Future 3 – Protect

Future 3 – Protect manages stormwater and groundwater mainly via a network of pipes and pump stations to move water out of South Dunedin.

Roads help to direct and hold water during intense rainfall and stormwater reserves or constructed wetlands provide even more storage when required.

To support this, Council would improve the seawall along Portsmouth Drive, and raise an area of Forbury Corner to expand the existing high ground and create intensified space for people to relocate to, away from areas of highest risk. To minimise the amount of land raising required, a new residential development is included in the Ocean Beach Domain area.

KEY PROJECT FEATURES

- TOTAL REPURPOSED LAND **80.7 ha**
- **1190** PROPERTIES ACQUIRED
- **31 km** OF PIPING NETWORKS
- **14 ha** FOR STORAGE & WETLANDS
- **38 ha** OF RAISED LAND
- **2.1 km** SEAWALL
- **16 km** OF GW PIPE NETWORKS
- **10** NEW PUMP STATIONS
- **4** NEW OUTFALLS
- **0 km** OF OPEN CHANNELS
- **1** NEW GW PUMP STATIONS

What we heard about Future 3 – Protect

In 2025, Council asked for feedback from Aukaha (representing Kāi Tahu mana whenua) and the local community. We've used this feedback to inform development of the proposed futures.

KĀI TAHU RŪNAKA

Engagement with Aukaha indicated that Kāi Tahu mana whenua considers **Future 3 – Protect** a modest improvement to the Status Quo, but view it as fundamentally limited by its reliance on hard infrastructure. While the inclusion of larger stormwater retention areas and green spaces offers some ecological benefits, the approach does not fully align with Te Mana o Te Wai (wellbeing of water) or ki uta ki tai (mountains to sea) principles.

Aukaha noted moderate disruption and risks of inequitable transitions, with vulnerable communities potentially disadvantaged. They had favourable perceptions of **Future 3 – Protect** related to general risk reduction and an improvement in community hauora (health). However, the reliance on hard infrastructure rather than natural process limits the ability for mauri (life force) to be enhanced.

Overall, **Future 3 – Protect** is viewed as a compromise: slightly better than Status Quo, but misaligned with best outcomes for mana (recognised authority and prestige), whakapapa (genealogy) and cultural aspirations.

COMMUNITY ENGAGEMENT

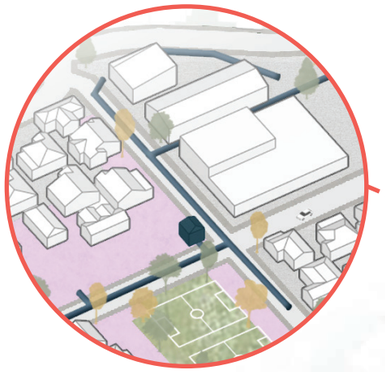
South Dunedin communities' perspectives on **Future 3 – Protect** are mixed, reflecting both optimism and caution. Many respondents felt this option was taking South Dunedin in the right direction, with around 39% agreeing and 20% strongly agreeing. People appreciated the inclusion of wetlands, seeing them as visually appealing and beneficial for the area's character.

While **Future 3 – Protect** was seen as empowering by giving people choices about where and how they live, concerns remained about equity and transparency of potential property acquisition.

Overall, **Future 3 – Protect** was viewed as a balanced and cost-effective approach that could improve resilience and quality of life without requiring widespread relocation. However, some respondents expressed uncertainty about details such as how land would be raised, the timeframe for implementation, and what support would be available for affected residents.

