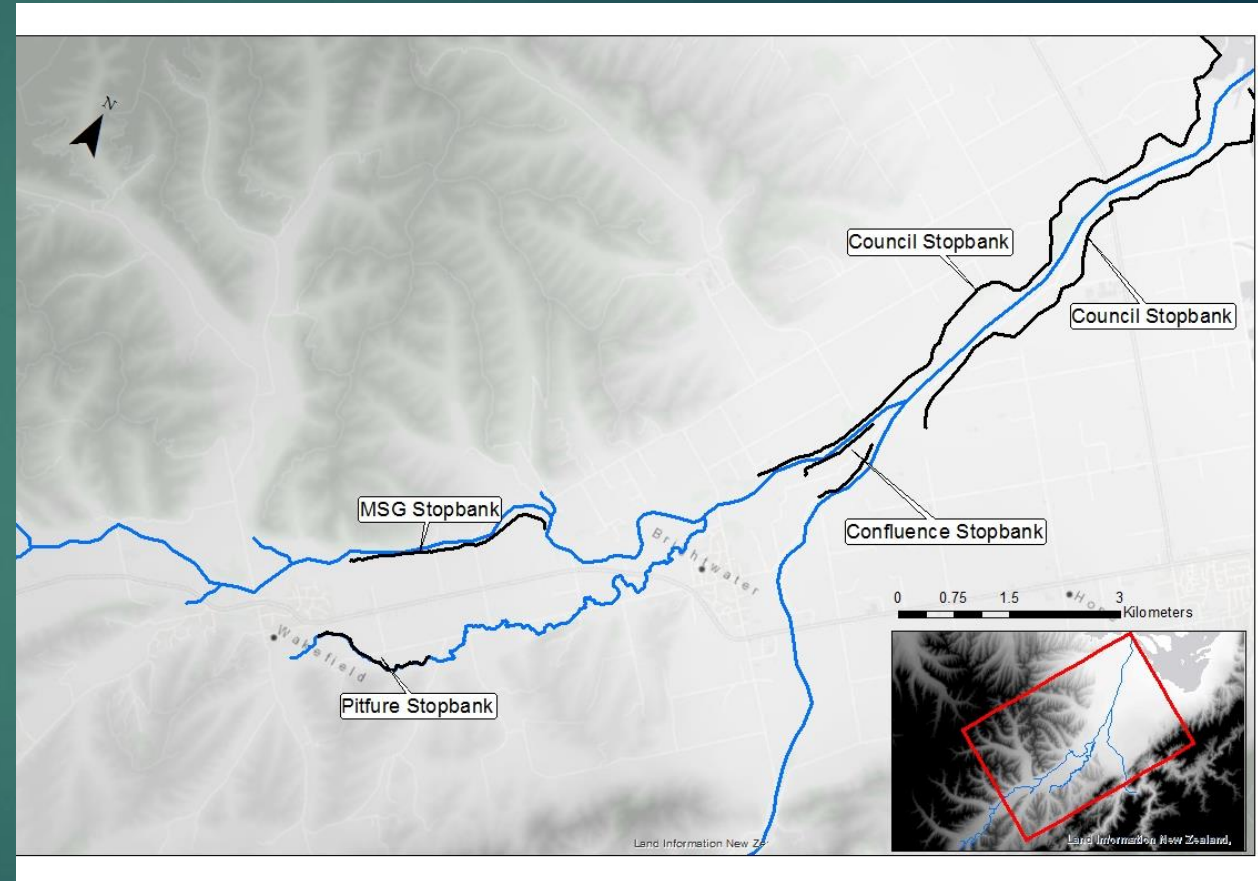


# The impacts of undocumented stopbanks on flood routing: a Tasman case study

THOMAS WALLACE

# Background

- Floods are New Zealand's most frequent and damaging natural event
- Currently no nationwide standard for flood protection
- Undocumented stopbanks not subjected to formal design, consents, or maintenance
- Currently thought to pose a significant and unassessed impact on flood routing
- TDC undocumented stopbanks: Main Spring Grove, Pitfure, Confluence



