Catchment SOLUTIONS

TIAKI WAI | CARING FOR LAND & WATER

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FARMED LANDSCAPES RESEARCH CENTRE

Tools to map and design Detainment Bunds©PS120 at catchment-scale

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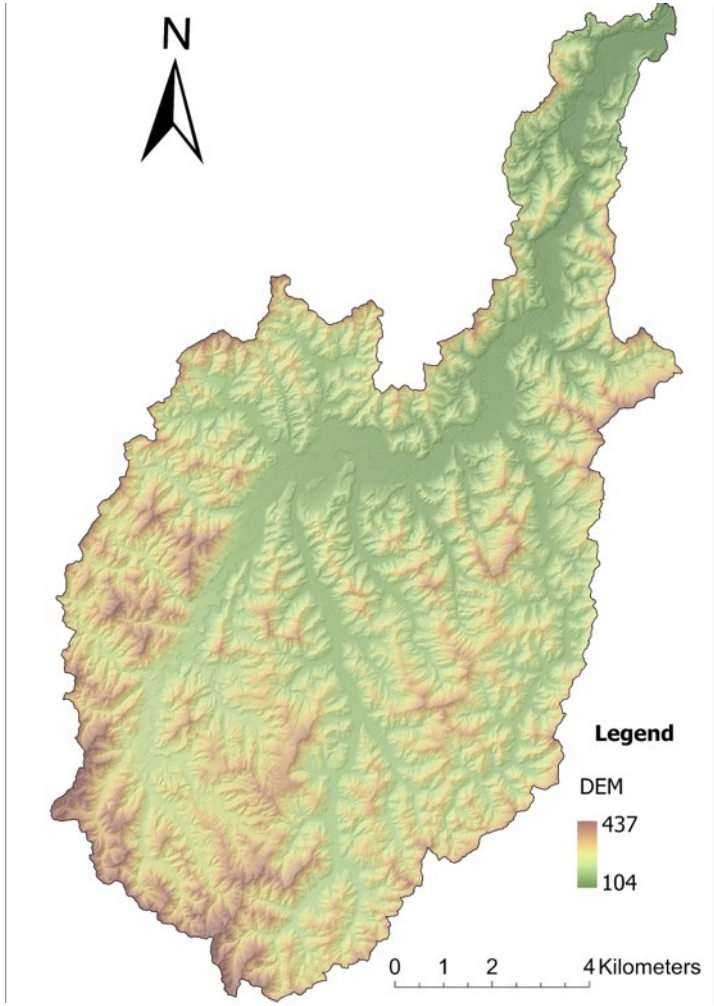
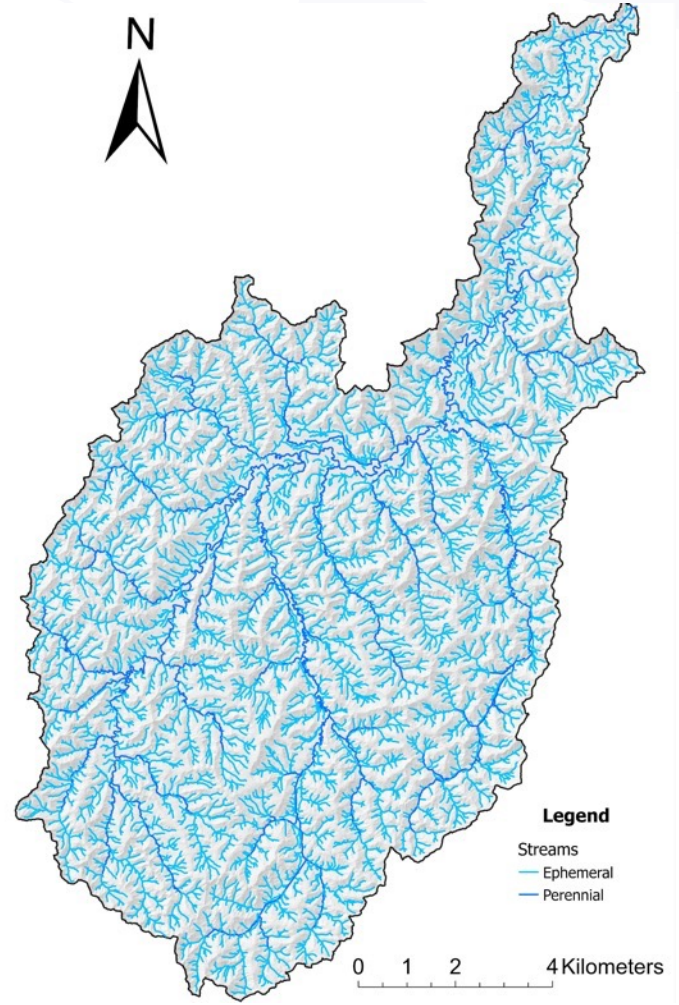
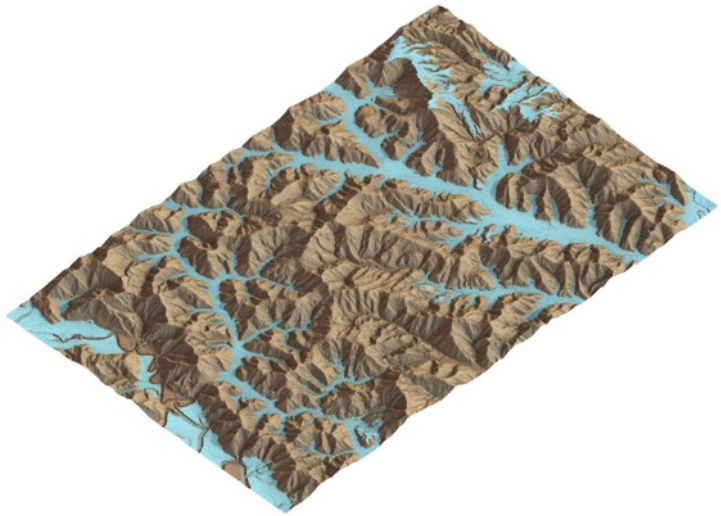
Digital Elevation Models (DEM) and Digital Surface Models (DSM)







