Northern Adaptation Area: Draft Adaptation Pathways

Northern Adaptation Area is separated into four sub-areas:

- Otaki Beach
- Te Horo Beach
- Peka Peka Beach
- Rural Northern Adaptation Area

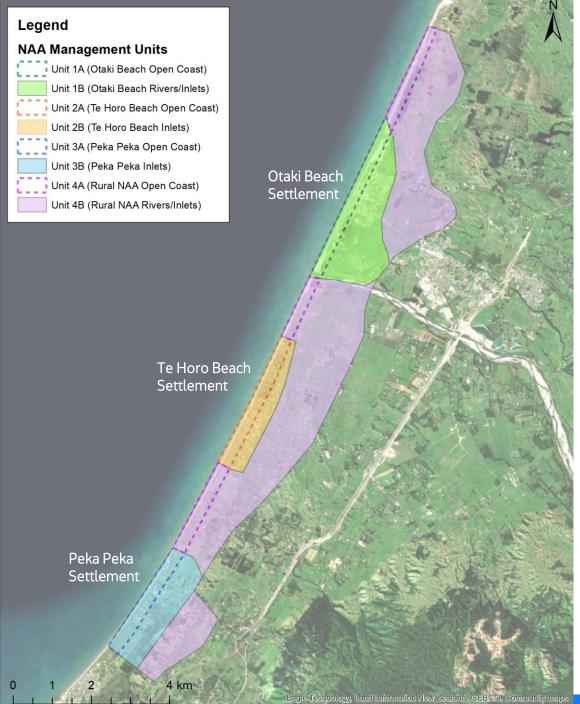
Each sub-area has been further split into two 'management units' based on the hazard source (e.g. erosion and inundation).

Possible high-level pathways of adaptation options which give effect to the Draft NAA Objective (from CAP workshop, 29th March. 2023) have been formed for CAP discussion.

The aim of this workshop session is for CAP to:

- Select a short-list of pathways for each sub area that they think require further consideration (economic assessment and MCDA scoring);
- Define what package of actions could be used for each option in the short-listed pathways.

Overview of Management Units



Re-cap - Northern Adaptation Area Draft Adaptation Objective

Draft Adaptation Pathways have been formed to achieve this draft objective:

Secure long-term coastline resilience through nature-based adaptation solutions, where possible, that:

- Maintains safe access to the beach;
- Maintains food basket values (mahinga kai); and
- Provides flexibility for the community to respond to increasing sea level rise risks over time.

Short-list Adaptation Options

ž	ź
C	
F	=
٥	Ļ

ACTIONS

ENHANCE

We keep doing what we are doing, and do it better



- Enhance existing inundation protection
- Dune resilience 'package' (planting, managing access, sand trap fencing)
- **Education and** emergency management

ACCOMODATE

We adapt where we are and learn to live with the hazard



- Floodproof buildings and infrastructure
- Adaptable and relocatable buildings
- Elevate floor levels of buildings

PROTECT

We protect ourselves from the hazard



- Soft Engineering
- Renourishment
- Beach scraping/ dune reconstruction

Hard Engineering

- Sea walls
- Stopbanks
- Culverts and floodgates
- Detached breakwaters

Pumpstations

RETREAT

We move to safer ground



Retreat

AVOID

We avoid developing in places we know will be at risk in the future



- Zoning and setback controls
- Trigger-based or time limited land use controls
- Building design
- Reducing further intensification or development

Pathways Template

•		 	
	CI		
	Sub-area:		
	Jab alca.		