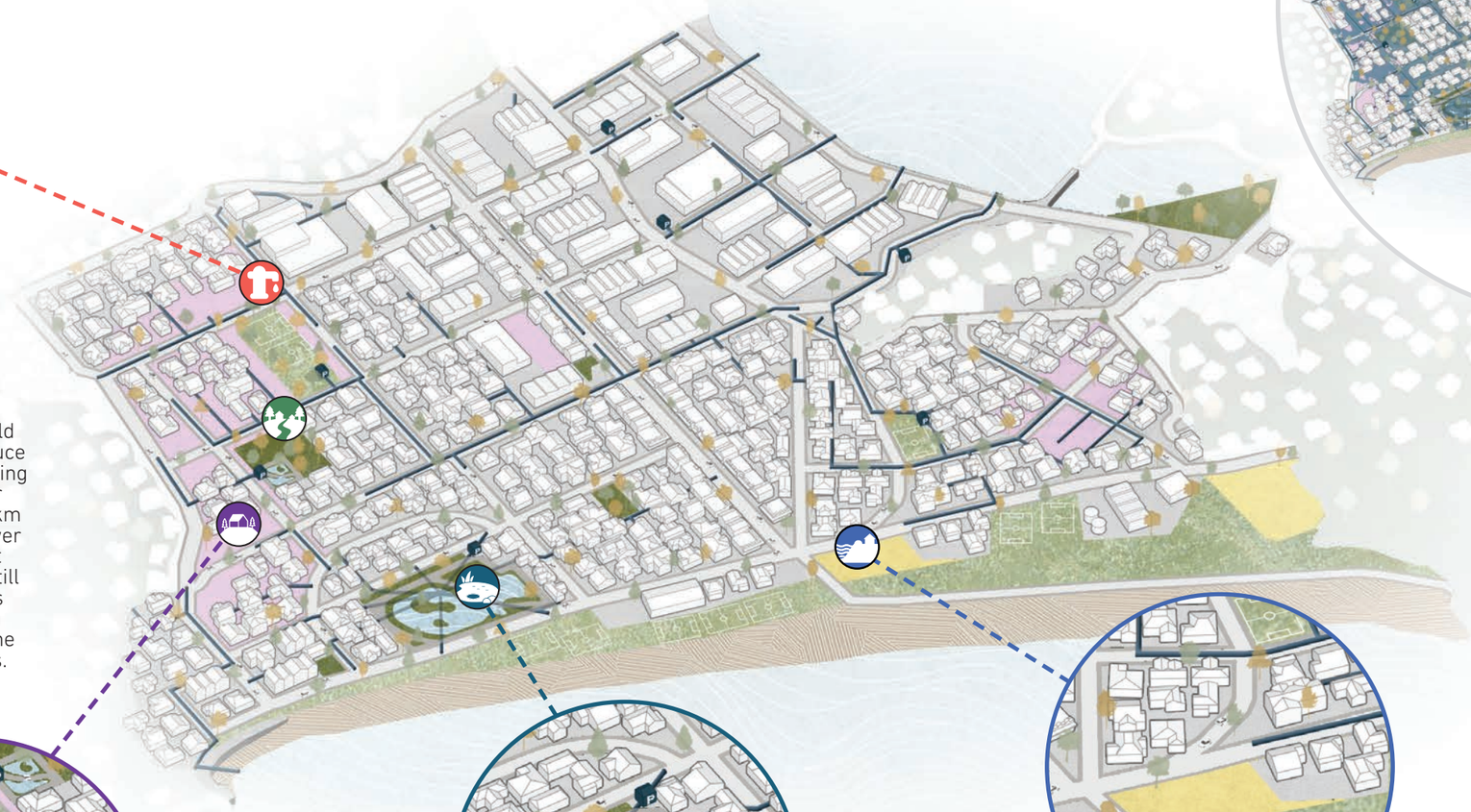
FUTURE 3 – PROTECT

Short-term (next few decades)



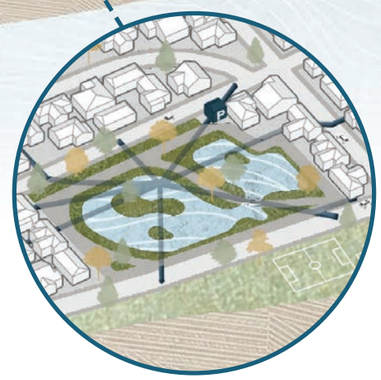
Pipes, pumps and flow paths

Over the next few decades, Council would invest heavily in pipes and pumps to reduce flooding, including new pump stations lifting peak capacity by 137% and upsizing or adding stormwater pipelines across 25 km of the network. Daily pumping would lower groundwater while providing sufficient capacity to drain rainfall. Roads would still flood periodically, but property impacts are generally avoided in storms with a 2% annual chance of occuring, with some damage risk in rarer 1% chance events.



Property acquisition

Property acquisition (shown in pink areas) would be required in high groundwater zones to prepare for safer development and infrastructure. Changes to planning rules begin in the Flat with changes in development rules to avoid increasing risk.

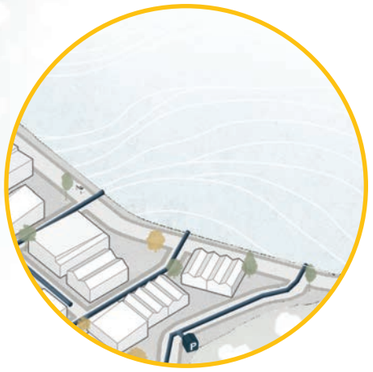


Storage

Parts of Forbury, Bathgate and Tonga parks would be adapted as stormwater storage, balancing sport, recreation, natural spaces, and water. They would connect to the piped and pumped network, with ponds drained to add system capacity. Most of the time Bathgate and Tonga would be dry, but during major rain they would temporarily store water, which is then pumped out after the peak. More blue-green space will be needed over time, requiring some land acquisition in the short-term.

New development

Areas shown in yellow along Victoria Road would be zoned for medium-density development to provide lower-risk residential development spaces for people to shift to over time. Any loss of existing park space would be balanced by creation of more parks and green spaces in higher risk areas, such as on the Flat. These types of 'land use swaps' would help enable the best use of land in South Dunedin.



Coastal protection

In the short-term, there are no changes to coastal protection along the harbourside.