Where to find?

- LINZ: https://data.linz.govt.nz/
- Contact local RC

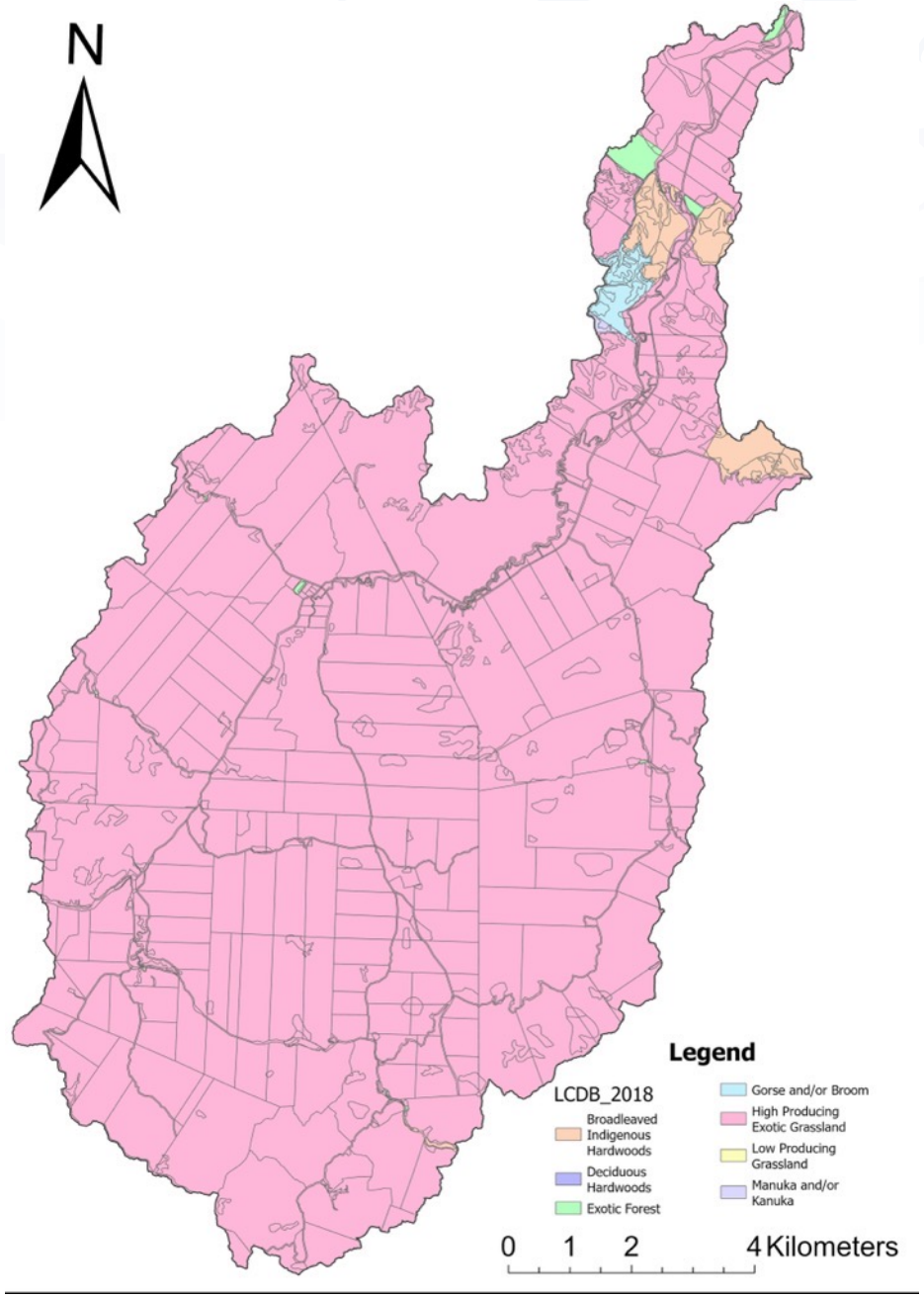
Land-use/land cover information

What areas should we focus on?