Waimea Floodplain

# Objectives

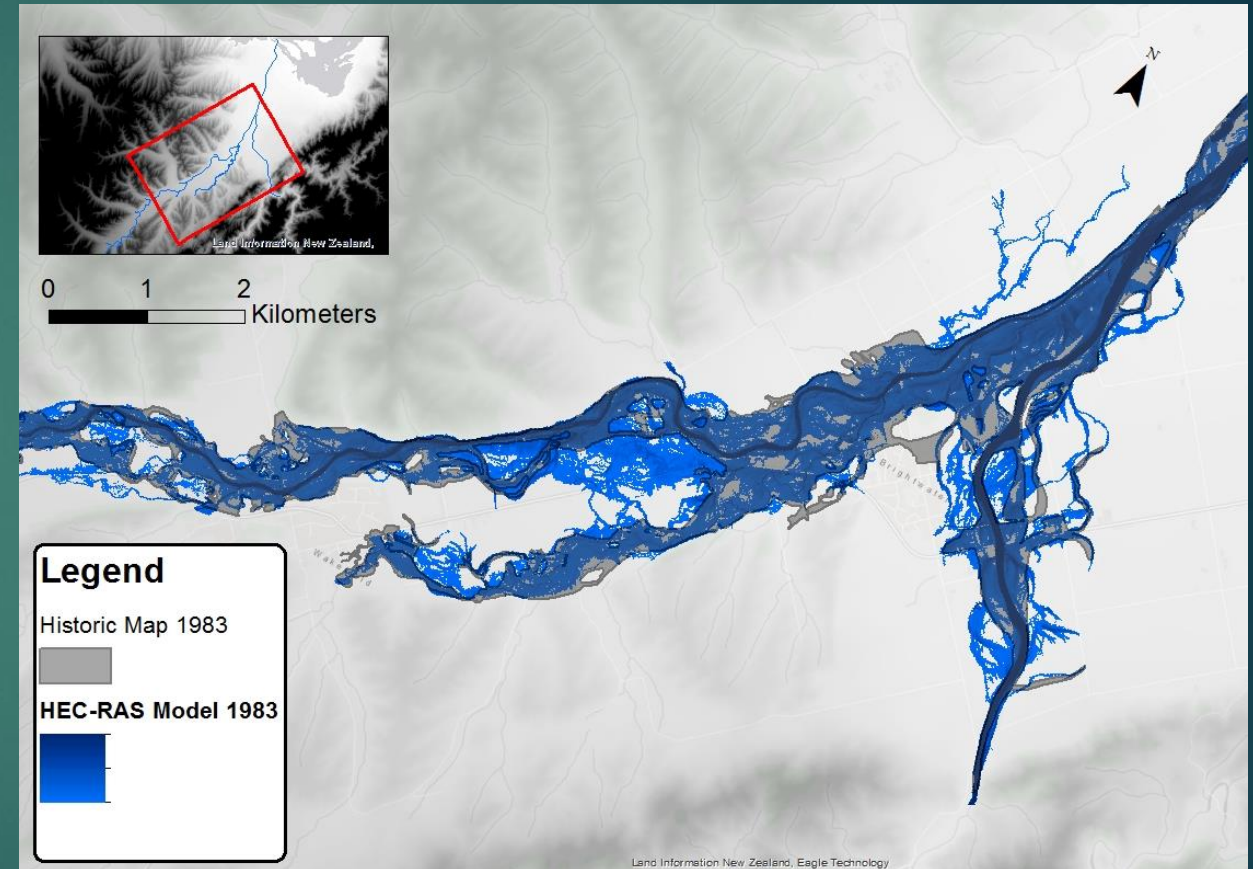
- ▶ Create a data set of characteristics of the undocumented stopbanks and integrate this with the Tasman's stopbank inventory
- ▶ Create a computational flood model to carry out flood assessments to determine the impact of the undocumented stopbanks

Scenario	Definition	Documented	MSG	Pitfure	Confluence
D1U1	All stopbanks present	✓	✓	✓	✓
D0U0	All stopbanks removed	-	-	-	-
D1U0	Documented stopbanks are removed	-	✓	✓	✓
MSG0	MSG stopbank is removed	✓	-	✓	✓
Pit0	Pitfure stopbank is removed	✓	✓	-	✓
Con0	Confluence stopbank is removed	✓	✓	✓	-
MSGR	MSG stopbank is modified	✓	✓ ✓	✓	✓
PitR	Pitfure stopbank is modified	✓	✓	✓ ✓	✓

