Karuah & Great Lakes Landcare – Farm Dam Field Day, The Branch

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Field Day Program

- Determining Harvestable Rights
- Sizing your farm dams
- Planning your farm dams
- Estimating catchment areas
- Estimating earth in dam walls
- Building a Dam
- Managing your dam
- Track construction and maintenance
- Soils
- Site inspections

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Harvestable Rights – Do I need a licence

A licence is not required for the following dams in NSW.

- Dams constructed on First or Second order streams that capture 10% of the average regional rainfall runoff
- Dams built before 1st Jan 1999 that are used for stock and domestic purposes and located on First or Second order streams
- Dams up to 1 megalitre on small size properties with a MHRDC less than 1 meg approved before 1st Jan 1999

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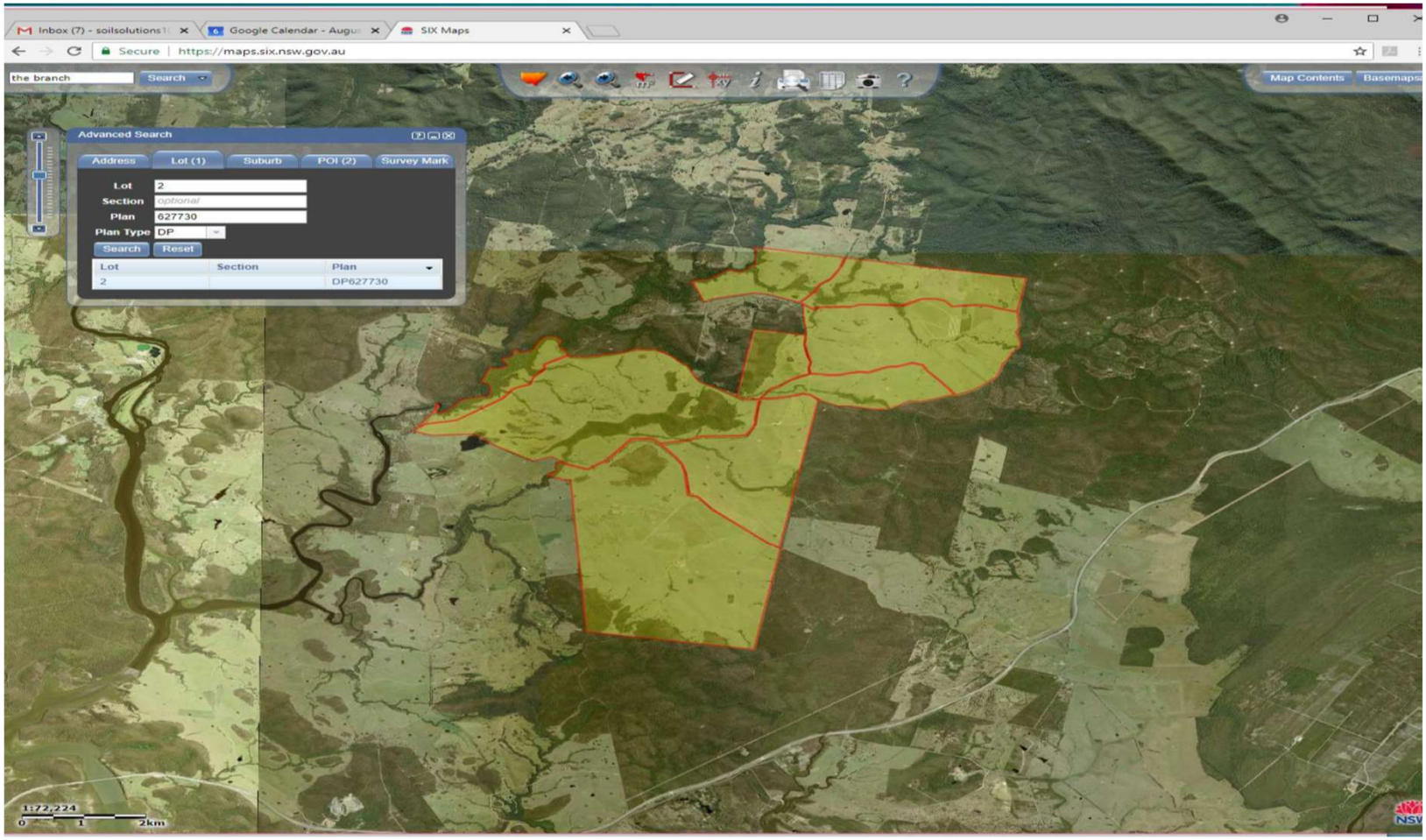
Calculating your harvestable rights

- Determine your property area in Hectares
  - Leased or ajisted land not included
  - Rates notice
  - Six maps or google maps a tool to calculate property size
- Find dam capacity multiplier - NSW Water guide
- Multiply both to determine MHRDC for property