- Pastures, agricultural areas
- Filter out roads, forests, lakes, etc.

Where to find?

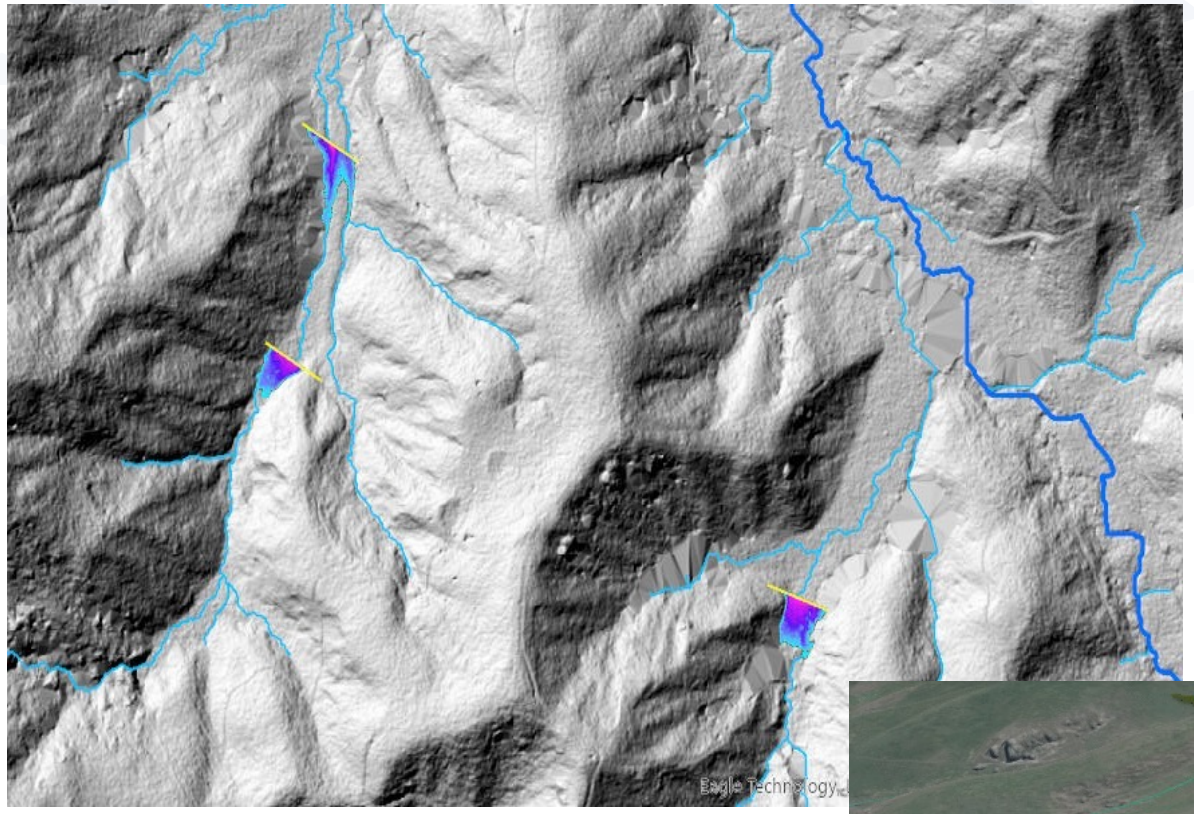
- Landcare Research LCDB v. 5.0: https://lris.scinfo.org.nz/