For each pathway, include the possible adaptation option and example of possible action under that option



Management Unit	Pathway	Short term	\rightarrow	Medium term	→	Long term
Coast	Pathway 1		→		→	
Open (Pathway 2		\rightarrow		→	
Unit A: n/Inunc	Pathway 3		→		→	
Management Unit A: Open Coast Erosion/Inundation	Pathway 4		\rightarrow		\rightarrow	
Manag	Pathway 5		→		→	
c	Pathway 6		→		→	
Unit B: ındatio	Pathway 6		→		\rightarrow	
ement vers inc	Pathway 8		→		\rightarrow	
Management Unit B: Inlets/Rivers inundation	Pathway 9		→		\rightarrow	
<u>E</u>	Pathway 10		→		\rightarrow	

- All pathways at all timeframes to include "<u>Avoid"</u> option through land-use planning (e.g short term is new coastal hazard provisions in Coastal Environment District plan change).
- Under existing RMA legislation, the success of planning actions is limited to re-developments and new developments by existing use rights. For re-development, this is dependent on the "turn-over" of building stock.

S © Jacobs 2023

Draft Adaptation Pathways for each Management Unit

Management Units – Otaki Beach

	Coa Eros		Coastal Inundation		
SLR Scenario	SSP2- 4.5	SSP5- 8.5	SSP2- 4.5	SSP5- 8.5	
Element	2130	2130	2130	2130	
Built Environment					
Properties - Whole Adaptation Area	L	L	М	Е	
Properties - Otaki Beach	M	Н	Н	Е	
Properties - Te Horo Beach	M	Н	M	M	
Properties - Peka Peka	L	M	M	M	
Water Supply Infrastructure	M	Н	L	L	
Wastewater Infrastructure	M	Н	L	Н	
Stormwater Infrastructure	M	Н	M	Н	
Roads and Bridges	L	Н	Н	Е	
Electrical Transmission and supply infrastructure	M	Н	L	M	
Natural gas supply mains	No Exposure		L	M	
Ecological					
Dunes	L	Н	M	Н	
Ecological Sites	L	Н	M	Е	
Wetlands	L	L	M	Н	
Significant Bird Habitat	L	L	Н	Н	
Key Indigenous Trees	L	L	L	L	
Human					
Displacement	L	М	M	Н	
Inequities	М	М	Н	Е	
Health	M	M	Е	Е	
Daily Routines	L	M	M	M	
Natural Character					
CTA1: Ōtaki (Coastal Terrestrial Area)	М	М	M	М	
Otaki Dunes (High Natural Character)	M	M	M	M	
Te Horo Dunes (High Natural Character)	L	M	L	L	
Part of CTA2: Waikanae and Paraparaumu (Coastal Terrestrial Area)	M	Н	M	Н	
Peka Peka Dunes (High Natural Character)	M	Н	M	M	



Sub-area 1: Otaki Beach Settlement

Starter for Discussion

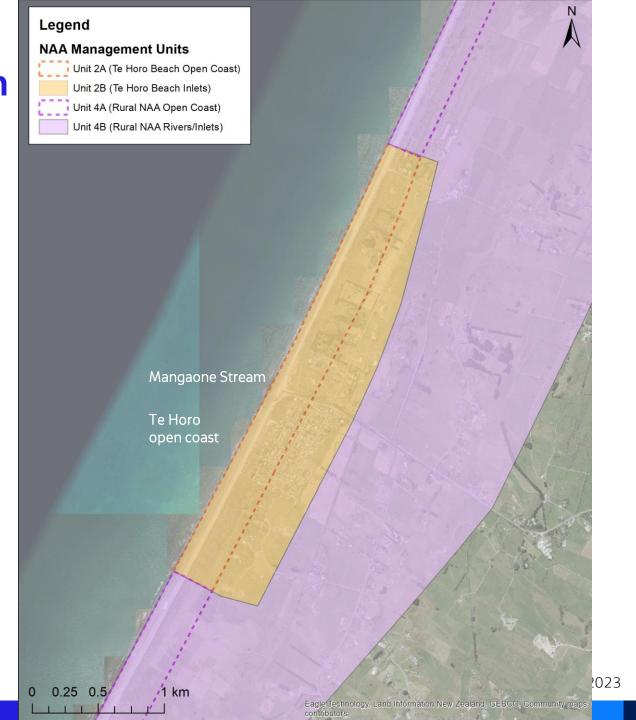
All pathways at all timeframes to include "Avoid" option through landuse planning