Property Location by Six Maps



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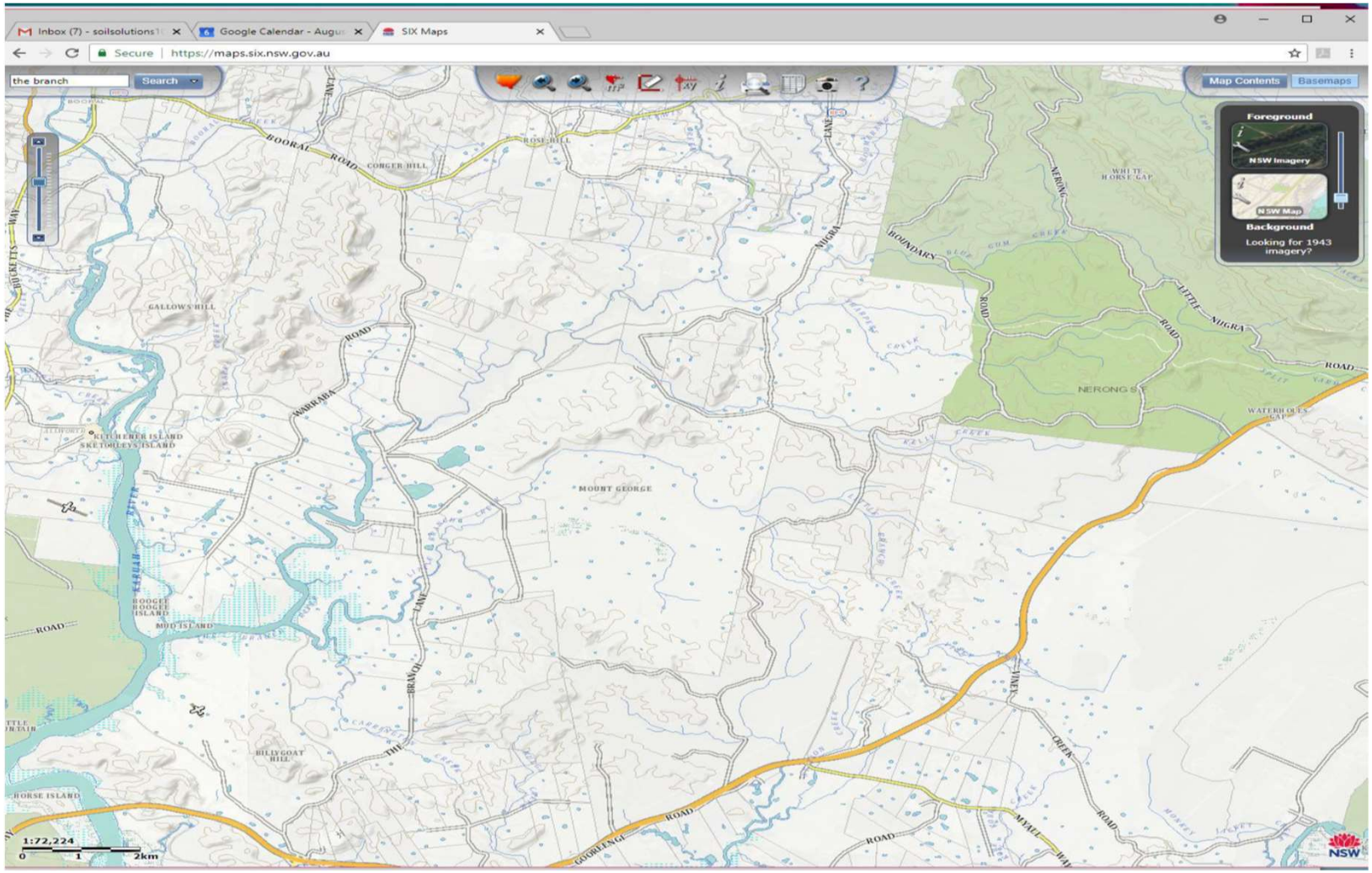
Property topography map in Six Viewer



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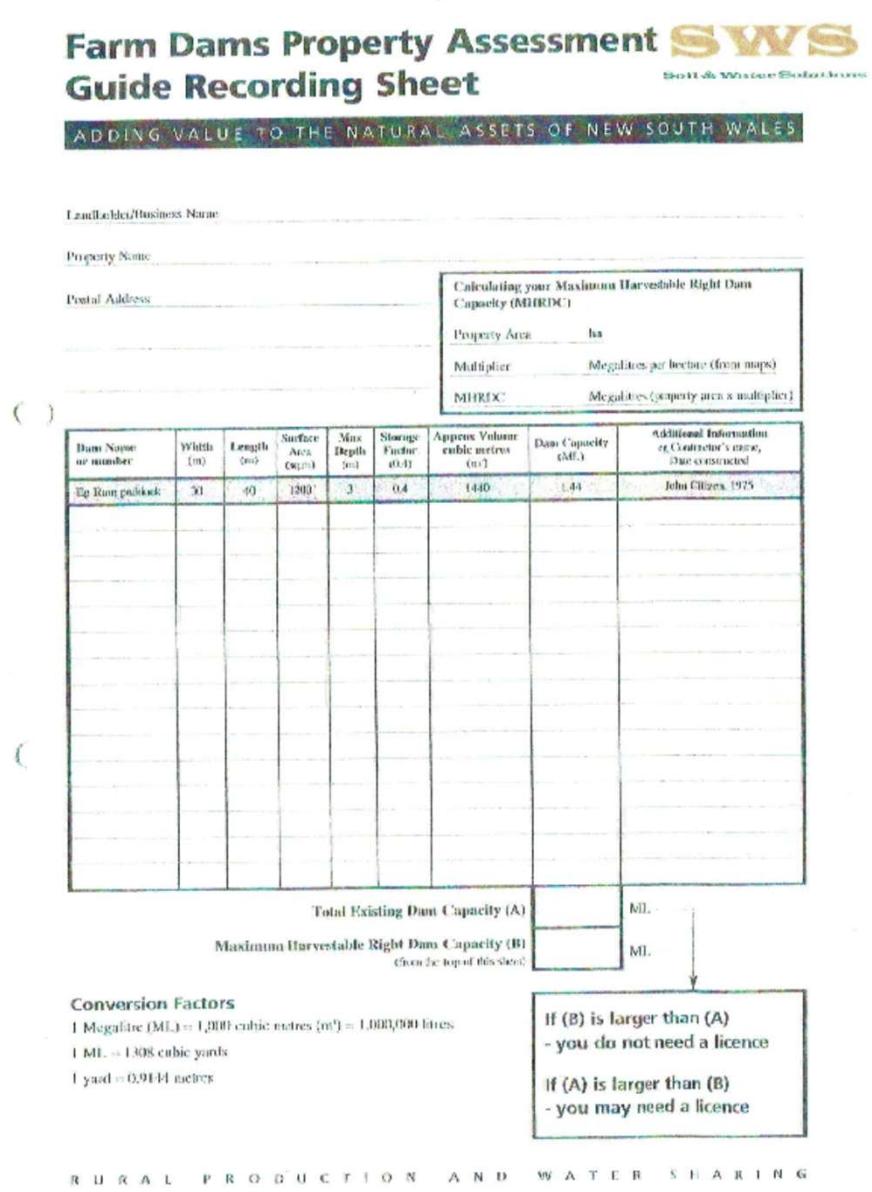
Harvestable Rights Calculation Sheet