*Scenarios Tested*

# Methods

- ▶ HEC-RAS full 2D modelling
- ▶ 2016 LiDAR with 2016 interpolated cross section bathymetry
- ▶ Ungauged tributaries estimated with TM61
- ▶ 2012 LCDB for land use
- ▶ Calibrated against 1983 flood event
- ▶ Validated against 2011, 1982, 1980 events



*Calibrated model against historic flood map*

# Condition Assessment

	Height (m)	Cover	Significant Issues
<b>Council</b>	2.6	Grasses	-
<b>MSG</b>	1.2/2.6	Grasses/ Impenetrable	Woody Vegetation
<b>Pitfure West</b>	1.0	Woody Vegetation	Woody Vegetation, Decayed Roots
<b>Pitfure East</b>	1.0	Grasses	Erosion of Banks
<b>Confluence Wai-iti</b>	1.5	Scrub	Access Roads
<b>Confluence Wairoa</b>	1.5	Impenetrable	Woody Vegetation

*Summary of stopbank condition assessment*

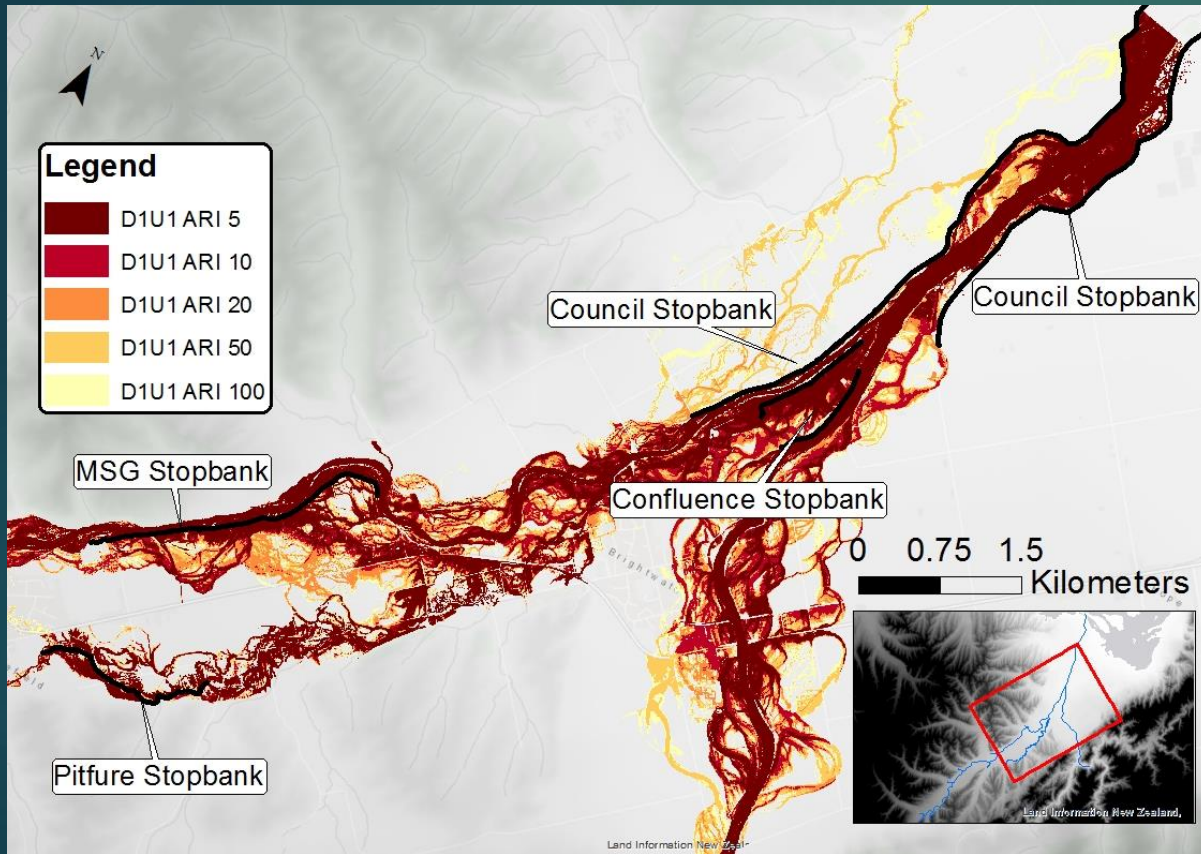