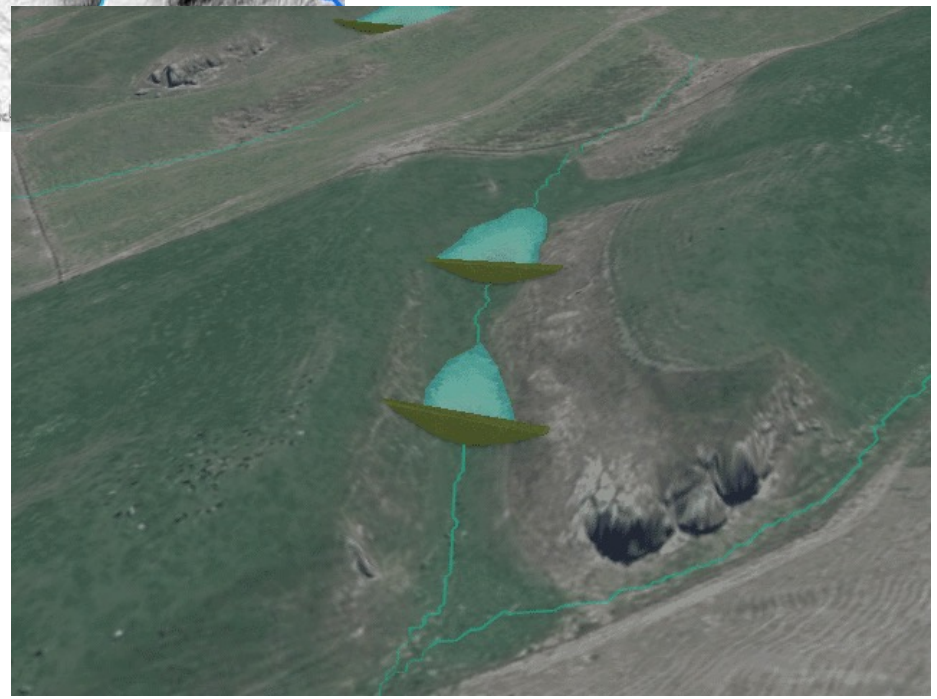


ACPF tool - USDA

Inputs

- DEM
- Catchment boundary
- Land use
- Design parameters (i.e., height, length)





DB potential sites

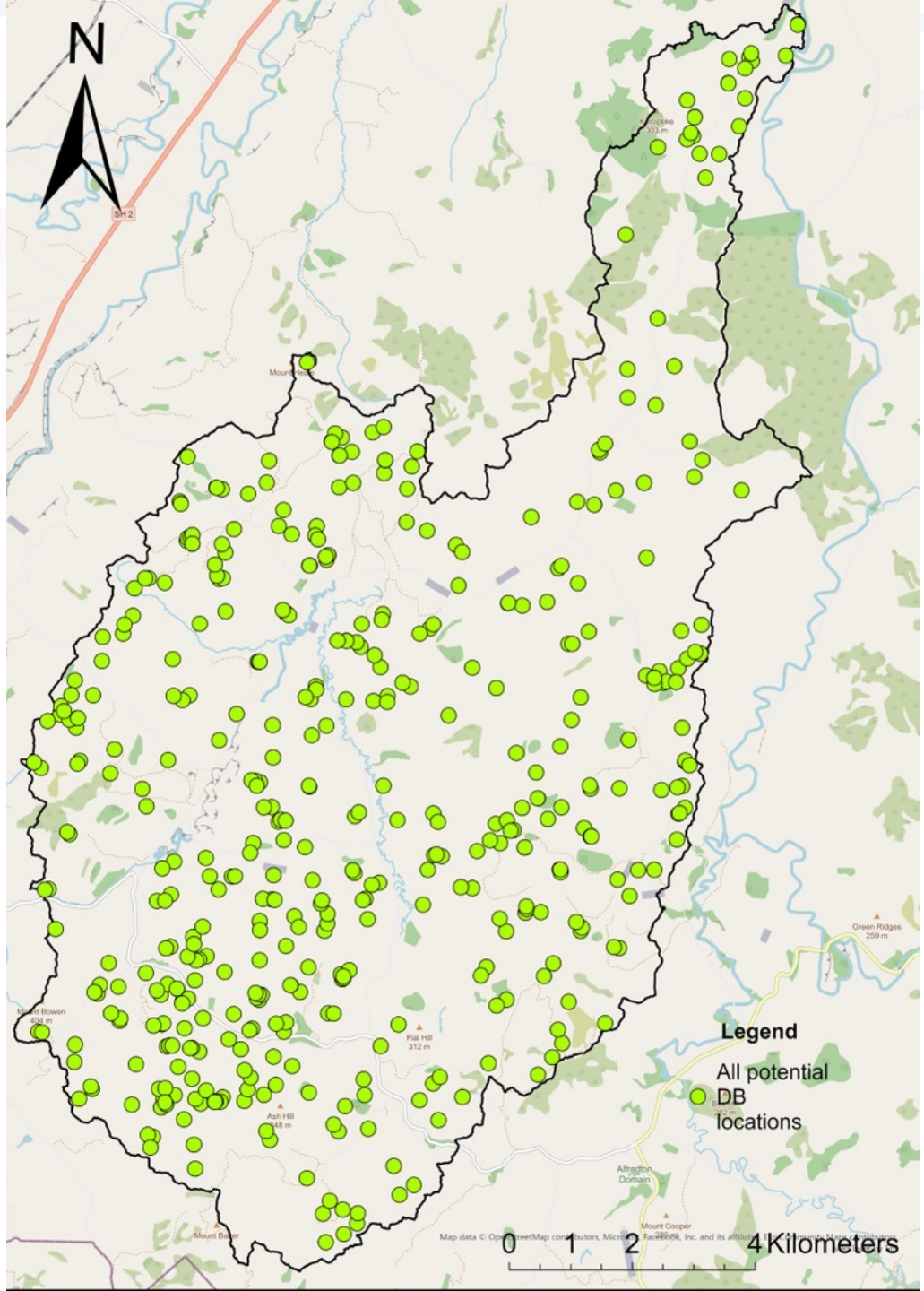
- Pond storage (m^3)
- Contributing catchment area (ha)
- Storage/catchment ratio (>=120)