Farm Dams Property Assessment Guide Recording Sheet

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ADDING VALUE TO THE NATURAL ASSETS OF NEW SOUTH WALES

Landholder/Business Name

Property Name

Postal Address

Calculating your Maximum Harvestable Right Dam Capacity (MHRDC)

Property Area ha

Multiplier Megalitres per hectare (from maps)

MHRDC Megalitres (property area x multiplier)

Dam Name or number	Width (m)	Length (m)	Surface Area (sq.m)	Max Depth (m)	Storage Factor (0.4)	Approx Volume cubic metres (m³)	Dam Capacity (ML)	Additional Information eg Contractor's name, Date constructed
Eg Run paddock	30	40	1200	3	0.4	1440	1.44	John Citizen, 1975

Total Existing Dam Capacity (A) ML.

Maximum Harvestable Right Dam Capacity (B) (from the top of this sheet) ML.

Conversion Factors

1 Megalitre (ML) = 1,000 cubic metres (m³) = 1,000,000 litres

1 ML = 1308 cubic yards

1 yard = 0.9144 metres

If (B) is larger than (A)
- you do not need a licence

If (A) is larger than (B)
- you may need a licence

RURAL PRODUCTION AND WATER SHARING

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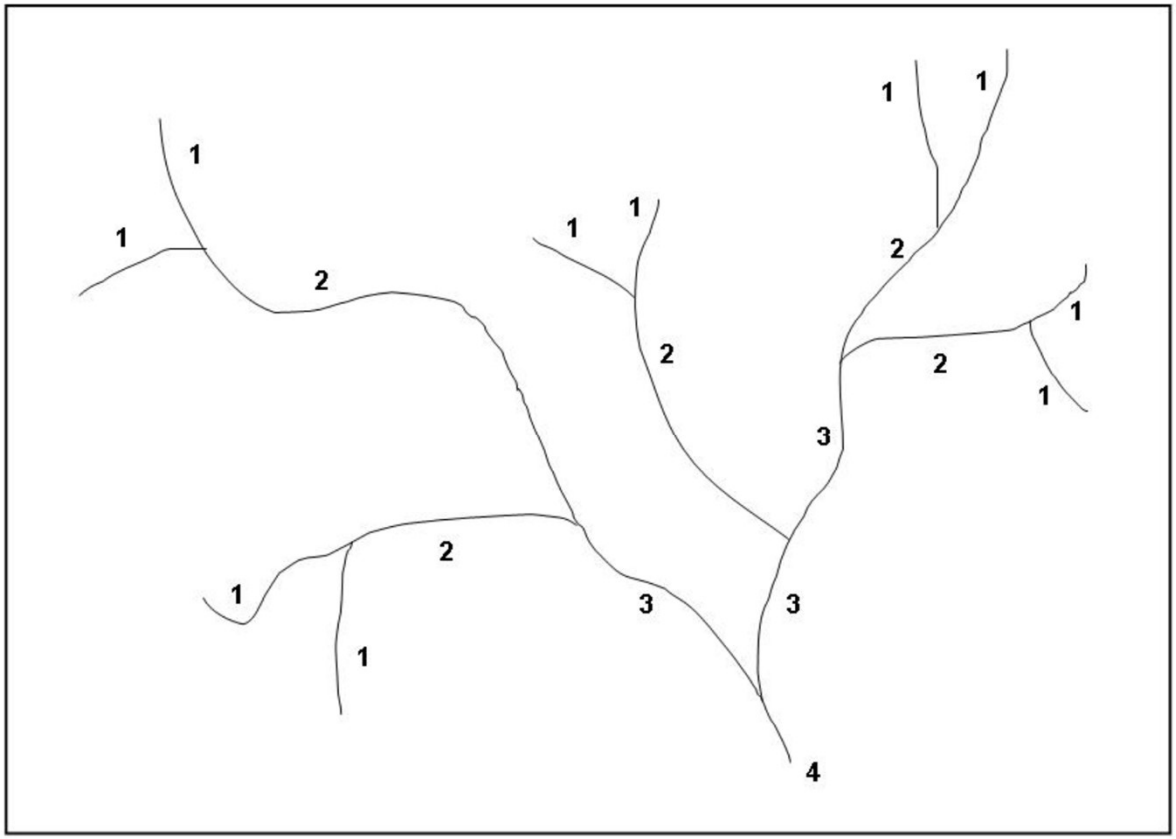
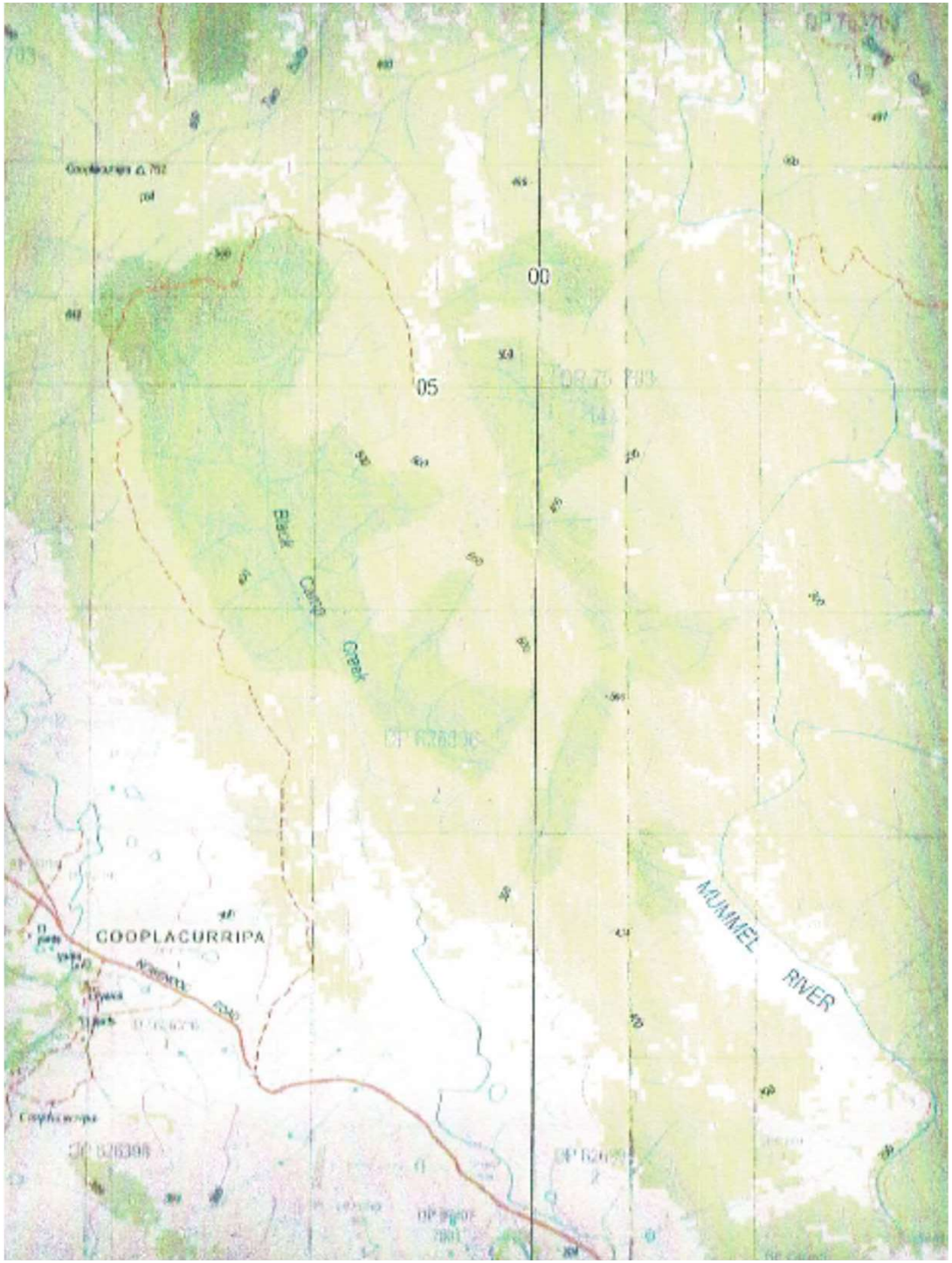
Stream Order system