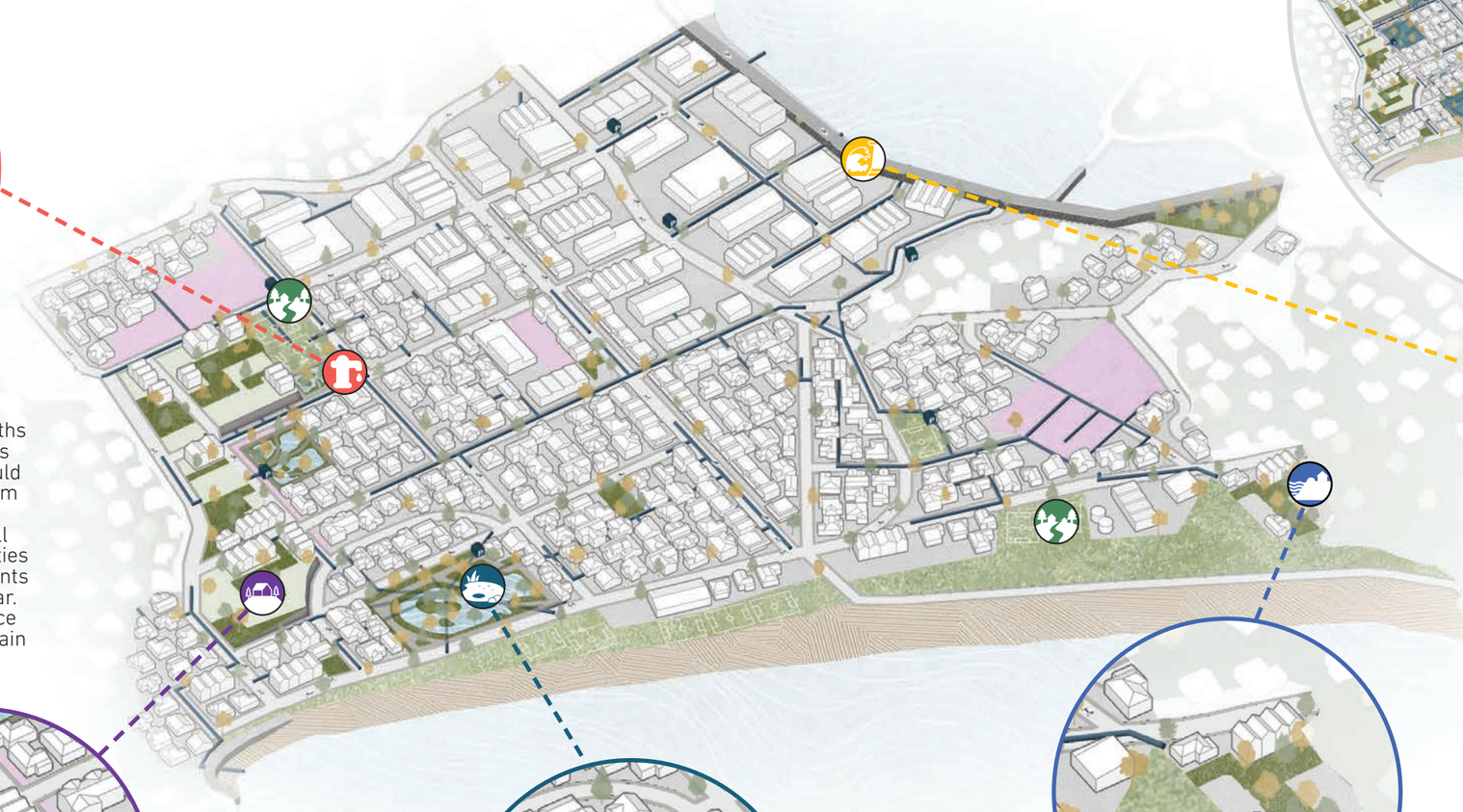
Working together with the St Clair / St Kilda Coastal Plan: There are a few ways to protect the coast, from hard structures like seawalls and offshore barriers (offshore breakwater) to softer options like adding more sand. Any plan would also deal with the contaminated landfill at Kettle Park. Right now, the quickest and most effective thing to do is protect the area where the St Clair geobags end and the Kettle Park landfill begins. This would mean building an offshore breakwater there, removing some of the landfill, and reshaping the dunes at Middles Beach to help reduce erosion. This intervention is under development and appraisal at this stage.

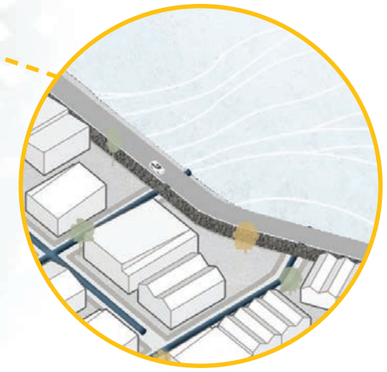
FUTURE 3 – PROTECT

Medium-term (mid-century)

Pipes, pumps and flow paths

Signals and triggers including flood depths greater than 150mm on residential lots or local roads during design events would prompt Council to invest in a further 5km of pipes and increase pump capacity by an additional 12%. Roads would still periodically flood, but impacts to properties are generally avoided during rainfall events with a 2% chance of occurring each year. During extreme events with a 1% chance of occurring each year, there would remain some risk of property damage.