Management Unit	Draft Pathway	Short term (0-30 years)	→	Medium term (30-50 years)	→	Long term (50-100 years)
Coast	1 (best under SSP2-4.5)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
_	2 (SSP5-8.5 only)	Status Quo (continue current dune maintenance)	\rightarrow	Enhance (Increase Dune Resilience)	→	Hard Engineering Protection Or Retreat (Infrastructure & Properties)
t 1A: 0 nundati	3 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
Management Unit 1A: Ope Erosion/Inundation	4 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Hard Engineering Protection Or Retreat (Infrastructure & Properties)
nagem Erc	5 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
Ma	6 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	→	Hard Engineering Protection Or Retreat (Infrastructure & Properties)
w	7 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Status Quo (continue maintenance of current structures)	→	Enhance
/River	8 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	\rightarrow	Enhance (strengthen existing structures)	→	(strengthen existing structures)
: Inlets on	9 (Either scenario)	Status Quo (maintenance of current structures)	\rightarrow	Enhance (strengthen existing stopbanks)	→	Accommodate (proactively raise floors/flood proof houses)
nt Unit 1B: Inlets/Rivers inundation	10 (Either scenario)	Enhance (strengthen existing structures)	→	Enhance (strengthen existing stopbanks)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)
Management			Accommodate (proactively raise floors/flood proof houses)		→	Accommodate (proactively raise floors/flood proof houses)
	11 (SSP5-8.5 only)	Enhance (strengthen existing structures)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)

Management Units – Te Horo Beach

		stal sion	Coastal Inundation		
SLR Scenario	SSP2- 4.5	SSP5- 8.5	SSP2- 4.5	SSP5- 8.5	
Element	2130	2130	2130	2130	
Built Environment					
Properties - Whole Adaptation Area	L	L	M	Е	
Properties - Otaki Beach	M	Н	Н	Е	
Properties - Te Horo Beach	M	Н	M	M	
Properties - Peka Peka	L	M	M	M	
Water Supply Infrastructure	M	Н	L	L	
Wastewater Infrastructure	M	Н	L	Н	
Stormwater Infrastructure	M	Н	M	Н	
Roads and Bridges	L	Н	Н	Е	
Electrical Transmission and supply infrastructure	M	Н	L	M	
Natural gas supply mains	No Exp	oosure	L	М	
Ecological					
Dunes	L	Н	M	Н	
Ecological Sites	L	Н	M	Е	
Wetlands	L	L	M	Н	
Significant Bird Habitat	L	L	Н	Н	
Key Indigenous Trees	L	L	L	L	
Human					
Displacement	L	М	M	Н	
Inequities	M	М	Н	Е	
Health	M	М	Е	Е	
Daily Routines	L	М	M	М	
Natural Character					
CTA1: Ōtaki (Coastal Terrestrial Area)	M	М	M	M	
Otaki Dunes (High Natural Character)	M	М	M	M	
Te Horo Dunes (High Natural Character)	L	M	L	L	
Part of CTA2: Waikanae and Paraparaumu (Coastal Terrestrial Area)	M	Н	M	Н	
Peka Peka Dunes (High Natural Character)	M	Н	M	M	