Exercise - Determine the stream orders for Black Camp Creek



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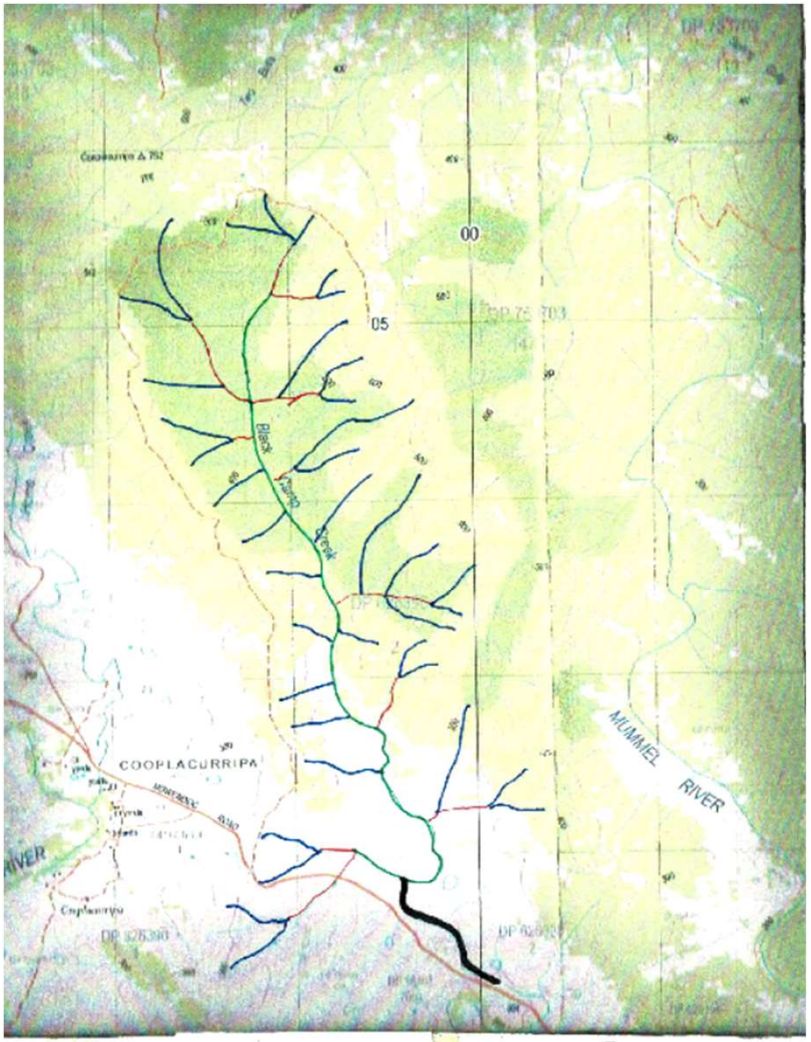
Stream orders



Planning Farm Dams

1. Estimate water requirements
2. Select the site & dam shape
3. Estimate volume and rate of runoff from catchment
4. Soil Investigation – construction technique