Coastal protection

Once sea level reaches 0.55m above 2005 levels, improved coastal protection along the harbourside would be required, with Council investing in extending the seawall to Bayfield Park and raising road levels to maintain emergency and community access. Construction of the seawall would need to take place during this period along the harbour edge to prevent overtopping into the industrial area and the Edgar Centre.

Working Together with the St Clair / St Kilda Coastal Plan: Rising sea levels and more storms would weaken and undermine the south coast seawall over time. To stop it from failing and to help keep sand on the beach, the seawall would need to be upgraded, shifted and possibly supported with extra sand. In future, buffer zones might be needed along the coast to allow room to move things back if erosion or flooding gets worse.

New development

Medium-density housing would be developed along Victoria Road with on site stormwater management, set back from projected future shorelines. Any park loss would be offset by new green space in higher risk flat areas to optimise land use in South Dunedin. In high groundwater areas (e.g., Musselburgh), converting to open space would enable tighter drain spacing while keeping these areas suitable for sport and recreation. New development along Forbury Road would begin once land raising is complete.

Storage

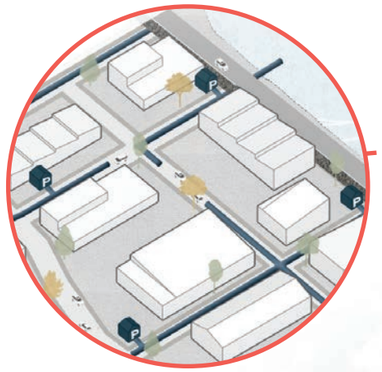
The existing storage areas have minor expansions in the medium-term. Over time, Tonga and Bathgate Parks are used more frequently to store heavy rainfall.

Land raising and development

Property acquisition would be complete by this point and would provide more space to manage stormwater and raise land. The area around Forbury Corner would be cleared and built up to prepare for development in a safe elevated area. Land raising would make ground levels higher through placement of fill material to reduce risk to pluvial, groundwater and coastal flooding and would extend the natural terraced area.

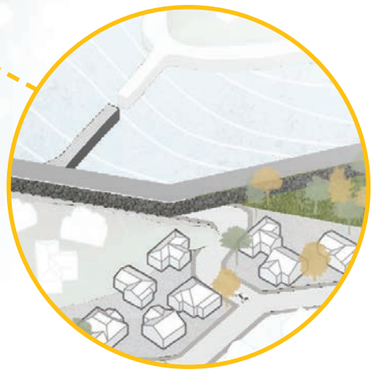
FUTURE 3 – PROTECT

Long-term (towards the end of the century and beyond)



Pipes, pumps and flow paths

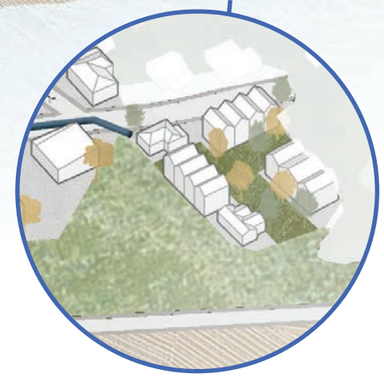
Council would increase pump capacity by a further 19% to keep land dry, with no additional pipes required if maintenance and periodic replacement are sustained. Roads would still flood periodically, but property impacts are generally avoided in storms with a 2% annual chance of occuring, though some risk would remain in rarer 1% events. Groundwater would be managed with daily pumping up to about 1.1 m of sea level rise, but becomes increasingly challenging beyond 2125.



Coastal protection

In the long-term an extended seawall would provide coastal protection along the harbourside, along with a raised road levels to maintain emergency and community access.

Working Together with the St Clair / St Kilda Coastal Plan: Long term coastal risks on the South Coast are hard to predict, but managing erosion and flooding would likely require a mix of ongoing actions, and engineers would need updated information to decide which options work best. In some places, moving things further back from the coast may be needed.

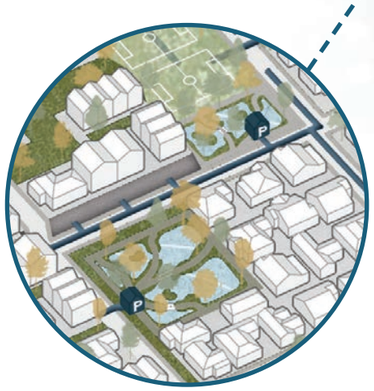


New development

Medium-density residential space along Victoria Road and Forbury Road would be complete by this stage providing additional space for people in low-lying areas to shift to safer areas.