Sub-area 2: Te Horo Beach Settlement

Starter for Discussion

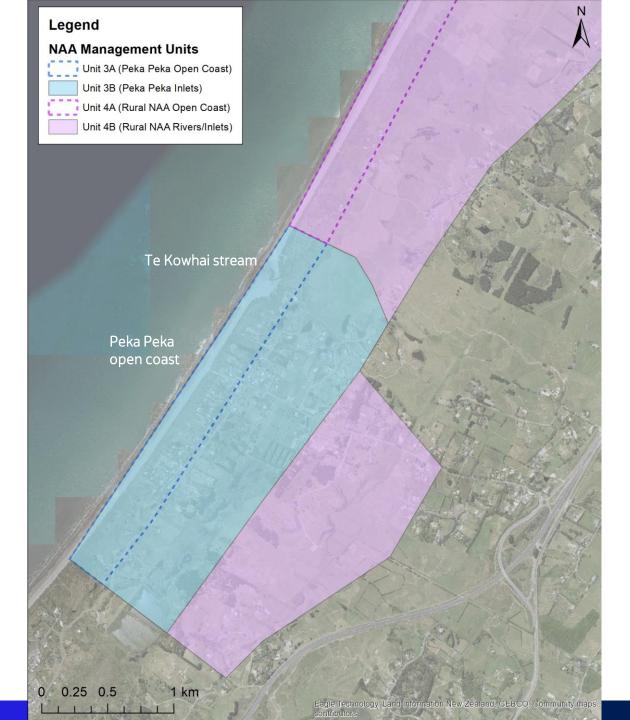
All pathways at all timeframes to include "Avoid" option through landuse planning



Management Unit	Draft Pathway	Short term (0-30 years)	→	Medium term (30-50 years)	→	Long term (50-100 years)
ast	1 (best under SSP2-4.5)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
Open Coast ition	2 (SSP5-8.5 only)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	Hard Engineering Protection Or Retreat (Properties)
t 2A: 0 nundati	3 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
ement Unit 2A: Oper Erosion/Inundation	4 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Hard Engineering Protection Or Retreat (Properties)
Management Erosioı	5 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
Ma	6 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	→	Hard Engineering Protection Or Retreat (Properties)
w	7 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Status Quo (continue maintenance of current structures)	→	Enhance
/River	8 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Enhance (strengthen existing structures)	→	(strengthen existing structures)
2B: Inlets/Rivers ition	9 (Either scenario)	Status Quo (maintenance of current structures)	\rightarrow	Enhance (strengthen existing stopbanks)	→	Accommodate (proactively raise floors/flood proof houses)
Unit	10 (Either scenario)	Enhance (strengthen existing structures)	→	Enhance (strengthen existing stopbanks)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)
Management	Accommodate (proactively raise floors/flood proof houses)		→	Accommodate (proactively raise floors/flood proof houses)		
Man	11 (SSP5-8.5 only)	Enhance (strengthen existing structures)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)

Management Units – Peka Peka Beach

	Coa Eros		Coastal Inundation		
SLR Scenario	SSP2- 4.5	SSP5- 8.5	SSP2- 4.5	SSP5- 8.5	
Element	2130	2130	2130	2130	
Built Environment					
Properties - Whole Adaptation Area	L	L	M	E	
Properties - Otaki Beach	M	Н	Н	Е	
Properties - Te Horo Beach	M	Н	M	M	
Properties - Peka Peka	L	М	M	M	
Water Supply Infrastructure	M	Н	L	L	
Wastewater Infrastructure	M	Н	L	Н	
Stormwater Infrastructure	M	Н	M	Н	
Roads and Bridges	L	Н	Н	Е	
Electrical Transmission and supply infrastructure	M	Н	L	M	
Natural gas supply mains	No Exp	osure	L	M	
Ecological					
Dunes	L	Н	M	Н	
Ecological Sites	L	Н	M	Е	
Wetlands	L	L	M	Н	
Significant Bird Habitat	L	L	Н	Н	
Key Indigenous Trees	L	L	L	L	
Human					
Displacement	Г	М	M	Н	
Inequities	М	М	Н	Е	
Health	М	М	Е	Е	
Daily Routines	L	М	M	М	
Natural Character					
CTA1: Ōtaki (Coastal Terrestrial Area)	М	М	M	M	
Otaki Dunes (High Natural Character)	М	М	M	M	
Te Horo Dunes (High Natural Character)	L	М	L	L	
Part of CTA2: Waikanae and Paraparaumu (Coastal Terrestrial Area)	M	Н	M	Н	
Peka Peka Dunes (High Natural Character)	M	Н	M	M	