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Estimate Storage Requirements

- Need to provide sufficient water storage capacity for:
  - Total stock and domestic water requirements
  - Allowance for seepage
  - Allowance for evaporation

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Stock & Domestic Water Requirements

Type	Daily Consumption (Litres per head)	Numbers	Summer (OCT – MARCH) Litres per month per head	Winter (APR - SEPT) Litres per month per head	Total Water Requirements (litres)
Domestic – with septic	175		5250	5250	
Cattle					
Dairy	70		2100	1400	
Beef	45		1350	900	
Feedlot	90		2700	1800	
Calves	25		750	500	
Sheep	4.5		135	70	
Lambs – Half Sheep					
Horses	55		1650	1100	
Pigs	25		750	450	
Poultry – Per 100 birds	40		1200	1000	
Total stock water requirements					

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Stock & Domestic Water Requirements - Example

Type	Daily Consumption (Litres per head)	Numbers	Summer (OCT – MARCH) Litres per month per head	Winter (APR - SEPT) Litres per month per head	Total Water Requirements (litres)
Domestic – with septic	175	4	5250	5250	252,000
Cattle					
Dairy	70	50	2100	1400	1,050,000
Beef	45	80	1350	900	1,080,000
Feedlot	90		2700	1800	
Calves	25		750	500	
Sheep	4.5		135	70	
Lambs – Half Sheep					
Horses	55	10	1650	1100	165,000
Pigs	25		750	450	
Poultry – Per 100 birds	40		1200	1000	
Total stock water requirements					2,547,000
				/1,000 to = m3	2,547.00
				1,000m3 = 1 Megalitre	2.57ML

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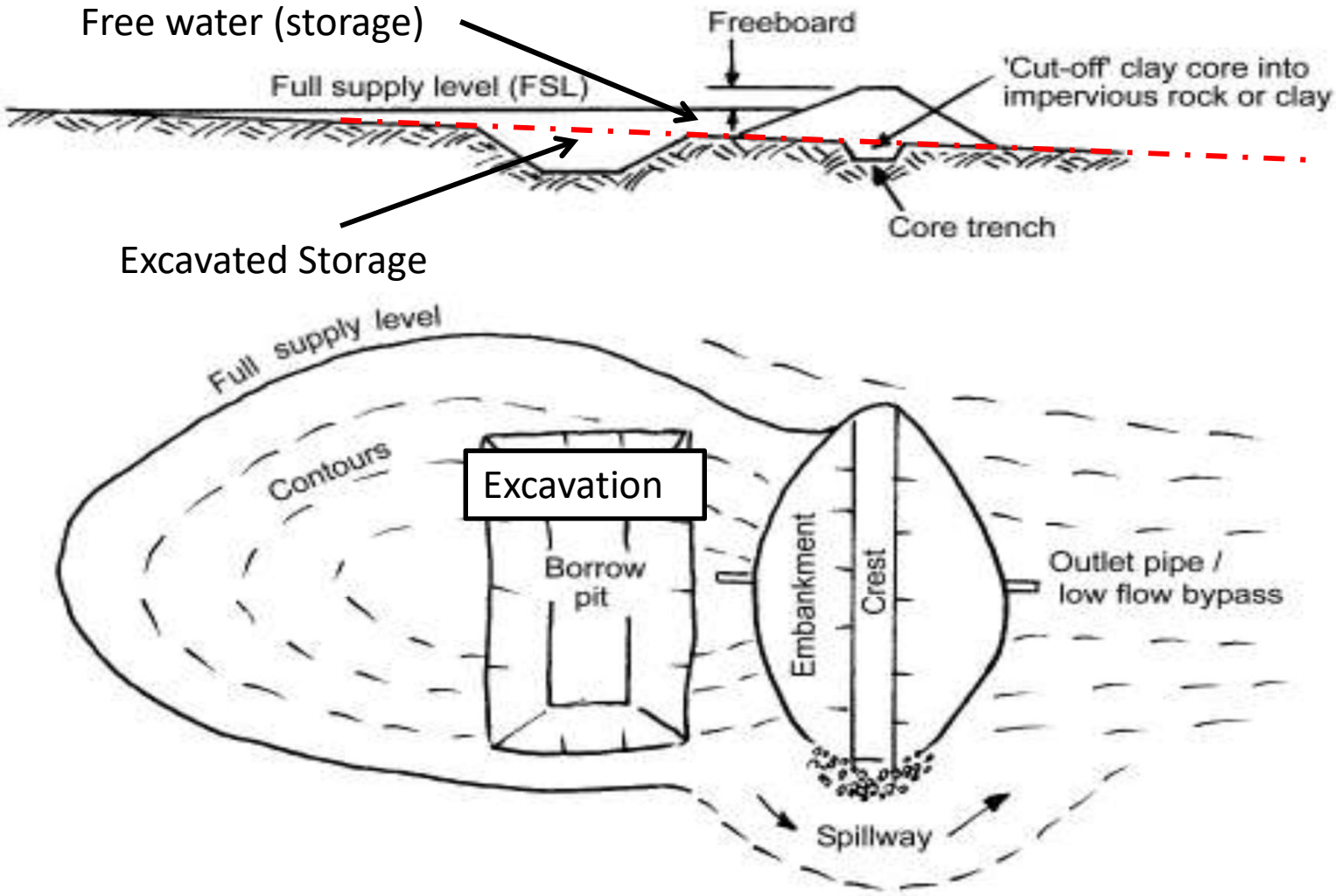
Evaporation and Seepage Losses

- On areas east of the Great Dividing Range allow:
  - 25% loss through seepage in dam
  - 50% Evaporation loss
  - Therefore for every 1 megalitre of storage required a dam of 1.75 to2 Megalitres will need to be constructed

Components of a Dam



Excavation

- Storage reservoir that will not seep
- Provides soil for the embankment (wall)
- Good depth of water (>2m)