Potential places for DB©PS120 in Mangaone River Catchment

Size scenarios of DB included:

- 2 and 3 m height
- 25, 50, 75 and 100 m length

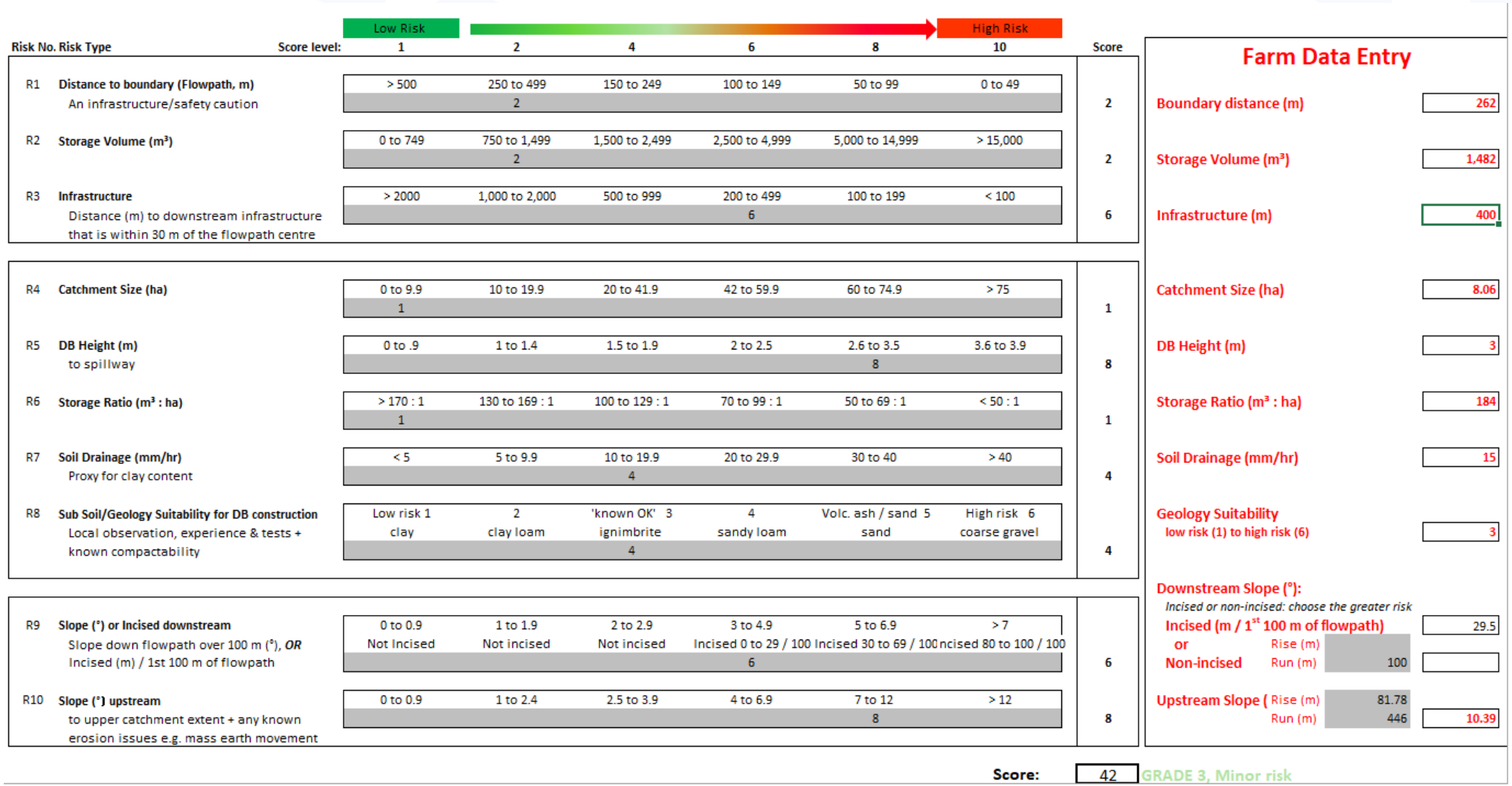
~529 potential DB with a storage/catchment ratio >100