Sub-area 3: Peka Peka Settlement

Starter for Discussion

All pathways at all timeframes to include "Avoid" option through landuse planning

Avoid

Enhance

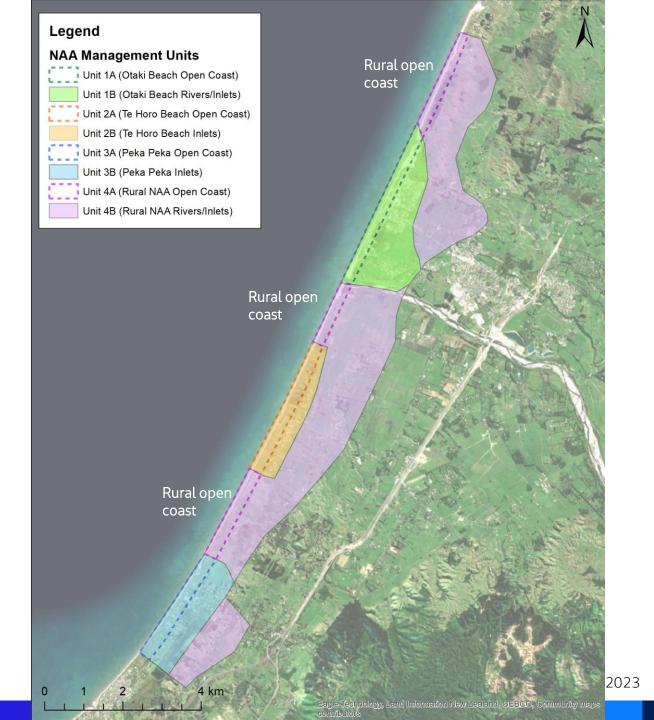
Accommodate

Starter for Discussion		or Discussion	use planning		X		Makaru
	Management Unit	Draft Pathway	Short term (0-30 years)	→	Medium term (30-50 years)	7	Long term (50-100 years)
ıst	ast	1 (best under SSP2-4.5)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
	Management Unit 3A: Open Coast Erosion/Inundation	2 (SSP5-8.5 only)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	\rightarrow	Hard Engineering Protection Or Retreat (Properties)
	t 3A: 0 nundati	3 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
	ement Unit 3A: Opel Erosion/Inundation	4 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Hard Engineering Protection Or Retreat (Properties)
	nagem Ero	5 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
	Wa	6 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	\rightarrow	Hard Engineering Protection Or Retreat (Properties)
	ω.	7 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Status Quo (continue maintenance of current structures)	→	Enhance
	/River	8 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Enhance (strengthen existing structures)	→	(strengthen existing structures)
	i: Inlets on	9 (Either scenario)	Status Quo (maintenance of current structures)	→	Enhance (strengthen existing stopbanks)	→	Accommodate (proactively raise floors/flood proof houses)
Management Unit 3B: Inlets/Rivers inundation	nt Unit 3B inundatio	10 (Either scenario)	Enhance (strengthen existing structures)	→	Enhance (strengthen existing stopbanks)		Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)
	ageme		(proactively ra		Accommodate (proactively raise floors/flood proof houses)	→	Accommodate (proactively raise floors/flood proof houses)
	Man	11 (SSP5-8.5 only) Enhance (strengthen existing structures)		→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Properties)
	12						@ lacohe 2023