*Typical Pitfure stopbank section*

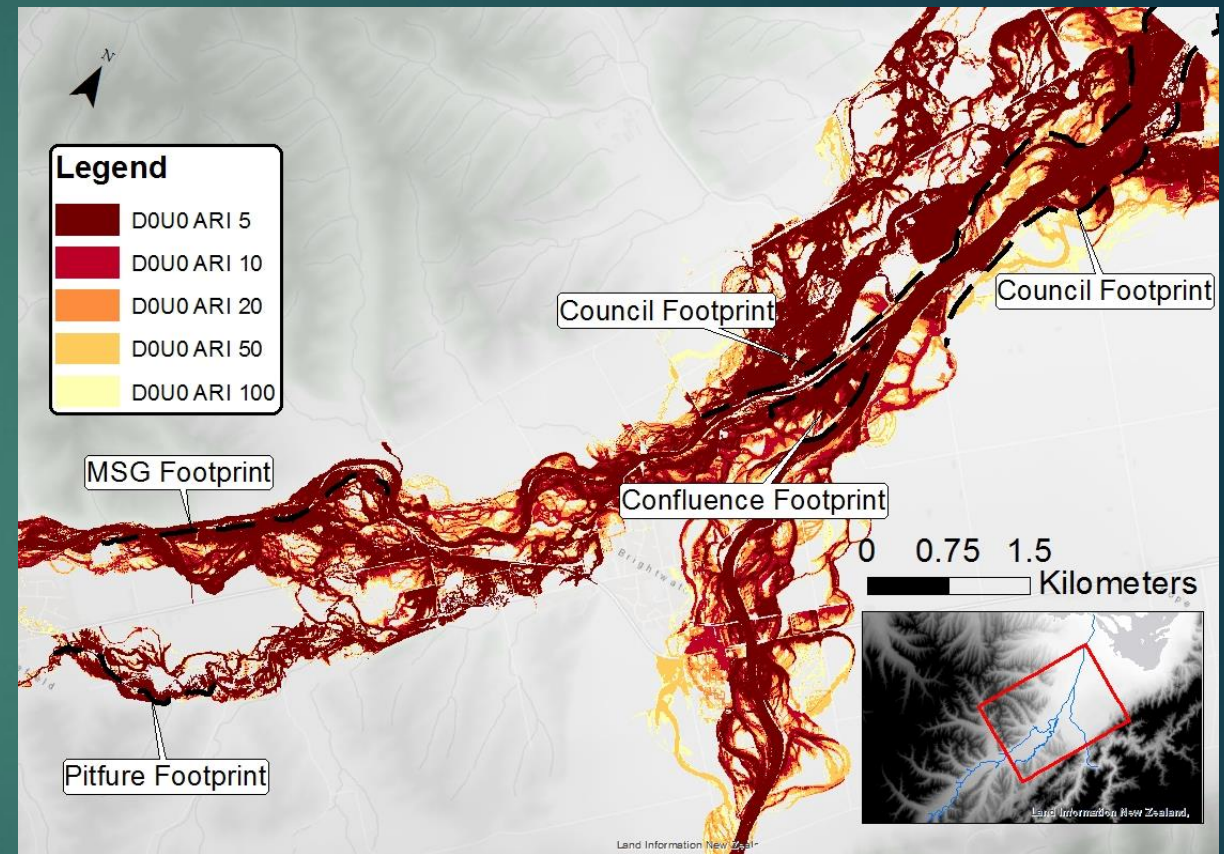


*Typical Council stopbank section*

# Area Inundated – D1U1 & D0U0



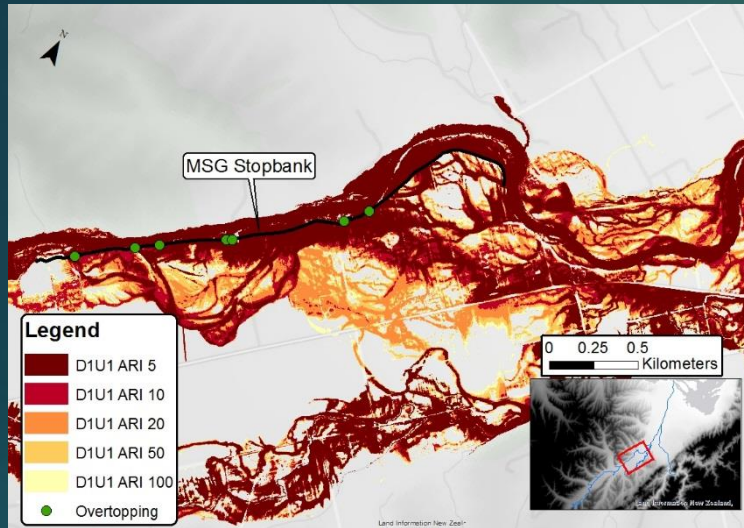
*All stopbanks present*



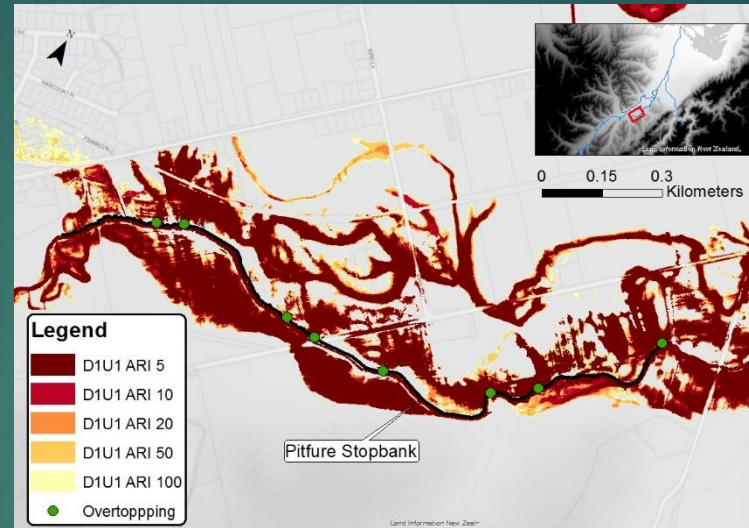
*No stopbanks present*

- ▶ 5 year event: Difference in inundation  $\sim 4.1 \text{ km}^2$
- ▶ 100 year event: Difference in inundation  $\sim 5.8 \text{ km}^2$