Farm pond
and potential DB


Potential DB

DB Risk assessment (PMP Inc., 2023)



Risk No.	Risk Type	Score level: 1	2	4	6	8	10	Score
		Low Risk →					High Risk	
R1	**Distance to boundary (Flowpath, m)** An infrastructure/safety caution	> 500	250 to 499 **2**	150 to 249	100 to 149	50 to 99	0 to 49	2
R2	**Storage Volume (m³)**	0 to 749	750 to 1,499 **2**	1,500 to 2,499	2,500 to 4,999	5,000 to 14,999	> 15,000	2
R3	**Infrastructure** Distance (m) to downstream infrastructure that is within 30 m of the flowpath centre	> 2000	1,000 to 2,000	500 to 999	200 to 499 **6**	100 to 199	< 100	6
R4	**Catchment Size (ha)**	0 to 9.9 **1**	10 to 19.9	20 to 41.9	42 to 59.9	60 to 74.9	> 75	1
R5	**DB Height (m)** to spillway	0 to .9	1 to 1.4	1.5 to 1.9	2 to 2.5	2.6 to 3.5 **8**	3.6 to 3.9	8
R6	**Storage Ratio (m³ : ha)**	> 170 : 1 **1**	130 to 169 : 1	100 to 129 : 1	70 to 99 : 1	50 to 69 : 1	< 50 : 1	1
R7	**Soil Drainage (mm/hr)** Proxy for clay content	< 5	5 to 9.9	10 to 19.9 **4**	20 to 29.9	30 to 40	> 40	4
R8	**Sub Soil/Geology Suitability for DB construction** Local observation, experience & tests + known compactability	Low risk 1 clay	2 clay loam	'known OK' 3 ignimbrite **4**	4 sandy loam	Volc. ash / sand 5 sand	High risk 6 coarse gravel	4
R9	**Slope (°) or Incised downstream** Slope down flowpath over 100 m (°), ***OR*** Incised (m) / 1st 100 m of flowpath	0 to 0.9 Not Incised	1 to 1.9 Not incised	2 to 2.9 Not incised	3 to 4.9 Incised 0 to 29 / 100 **6**	5 to 6.9 Incised 30 to 69 / 100	> 7 ncised 80 to 100 / 100	6
R10	**Slope (°) upstream** to upper catchment extent + any known erosion issues e.g. mass earth movement	0 to 0.9	1 to 2.4	2.5 to 3.9	4 to 6.9	7 to 12 **8**	> 12	8