Protect

Management Units – Rural NAA

		stal sion	Coastal Inundation		
SLR Scenario	SSP2- 0 4.5	SSP5- 8.5	SSP2- 4.5	SSP5- 8.5	
Element	2130	2130	2130	2130	
Built Environment					
Properties - Whole Adaptation Area	L	L	M	Е	
Properties - Otaki Beach	M	Н	Н	Е	
Properties - Te Horo Beach	M	Н	M	M	
Properties - Peka Peka	L	М	M	M	
Water Supply Infrastructure	M	Н	L	L	
Wastewater Infrastructure	M	Н	L	Н	
Stormwater Infrastructure	M	Н	M	Н	
Roads and Bridges	L	Н	Н	Е	
Electrical Transmission and supply infrastructure	M	Н	L	M	
Natural gas supply mains	No Exp	oosure	L	M	
Ecological					
Dunes	L	Н	M	Н	
Ecological Sites	L	Н	M	Е	
Wetlands	L	L	M	Н	
Significant Bird Habitat	L	L	Н	Н	
Key Indigenous Trees	L	L	L	L	
Human					
Displacement	L	М	M	Н	
Inequities	M	М	Н	Е	
Health	M	М	Е	Е	
Daily Routines	L	М	M	M	
Natural Character					
CTA1: Ōtaki (Coastal Terrestrial Area)	M	М	M	М	
Otaki Dunes (High Natural Character)	M	M	M	M	
Te Horo Dunes (High Natural Character)	L	М	L	L	
Part of CTA2: Waikanae and Paraparaumu (Coastal Terrestrial Area)	M	Н	M	Н	
Peka Peka Dunes (High Natural Character)	M	Н	M	M	



Sub-area 4: Rural NAA

Starter for Discussion

All pathways at all timeframes to include "Avoid" option through landuse planning



Management Unit	Draft Pathway	Short term (0-30 years)	→	Medium term (30-50 years)	→	Long term (50-100 years)
ast	1 (best under SSP2-4.5)	Status Quo (continue current dune maintenance)	→	Status Quo (continue current dune maintenance)	→	Enhance
ement Unit 1A: Open Coast Erosion/Inundation	2 (best under SSP2-4.5))	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	(Increase Dune Resilience)
t 1A: 0 nundati	3 (best under SSP5-8.5)	Status Quo (continue current dune maintenance)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)
ent Uni sion/Ir	4 (best under SSP2-4.5)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)
Management Unit 1A: Erosion/Inunda	5 (best under SSP5-8.5)	Enhance (Increase Dune Resilience)	→	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection
Ma	6 (SSP5-8.5 only)	Enhance (Increase Dune Resilience)	→	Soft Engineering Protection (dune reconstruction, renourishment, scraping)	\rightarrow	(dune reconstruction, renourishment, scraping)
40	7 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Status Quo (continue maintenance of current structures)	→	Enhance
/Rivers	8 (best under SSP2-4-5)	Status Quo (maintenance of current structures)	→	Enhance (strengthen existing structures)	→	(strengthen existing structures)
nit 1B: Inlets/Rivers ndation	9 (Either scenario)	Status Quo (maintenance of current structures)	→	Enhance (strengthen existing stopbanks)	→	Accommodate (proactively raise floors/flood proof houses)
nt Unit 1B: I inundation	10 (Either scenario)	Enhance (strengthen existing structures)	→	Enhance (strengthen existing stopbanks)	→	Or Additional Hard Protection (stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)
Management U inu	11 (SSP5-8.5 only)	Enhance	→	Accommodate (proactively raise floors/flood proof houses) Or Additional Hard Protection (stanbanks floodcates number stations)	→	Accommodate (proactively raise floors/flood proof houses) Or Additional Hard Protection
Σ	11 (SSP5-8.5 only) (strengthen existing structures) (stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)		→	(stopbanks, floodgates, pump stations) Or Retreat (Infrastructure & Properties)		

Copyright notice

Important

The material in this presentation has been prepared by Jacobs®.

All rights reserved. This presentation is protected by U.S. and International copyright laws. Reproduction and redistribution without written permission is prohibited. Jacobs, the Jacobs logo, and all other Jacobs trademarks are the property of Jacobs Engineering Group Inc.

Jacobs is a trademark of Jacobs Engineering Group Inc.