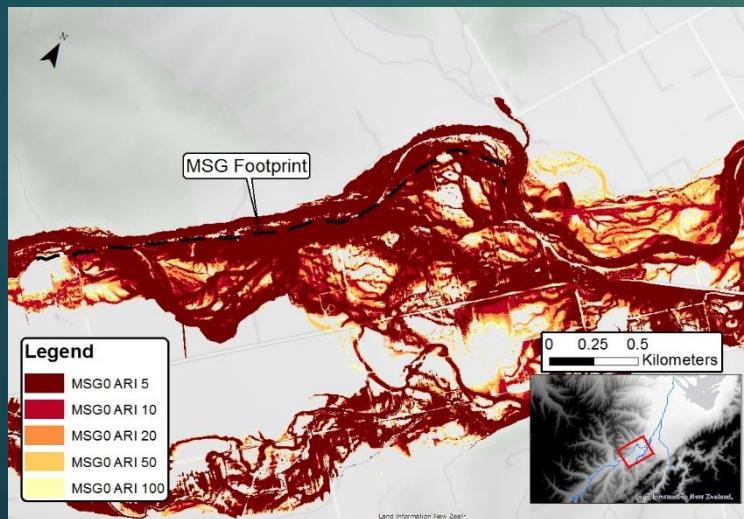
# Area Inundated – Removal



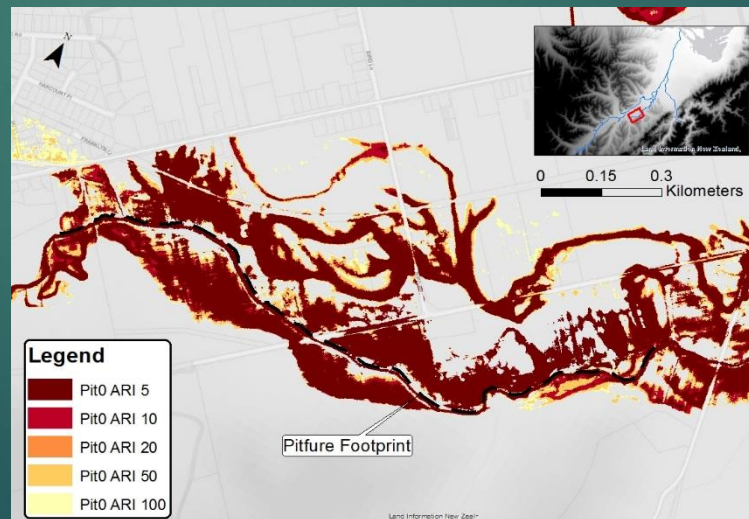
MSG stopbank present



Pitfure stopbank present



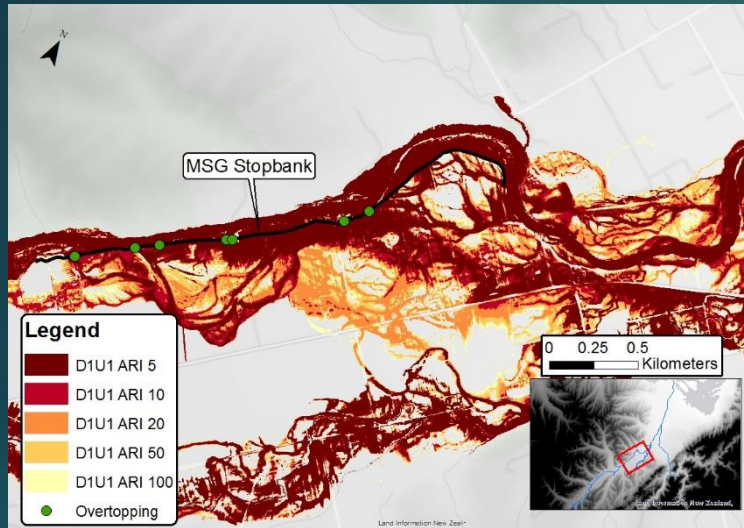
MSG stopbank removed



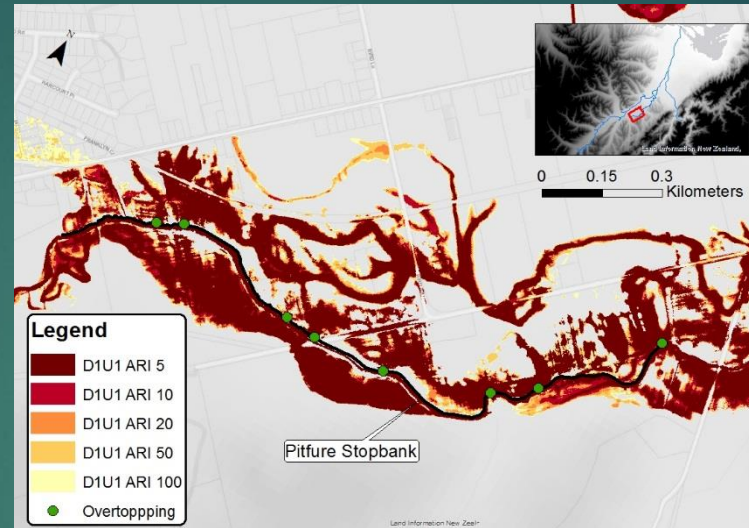
Pitfure stopbank removed

5 year event:  
MSG prevents ~0.43 m<sup>2</sup>  
from inundation

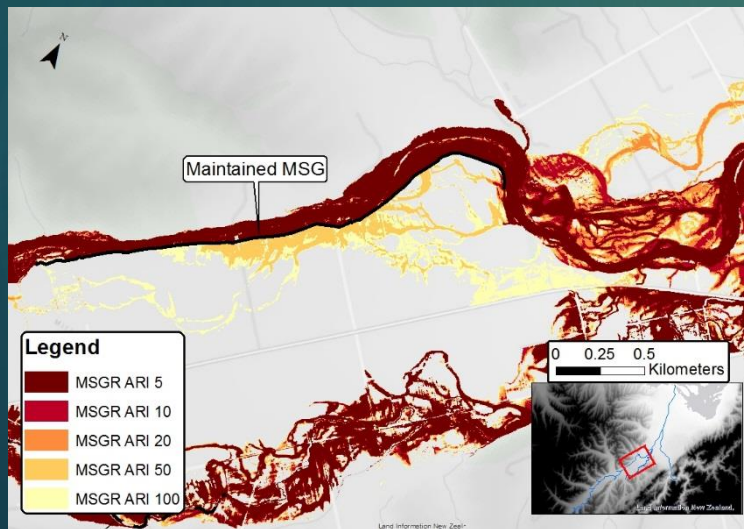