Green space creation

To avoid insurance retreat or unaffordable premiums, all acquired land would either be raised and developed or converted to green space for stormwater and groundwater management, reflecting the area's higher long-term risk. Green space would include reserves, sports fields, and parks - such as transforming the low-lying area behind King Edward Street for market days and community use. Council would keep flexibility to adapt to other futures, with gradual shifts to raised land (Future 6) as a very long-term option if risks become unmanageable.



Storage

The scale of storage in green space increases, providing further space for water on low-lying land as groundwater becomes more difficult to manage and rainfall is projected to increase. Water is stored in ponds then discharged when the network has capacity (e.g. after a storm passes).

FUTURE 3 – PROTECT

Objectives assessment

SUSTAINABLE URBAN DEVELOPMENT

Short-term

Early stormwater upgrades and limited uptake of water-sensitive design result in high embodied emissions. Changes to planning rules reduce flood risk and support compact growth.

Medium-term

Medium-density growth in safer areas and coastal protection improve resilience and create a compact urban form. High embodied emissions result from land raising and seawall construction, and there are ongoing operational emissions due to continued pumping.

Long-term

Transforming low-lying areas into greenways and focusing growth in elevated, walkable neighbourhoods improves resilience, while continued pumping results in ongoing emissions.

ENVIRONMENTAL AND CULTURAL RESTORATION

Short-term

Short-term engineered interventions increase stormwater discharges and limit ecological or cultural restoration, offering negligible biodiversity gains now, though changes to planning rules could enable future greenways.

Medium-term

Land elevation and new green spaces create habitat and improve water quality, but seawall expansion impacts nearshore ecosystems and cultural access. Limited co-design and reliance on hard infrastructure constrain deeper cultural restoration despite some alignment with Te Mana o Te Wai.

Long-term

Converting low-lying areas into greenways and wetlands would restore habitats and improve water quality, while cultural regeneration is enabled through natural landscapes; however, historic displacement, land-raising and seawall impacts remain, under-scoring the need for cultural integration to restore mauri and long-term ecological health.

PROMOTE COMMUNITY SAFETY

Short-term

Stormwater upgrades lower risks to homes and essential services, and changes to planning rules support safer choices despite community anxiety. While visible infrastructure boosts confidence even as construction disrupts access, ultimately improving health through reduced dampness and better living conditions.

Medium-term

Elevated land and coastal protection reduce flood exposure while green spaces lower residual risk and enhance recreation. Reliable transport access improves services despite temporary disruption. Ongoing seawall and pump maintenance is required. Overall wellbeing improves though uncertainty may affect psychological resilience.

Long-term

Green infrastructure and elevated land significantly reduce hazard exposure and create healthier living environments. Health improves and psychological resilience grows as communities stabilise, even as some impacts of past relocations persist. Residual risk from extreme events may require ongoing adaptation.

JUST TRANSITION

Short-term

Construction disruptions and buyouts risk stress and displacement, especially for culturally and linguistically diverse communities. While prioritising equity can reduce immediate flood risks for vulnerable groups, buyouts occurring before new elevated housing becomes available could create affordability pressures.

Medium-term

Land raising disrupts social structures and can fragment culturally diverse communities, while expanded elevated housing improves affordability and intergenerational equity. Accessible design supports elderly and disabled residents, and changes to planning rules limit redevelopment in high-risk areas, though relocation processes may still strain cultural ties, particularly for Pasifika and refugee households.

Long-term

Secure, affordable homes in elevated areas and new green spaces in former flood zones improve conditions for vulnerable communities, though past displacement may leave social scars, while long-term protection and amenity support intergenerational equity.

SOCIAL AND ECONOMIC RESILIENCE

Short-term

Upgraded stormwater systems reduce flood-related economic losses and support business continuity despite construction disruptions. Changes to planning rules and early land acquisition strengthen long-term adaptive capacity but create short-term uncertainty. Limited green infrastructure reduces potential amenity and ecological co-benefits.

Medium-term

Medium-density housing and coastal protection strengthen economic stability and reduce property damage, though construction and relocation may temporarily disrupt communities and local economies. Visible resilience measures improve adaptive capacity and public understanding of climate risks.