Embankment

- Not to allow excessive seepage
- Constructed from excavation area
- High enough so not to be overtopped (Freeboard)
- Strong enough to hold the water resting against it
- Make sure keyed into existing soil

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Spillway

- Allows excess water around the dam without damaging the embankment
- Spillway should outlet to flat area with good grass cover

- Adequate width (ensure depth < 0.3m)
- Channel must be >1m lower than crest of embankment (freeboard)

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Spillway

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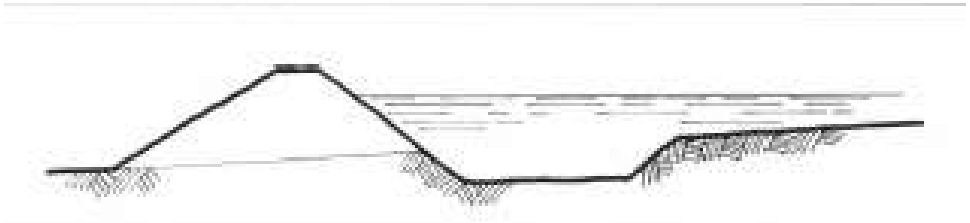
Types of Dams - Gully



- Earth
- Curved or straight wall
- Across gully, depression
- Good S/E ratio (up to 10:1)

Types of Dams - Hillside

- 3-sided or curved bank
- Incorporate catch drains
- S/E ratio =1 to 1.5
- Ensure water covers excavation area

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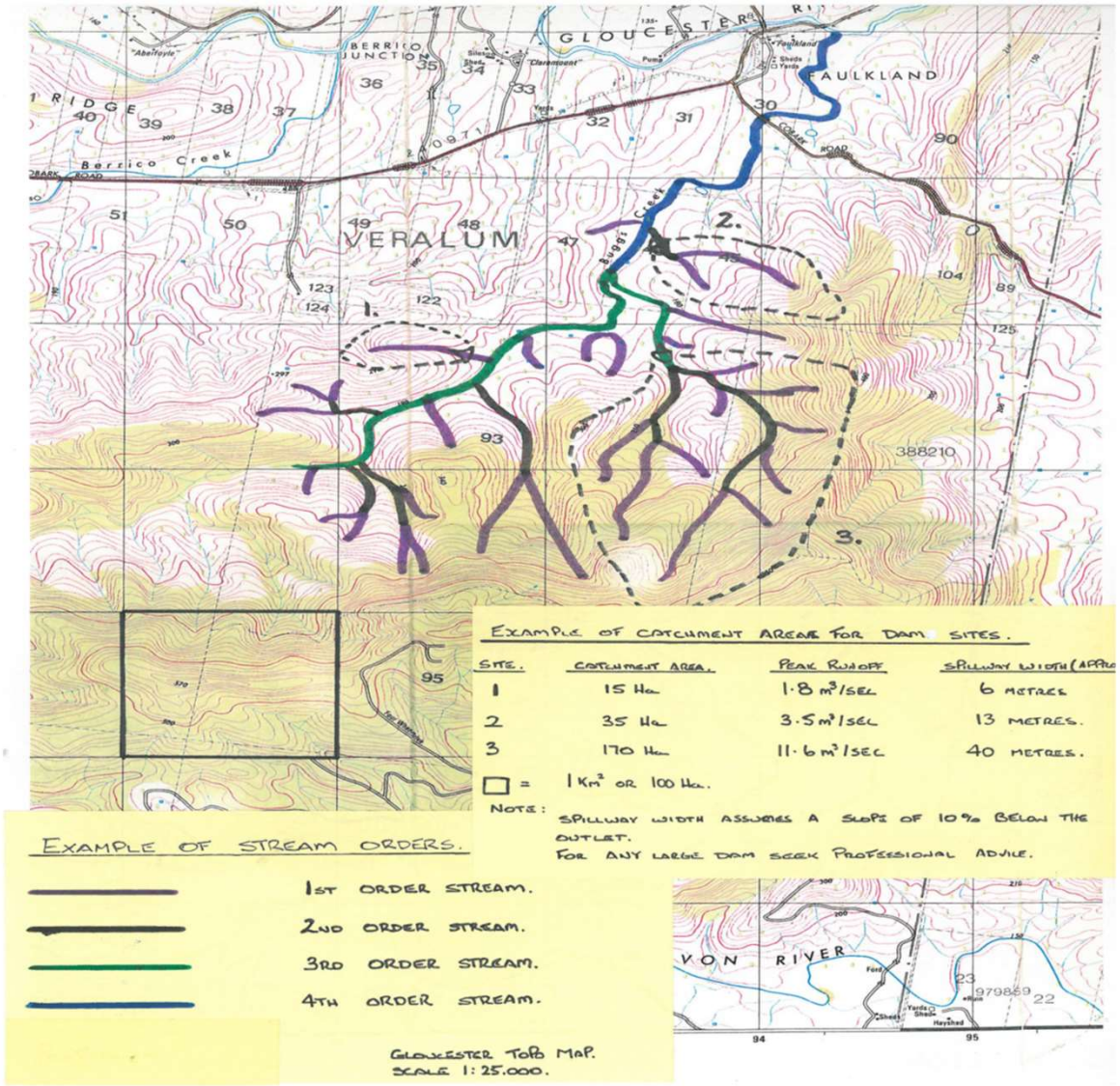
Types of Dams – Excavated Tanks

- Square, rectangular or round
- Excavated below natural ground surface
- Filled from surface runoff collected from catch drains or pumped into from creek or river
- Flat landscapes
- Maximum S/E ratio =1

Estimating Catchment Areas



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Estimating Annual Runoff Volume

(for NSW Catchments <260Ha)