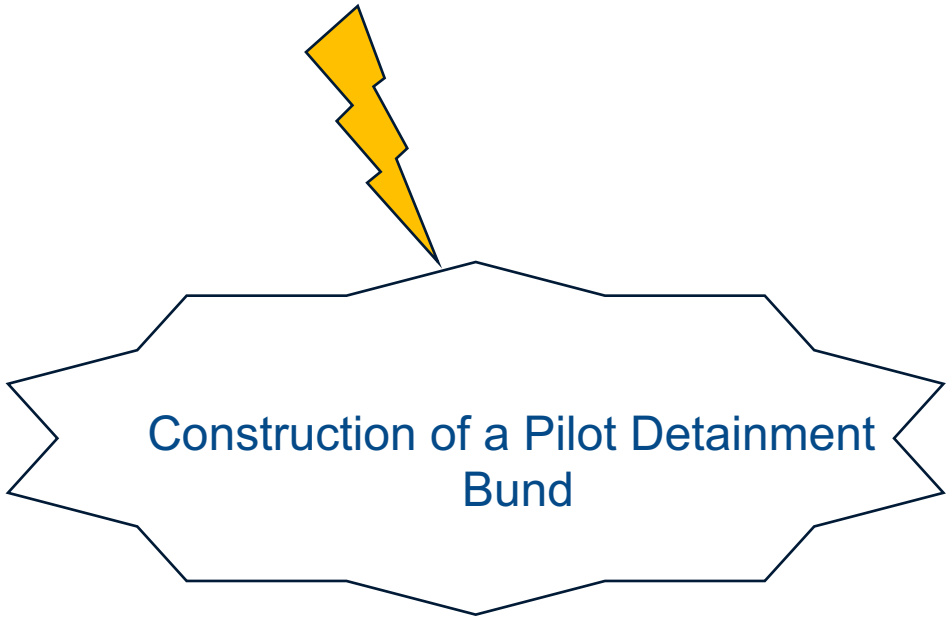
Score: 42 GRADE 3, Minor risk

Farm Data Entry

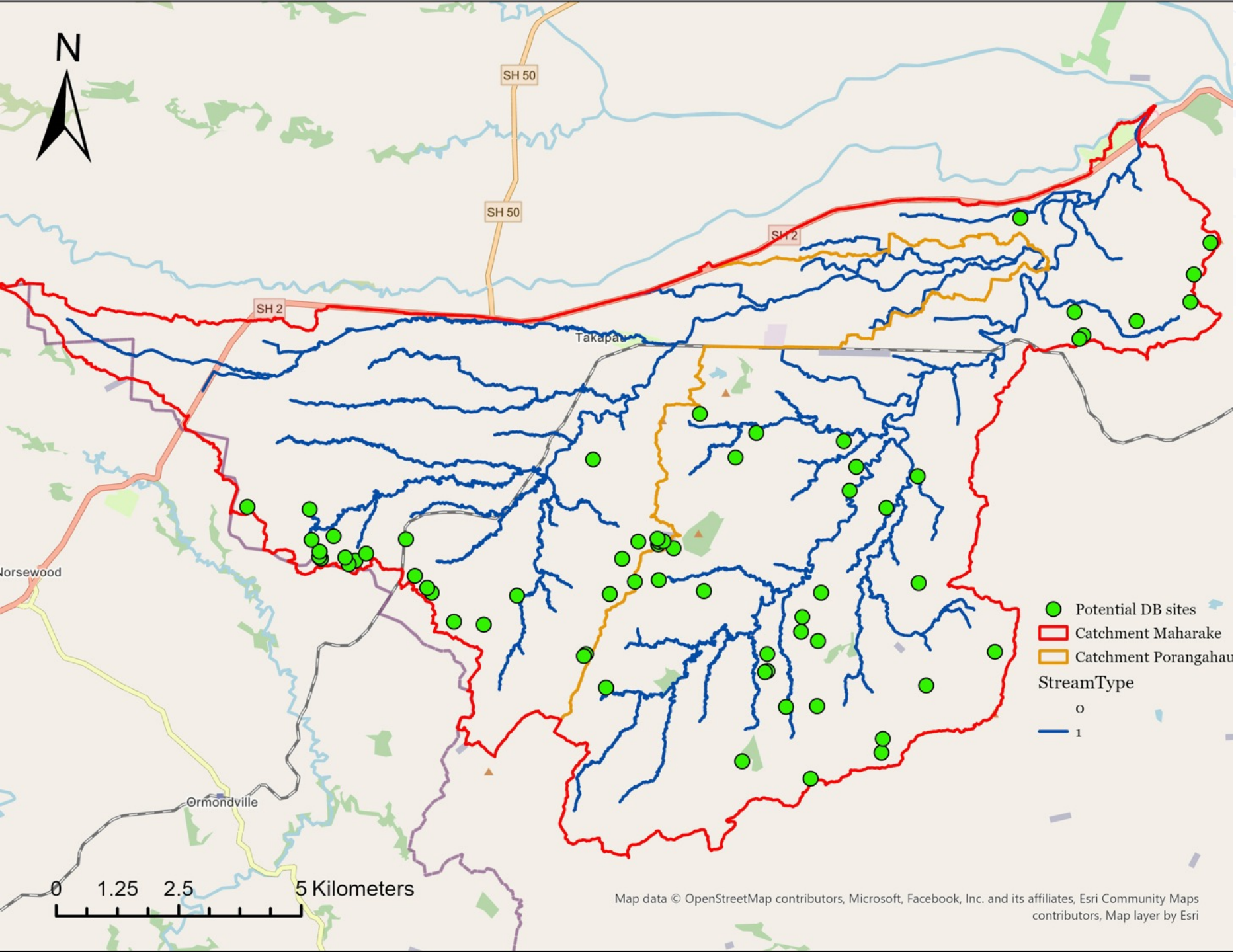
Boundary distance (m)		262
Storage Volume (m³)		1,482
Infrastructure (m)		400
Catchment Size (ha)		8.06
DB Height (m)		3
Storage Ratio (m³ : ha)		184
Soil Drainage (mm/hr)		15
Geology Suitability (low risk (1) to high risk (6))		3
Downstream Slope (°): *Incised or non-incised: choose the greater risk*		
Incised (m / 1st 100 m of flowpath)		29.5
or Non-incised	Rise (m)	
	Run (m)	100
Upstream Slope (	Rise (m)	81.78
	Run (m)	446
		10.39

Credit: John Paterson (PMP Inc.)