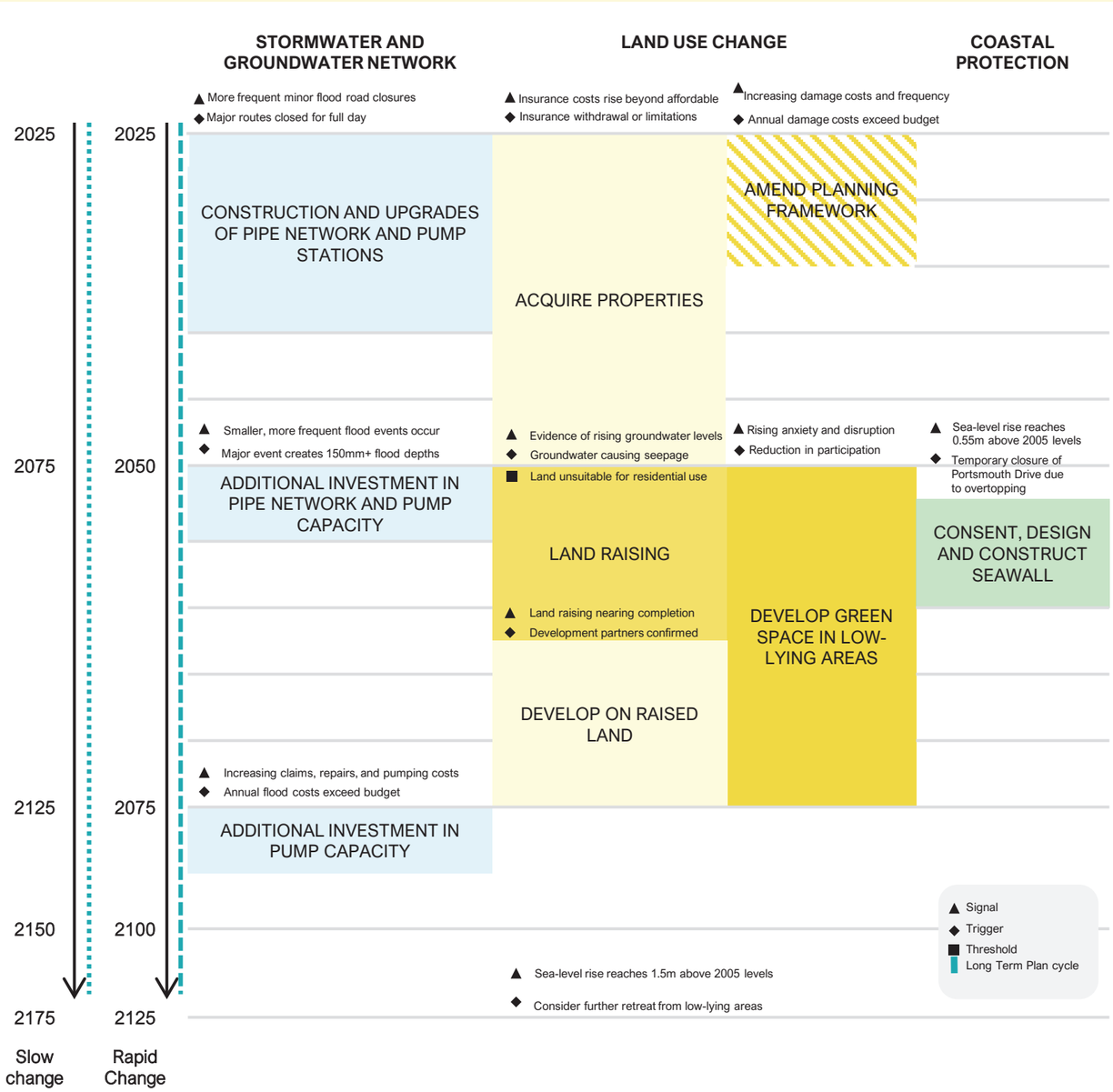
Long-term

Expanded greenways and elevated housing create a resilient urban system where businesses thrive in secure locations and improved infrastructure reduces flood-related losses. Active transport and public spaces foster social cohesion despite earlier fragmentation. Adaptive capacity strengthens through ongoing monitoring and flexible planning.

FUTURE 3 – PROTECT

Implementation approach

Adapting South Dunedin to a changing climate requires a sequence of interdependent actions, as shown below, which illustrates the indicative timeline for implementation. Actions along **Future 3 – Protect** are presented with sample signals (◆) and triggers (▲) representing early warning signs and resulting key decisions or enabling actions. Signals, triggers, and adaptation thresholds may be social, economic, ecological, physical, or cultural. The timing shown for signals, triggers, and actions is indicative only.



In the short-term, Council must first coordinate significant upgrades to the pipeline network and pumps to manage groundwater and stormwater efficiently. These upgrades need to be done simultaneously to avoid added cost and disruptions within the road corridor twice. Once drainage capacity is improved, Forbury Park and part of Tonga Park can be developed into greenspace for stormwater management. Short-term network upgrades have been designed to avoid needing to remove pipes in the future, and in the medium and long-term, increased stormwater capacity is largely provided by additional pumps.

At the same time, future development restrictions and opportunities require changes to the planning framework, which would need to be amended prior to physical works. In parallel, property acquisitions should be opportunistically pursued across Forbury Corner and Musselburgh. Properties acquired during this stage could be rented, leased, or similar until enough land is consolidated to enable large-scale transformation.

Finally, securing funding, consents and development partners would trigger major projects, including housing development at Tahuna and Forbury Corner. Enlargement of the existing seawall at Portsmouth Drive would require significant funds and should be complete prior to 2060 when the risk of overtopping increases due to sea level rise. Each step relies on the successful completion of the previous actions, creating a chain of dependencies that allow South Dunedin to adapt effectively to climate change.

