Whakarire Ave: Breakwater Engineering

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Whakarire Avenue: History

- Boulders from the Ahuriri entrance removed for ballast (~1870)
- Training moles at entrance trapped sediment (1879)
- Gravel and sand bypassing of entrance (1885)
- Gravels dredged from entrance to reclaim at Whakarire Ave (1888)
- Port breakwater (1890)
- Protection works to Whakarire Ave (1910-20)
- 1931 earthquake reduced Estuary flushing and caused 2.0m uplift
- 230,000m³ of gravel and sand to replenish Westshore beach (1987-present)
- Seawall construction along alignment of “old piles” (1994)
- Whakarire Ave: identified as an erosion hazard by Gibb (2002)
Coastal Processes

- Dominated by waves - relatively mild wave climate
- 1.7m spring tide range – produces weak currents
- Sediment is dominated by gravel on beach face and fine sand on nearshore
- Sediment drift is northwards, although significant losses due to abrasion
- Coastline is out of equilibrium at Westshore → 15,000m³ of beach nourishment per year
Equilibrium Shape of Westshore Beach

Ref: Worley (2002b)

Source Figure 3 Glibb (2003)
Option 2

Whakarire Ave
Enhanced Seawall
& Infilling of Backshore
Option 5

Whakarire Ave Attached Breakwater with Beach Creation
Option W5: Refinement

Objectives

- reduce reflection
- reduce impact on surfing
- reduce footprint
- improve amenity
- reduce erosion hazard
- improve Westshore Beach
Breakwater Alignments
Preferred Alignment
Effect on Westshore Beach (1)
Effect on Westshore Beach (2)
Engineering

- Design Life of 50-100 years
- Sea Level Rise of 0.5m
- Significant wave height ($H_s$-design) of 2.0m
Breakwater

Section through new Breakwater

Key details:
- Seaward armour 1.1m dia – 2.0m thick layer
- Crest 3.5m CD
- Core 0.450m dia
- Leeward armour 1.25m dia – 2.3m thick layer
- MHWS 1.8m
- ~ -0.6m CD
- 2.3m CD New beach
Beach

Foreshore

Berm width
10m to 35m

Existing seawall

2.6m CD

2.3m CD

1

25
Environmental Effects

Adverse effects (physical processes):

- **construction** (temporary)
- **surfing conditions** (will be slightly changed)
- **footprint of structures / beach** (loss of coastal marine area)
Environmental Effects

Beneficial Effects from Project

• property (private and public) protected
• feeder beach for Westshore
• new recreational beach
• better public access along coastal marine area.