# Area Inundated – Maintained



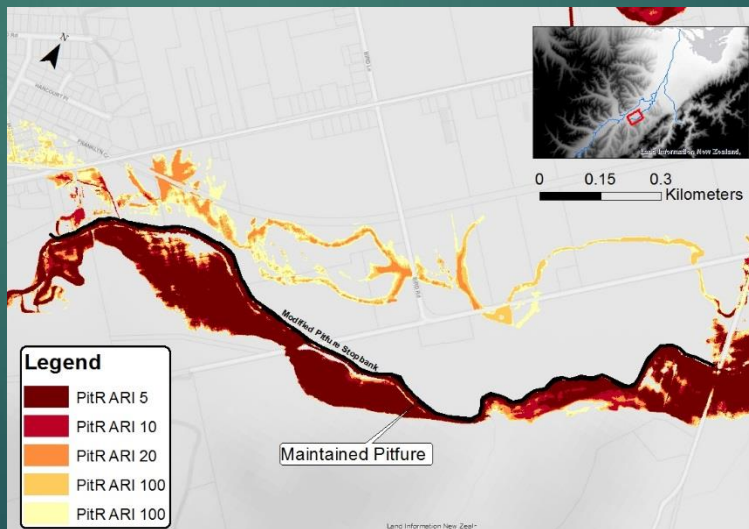
MSG stopbank present



Pitfure stopbank present



MSG stopbank modified



Pitfure stopbank modified

5 year event:  
MSG prevents  $\sim 0.49 \text{ m}^2$   
Pitfure prevents  $\sim 0.16 \text{ km}^2$

100 year event:  
MSG prevents  $\sim 0.77 \text{ km}^2$   
Pitfure prevents  $\sim 0.19 \text{ km}^2$