WHAT ELSE DO WE NEED TO ACTION IT?

Changes in zoning: Council would need to make changes for development in the Flat and enable works related to upgrading infrastructure and raising land. This is a critical first step.

Financial incentives or penalties: Financial incentives can positively influence land use change and relocation required. Further work is needed into the mechanisms to achieve this but could include Council providing land-swaps, grants or low-interest loans for households relocating to raised land and development incentives in safer areas.

Property acquisition (buyouts): Land would need to be acquired to make space for pipes, pump stations and green infrastructure (e.g. stormwater management wetlands) which are "public works" because of their flood mitigation and public safety functions. Simultaneously, acquisition across Forbury Corner and Musselburgh would be required to enable land raising and safer development.

Funding mechanisms: Funding mechanisms are crucial for both the development of infrastructure and property acquisition. Further work is required to investigate possible funding mechanisms but could include public-private partnerships or development contributions for infrastructure upgrades (for example). Investigations into potential Central Government support through the Regional Infrastructure Fund (or similar) or protection of Crown assets (like schools) should occur.

FUTURE 3 – PROTECT

Economic measures

The Cost Benefit Assessment work seeks to compare the implications of shortlisted futures for South Dunedin.
Costs and benefits are indicative and intended for comparison at this step of the South Dunedin Future (SDF) Programme.

Time period	Benefits ($m)	Costs ($m)	BCR
Short-term (0 - 25 years)	$452	$1,598	0.28
Medium-term (26 - 50 years)	$372	$452	0.82
Long-term (51 - 100 years)	$511	$48	10.61
Overall	**$1,335**	**$2,098**	**0.64 (0.54 - 0.75)**

Cost estimation approach

Based on spatial mapping of potential scenarios and typical unit rates from similar New Zealand projects. Calculated at 2025 present values, assuming staged implementation across the three time periods identified with construction spread over the first 10 years of each period. Includes:

* Construction (capital, preliminaries, demolition, utilities)
* O&M costs
* Professional fees
* Contingency and optimism bias (+66% per Treasury guidance)
* Proactive Property acquisition – 1,190 properties (residential, commercial, social).

Whole-of-life costs: 25-year maintenance cycles + annual O&M. Pump stations include an allowance for annual electricity charges.

Exclusions: GST, escalation, downtime.

Costs do not account for potential offsets (e.g., land resale) or private owner contributions.

Range: $2.1b ($1.9b – $2.5b), influenced by scale and uncertainty (especially land raising).

Monistised benefits include:

* Avoided fatalities & injuries
* Avoided residential, industrial & commercial property damage
* Avoided infrastructure damage
* Avoided trauma and social cohesion costs
* Avoided water quality impairment
* Avoided income loss and emergency services costs.

Benefits excluded due to data unavailability at this stage:

* Redevelopment potential / Gains in property value
* Avoided loss of open spaces and ecosystem services
* Avoided heritage building damage
* Value of insurability.

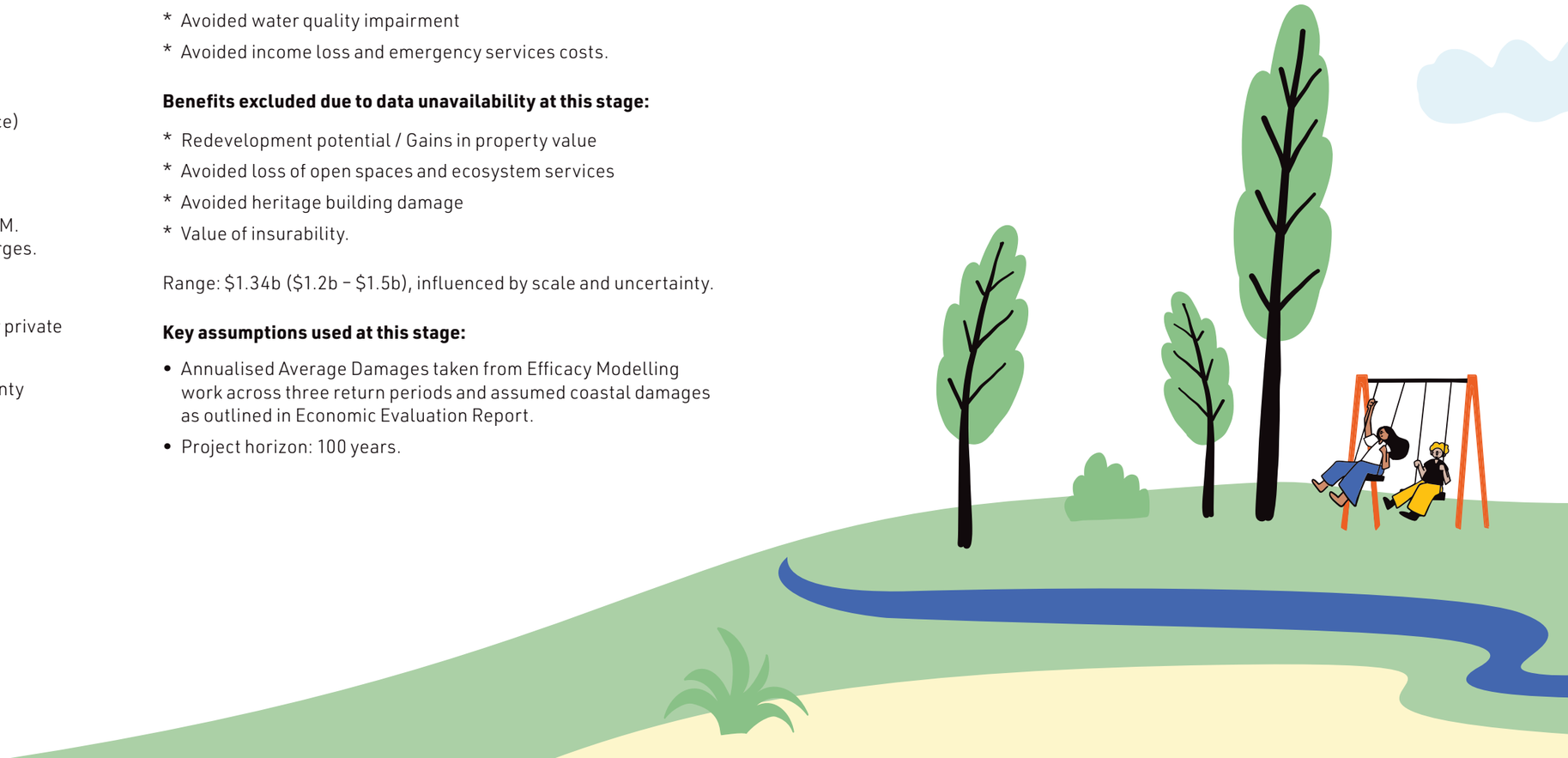
Range: $1.34b ($1.2b – $1.5b), influenced by scale and uncertainty.