TABLE 1 Runoff from catchments

Average annual rainfall (R) (mm)	Total annual evapor-ation (mm)	Reliability (years out of 10)	Runoff as percentage of average annual rainfall (P)			
			Shallow sand or loam soils (%)	Sandy clays (%)	Elastic clays (%)	Clay pans inelastic clays or shales (%)
over 1100	---	8	10 to 15	10 to 15	15 to 20	15 to 25
		9	6.5 to 10	6.5 to 10	10 to 13	10 to 16.5
901 to 1100	---	8	10 to 12.5	10 to 15	12.5 to 20	15 to 20
		9	6.5 to 8	6.5 to 10	8 to 13	10 to 13
501 to 900	less than	8	7.5 to 10	7.5 to 15	7.5 to 15	10 to 15
	1300	9	5 to 6.5	5 to 10	5 to 10	6.5 to 10
	1300 to 1800	8	5 to 7.5	5 to 12.5	5 to 10	10 to 15
		9	3 to 5	3 to 8	3 to 6.5	6.5 to 10
401 to 500	1300 to 1800	8	2.5 to 5	5 to 10	2.5 to 5	7.5 to 12.5
		9	1.5 to 3	3 to 6.5	1.5 to 3	5 to 8
250 to 400	less than	8	0 to 2.5	0 to 5	0 to 2.5	2.5 to 7.5
	1800	9	0 to 1.5	0 to 3	0 to 1.5	1.5 to 5
	more than	8	0	0 to 2.5	0	2.5 to 5
	1800	9	0	0 to 1.5	0	1.5 to 3

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Calculating catchment runoff

Catchment Runoff (m^3) = A * R * P * 0.1

A = catchment area (Ha)

R = average annual rainfall (mm)

P = runoff percentage

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Calculating catchment runoff

Town	Average Rainfall	Catchment area	run off %	Total run off - m^3	Run off - ML
Dungog/Gloucester/Tocal	940mm	Assume 10ha	7.50%	7,050	7 Megalitres
Dungog/Gloucester/Tocal	940mm	Assume 50ha	7.50%	35,250	32 ML
Muswellbrook/Merriwa	595mm	Assume 10ha	7.50%	4,460	4.4ML
Muswellbrook/Merriwa	595mm	Assume 50ha	5.00%	14,880	14.8ML
Newcastle/Gosford	1200	Assume 10ha	10%	12,000	12ML
Newcastle/Gosford	1200	Assume 50ha	10%	60,000	60ML

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Calculating Earth in Gully Dam Wall

Example

Estimate the wall volume of a dam across a gully with the dimensions shown in Figure 42:

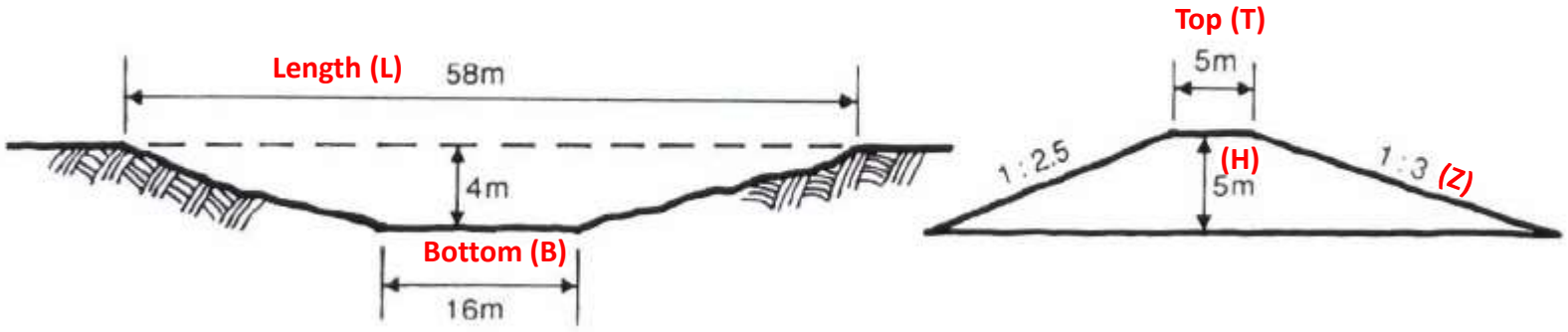

Figure 42 *Dimensions of a gully dam.*

Calculating Earth in Gully Dam Wall

$$V = 0.175 * H * (2B + L) * (ZH + 2T)$$

Where:

V = wall volume (m^3)

H = wall height (m)

B = bottom width (m)

L = length of wall at the top (m)

Z = sum of upstream and (usually 6) downstream batter grades

T = top width (m)

