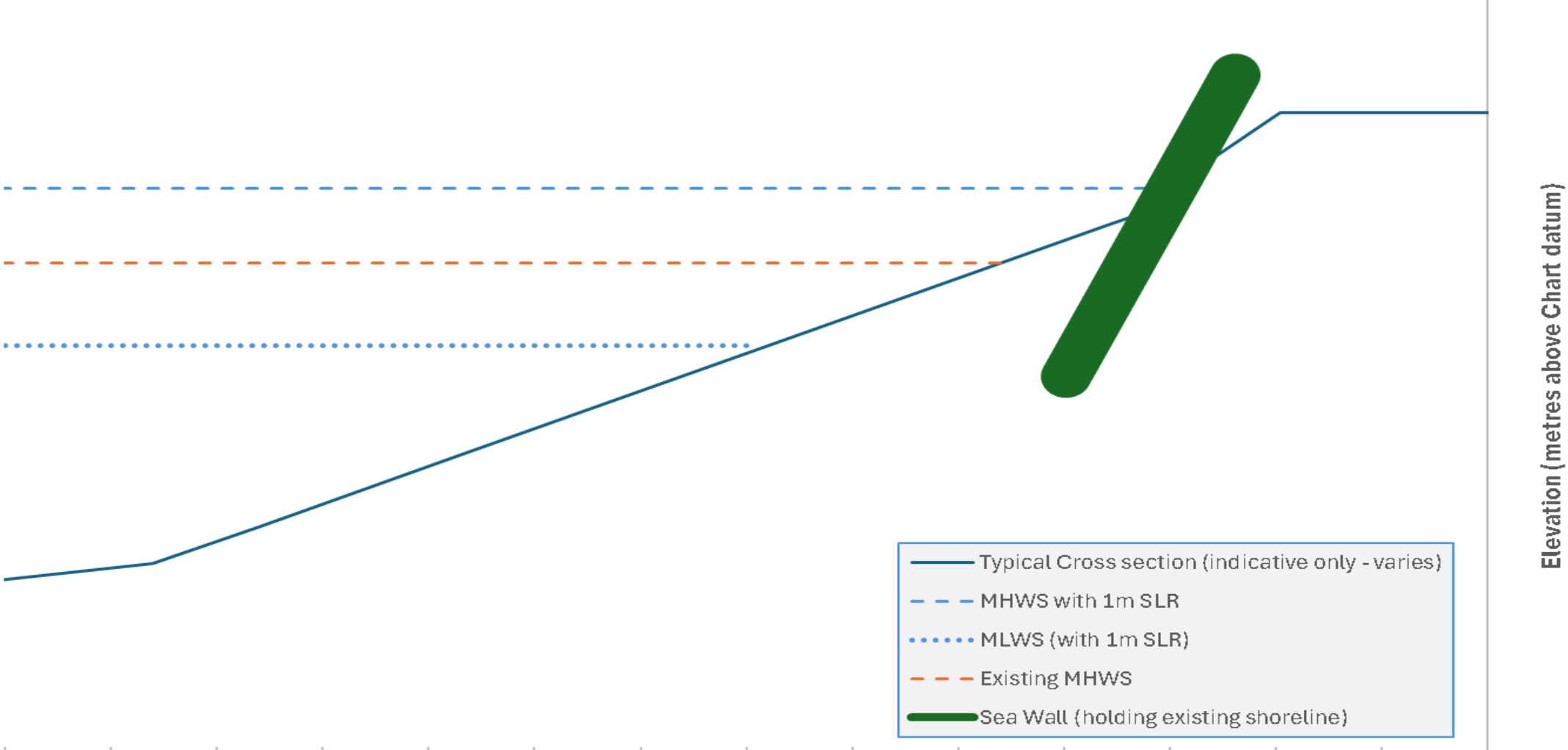


Duke Area mid-late 1950s

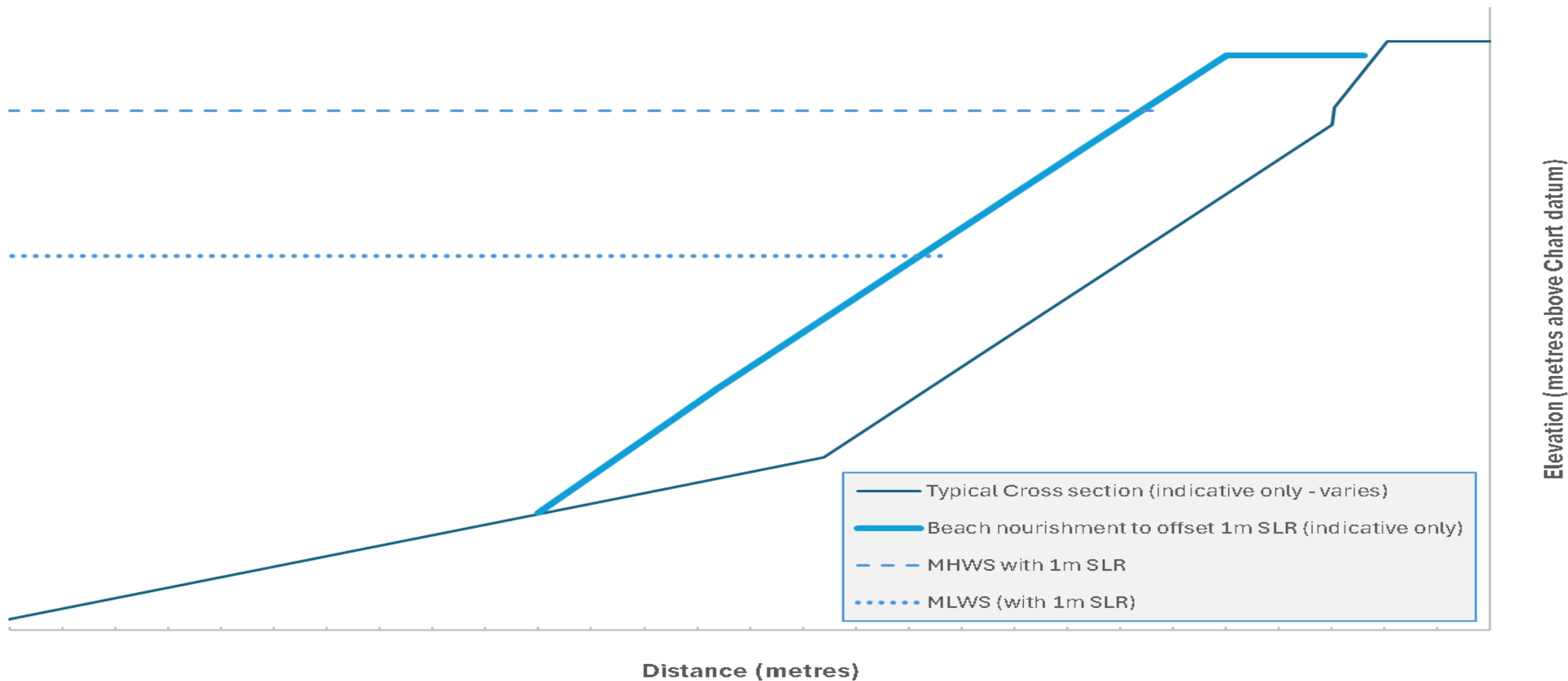
Managed Retreat - SKETCH ONLY



Sea Wall + 1m SLR - SKETCH ONLY



Beach Nourishment to Offset 1m SLR - SKETCH ONLY



Options - Summary

- In the longer term with projected sea-level rise, all options are difficult and expensive
- Managed retreat would eventually require significant landward relocation of existing beachfront development over time
- A well-engineered seawall would protect assets landward of the wall but would result in progressive beach loss over time, eventually requiring nourishment to maintain beach values
- Beach nourishment could potentially offset the adverse impacts of the wall but would require a suitable source of appropriate sediment
- An adaptive management plan would be useful to enable appropriate staged implementation of agreed action over time and ensure the community is aware of the longer term implications of choices

DISCUSSION