Nutrient concentrations ✖ Risk assessment ✖ Field suitability for DB ✖ Catchment Committee decision



Characteristic	Unit
Contributing area (ha)	10.43
Height (m)	2.3
Length (m)	51
Top width (m)	3
Base width (m)	20
Storage area (m2)	1319
Storage volume (m3)	1319
Storage volume:contr. area	126



Central Hawke's Bay

Preliminary analysis of DB

- 3m height x 25 m length
- 65 different locations

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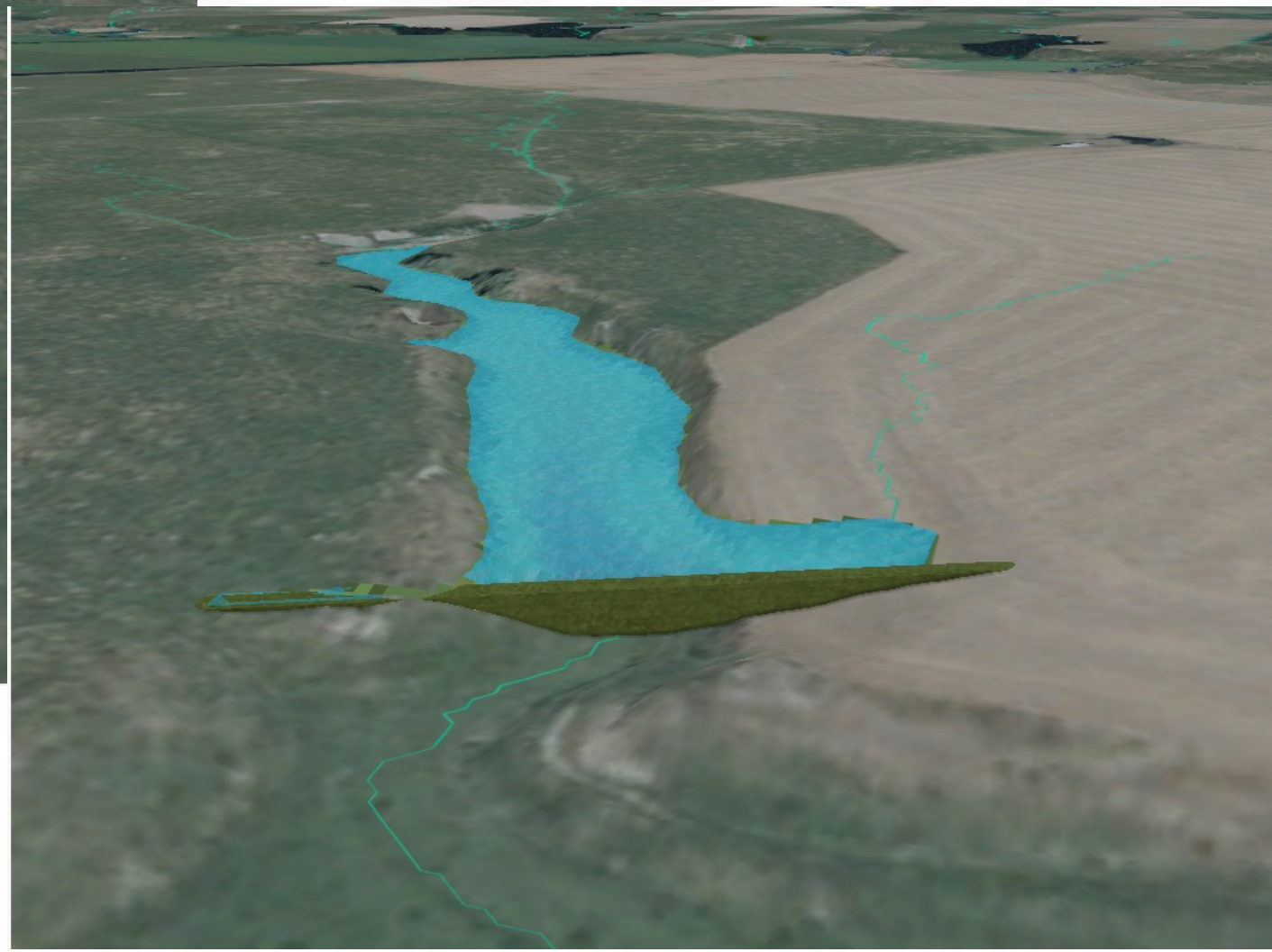

Preliminary design characteristics:
- 3.7 m height
- 30 m long
- 23 ha
- 3,500 m^3 (153:1 – storage : area ratio)

Progress forward

- ✓ Performance monitoring of the Detainment Bund in decreasing suspended solids (SS) and dissolved reactive phosphorous (DRP).
- ✓ Modelling and simulation of the potential number of Detainment Bunds to reduce SS and DRP.
- ✓ Incorporate these results into CSP Masterclasses to provide more robust capability.