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Building Farm Dams

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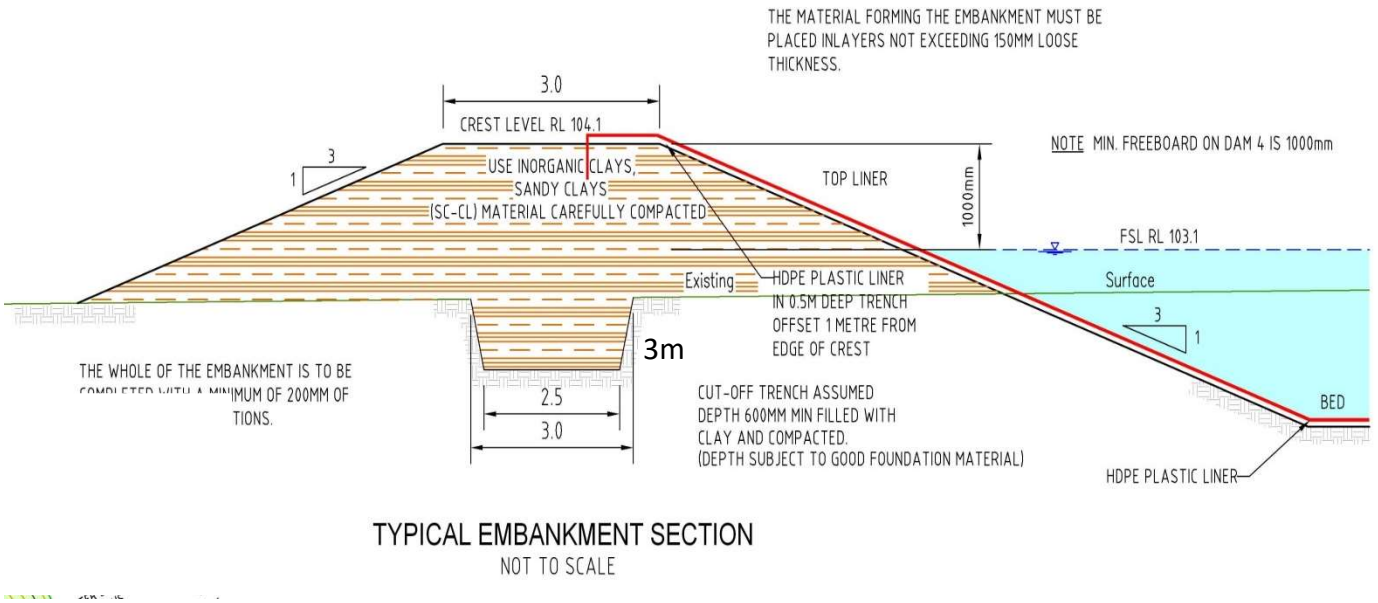
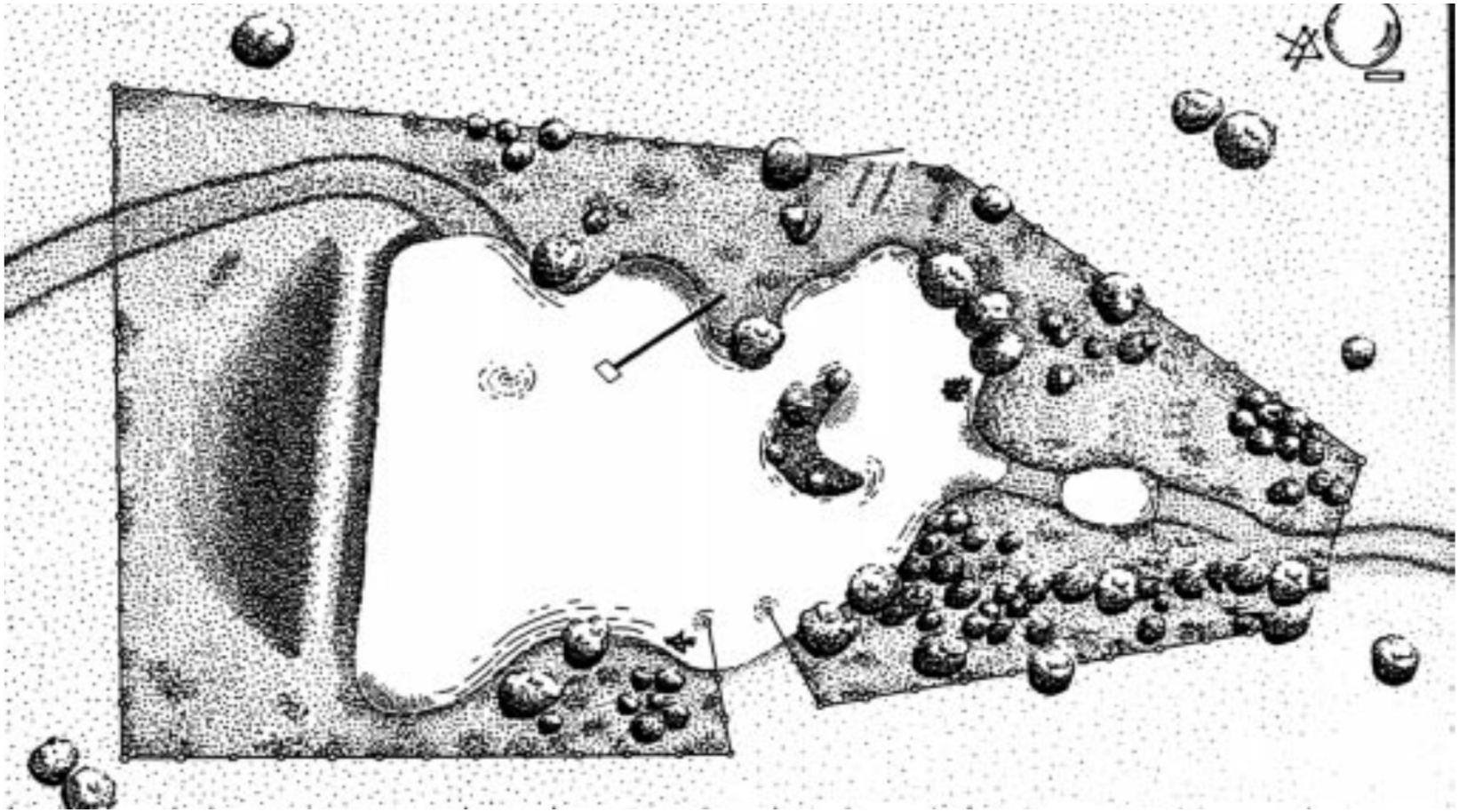
Typical Dam Specifications

- Batters generally 3:1
- 3 metre crest width
- Min 1 metre freeboard from spillway to top dam wall
- Cut of trench 2 to 3 metres wide into solid base



TYPICAL EMBANKMENT SECTION
NOT TO SCALE

Managing your Dam



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Managing your Dam

- Fence out dam
- Control stock access to reduce erosion and improve water quality
- Syphon from dam to a water trough if possible
- Construct silt trap upstream of dam and maintain vegetated area in flow line to capture sediment
- Plant trees around dam where possible to:
  - Not on dam wall
  - Help reduce evaporation. (wind and sun)
  - Reduce wave action in water against wall of dam (erosion issue)
  - Reduce water temperature to help control algal blooms

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