Key assumptions used at this stage:

- Annualised Average Damages taken from Efficacy Modelling work across three return periods and assumed coastal damages as outlined in Economic Evaluation Report.
- Project horizon: 100 years.

KEY PROJECT FEATURES

- TOTAL REPURPOSED LAND **80.7 ha**
- **10** NEW PUMP STATIONS
- **14 ha** FOR STORAGE & WETLANDS
- **1** NEW GW PUMP STATIONS
- **16 km** OF GW PIPE NETWORKS
- **31 km** OF PIPING NETWORKS
- **0 km** OF OPEN CHANNELS
- **2.1 km** SEAWALL
- **1190** PROPERTIES ACQUIRED
- **4** NEW OUTFALLS
- **38 ha** OF RAISED LAND



FUTURE 3 – PROTECT

Risk assessment

Future 3 – Protect provides significant reduction in pluvial flooding and groundwater risk in the short-term relative to the baseline risk (present day, unmitigated).

This risk profile would further reduce over the medium-term despite increasing natural hazards. In the long-term, risk associated with most hazards are managed; however, high uncertainty remains regarding the long-term management of coastal hazards at St Clair / St Kilda, and further investigations are underway.

In all timeframes, residual risk remains, which is associated with the consequences of hazard events that exceed as-built design limits, and structural failures (e.g. seawall, groundwater pumping systems). It can also be associated with operational risks (e.g. power failures, lack of maintenance).

Overall, the **Future 3 – Protect** risk profile is largely similar to the other proposed futures, but has a slightly lower long term risk than **Future 4 - Restore** due to the raising of land that provides additional flood risk reduction benefits and minimizes residual risk.

HOW IT WOULD REDUCE RISK

In the short-term, stormwater infrastructure upgrades are predicted to remove the flood risk associated with frequent events (10% chance of occurring each year) and drive significant reduction of flooding associated with infrequent events (1% chance of occurring each year) across all buildings, lifelines, and critical infrastructure. Up to 33% of buildings may be exposed to infrequent flooding, with 11% of those likely to experience flooding above floor level. Otherwise, flooding would be generally contained within roads posing a low risk. Improved drainage and pumping also lowers groundwater levels so that buildings, parks, and roads are unlikely to be at risk.

In the medium-term, additional measures such as strategic acquisition of land for conversion to green space or raised land, and continued stormwater infrastructure improvements, coastal protection, and management of groundwater further reduce pluvial flood risk, coastal flooding risk and groundwater risk. The percentage of buildings exposed to infrequent flooding above floor level drops to 8%. In the long-term, this drops further to 6% primarily due to high density residential areas re-locating to raised land. This has the added benefit of reducing residual risks in relation to pluvial flooding, groundwater hazards and coastal flooding.

HOTSPOT SUMMARY OF RISKS TO SOUTH DUNEDIN FUTURE 3 - PROTECT: EXPOSURE OF BUILDINGS AND ROADS TO FLOODING AND GROUNDWATER