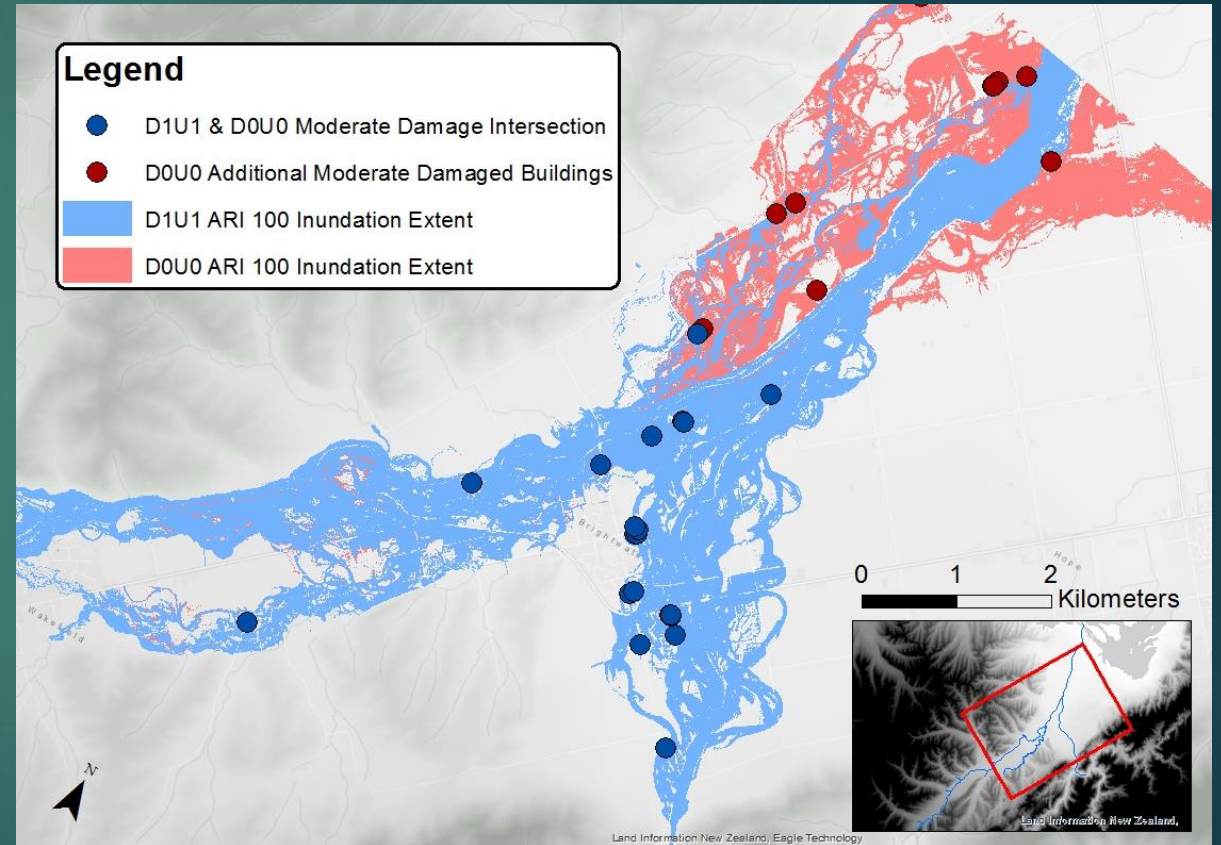
# Riskscape - Impact Assessment

- ▶ Riskscape used to quantify the damage/human displacement/reinstallment cost to buildings
- ▶ A major limitation is Riskscape is that its only considered buildings
  - ▶ Currently no quantification of damage to paddocks, bridges, road

# Riskscape – D0U0 & D1U1

- ▶ Overall increase of moderately damaged buildings of 13 (all stopbanks: 30 buildings)
- ▶ Overall increase of building reinstatement cost of \$1.3 million (all stopbanks: \$8.7 million)
- ▶ These are located mostly west of the council stopbanks

Total Building Damages - ARI 100			
		D1U1	D0U0
Damage Bracket	Up to \$50,000	\$380,000	\$530,000
	Up to \$100,000	\$300,000	\$600,000
	Up to \$200,000	\$1,100,000	\$1,500,000
	Up to \$500,000	\$5,200,000	\$5,900,000
	Up to \$1,000,000	\$1,700,000	\$1,700,000
	Over \$1,000,000	0	0



Moderately damage buildings: 100 year event

# Riskscape - Removal

- ▶ Building damage/costs are the same when all stopbanks are present despite increase in inundation area
- ▶ Stopbanks are flawed, both the stopbanks have undulations that allow water to pass through
- ▶ Highlights the importance of the council stopbanks

# Riskscape - Maintained

- ▶ Building damage/costs are the same when undocumented stopbanks are maintained despite reduction in area (0.77 km<sup>2</sup> MSG 100 year event)
  - ▶ Area affected has a low density of buildings
- ▶ Stopbanks were built in 1980s, land cover has changed, more vineyards/orchards

100 Year Event LCDB	1996		2012		Percent Change (%)
	Area (Km <sup>2</sup> )	Area Percentage (%)	Area (Km <sup>2</sup> )	Area Percentage (%)	
Orchard, Vineyard	1.9	10.5	2.8	15.8	+5.3
Township	0.3	1.6	0.4	2.4	+0.8
Short-rotation Cropland	0.9	5.0	1.0	5.8	+0.8
Paddock	12.0	67.2	10.7	60.0	-7.2
Total		17.8			

- ▶ **Again, only damage to buildings was considered for impact assessment**
- ▶ Any suggestions to quantify the loss to these is appreciated



Questions?