

This Document is based on a talk Robin gave to the Purbeck U3A Science & Technology Group in April 2009. See: <http://www.u3a.org.uk> / and <http://www.purbecku3a.org.uk/> for u3a National & Local details

The contents may be of interest to anyone irrigating or contemplating irrigating any crop, but particularly plantation crops such as tea.

**AN
AGRICULTURAL IRRIGATION
OVERVIEW**

**OR
AGRICULTURAL WATER MANAGEMENT**

Presented by Robin Humphries

INTRODUCTION

Apprenticeship with Ransomes & Rapier Ltd. Ipswich (1956-1958).

Water Control Equipment:

Water Control Gates

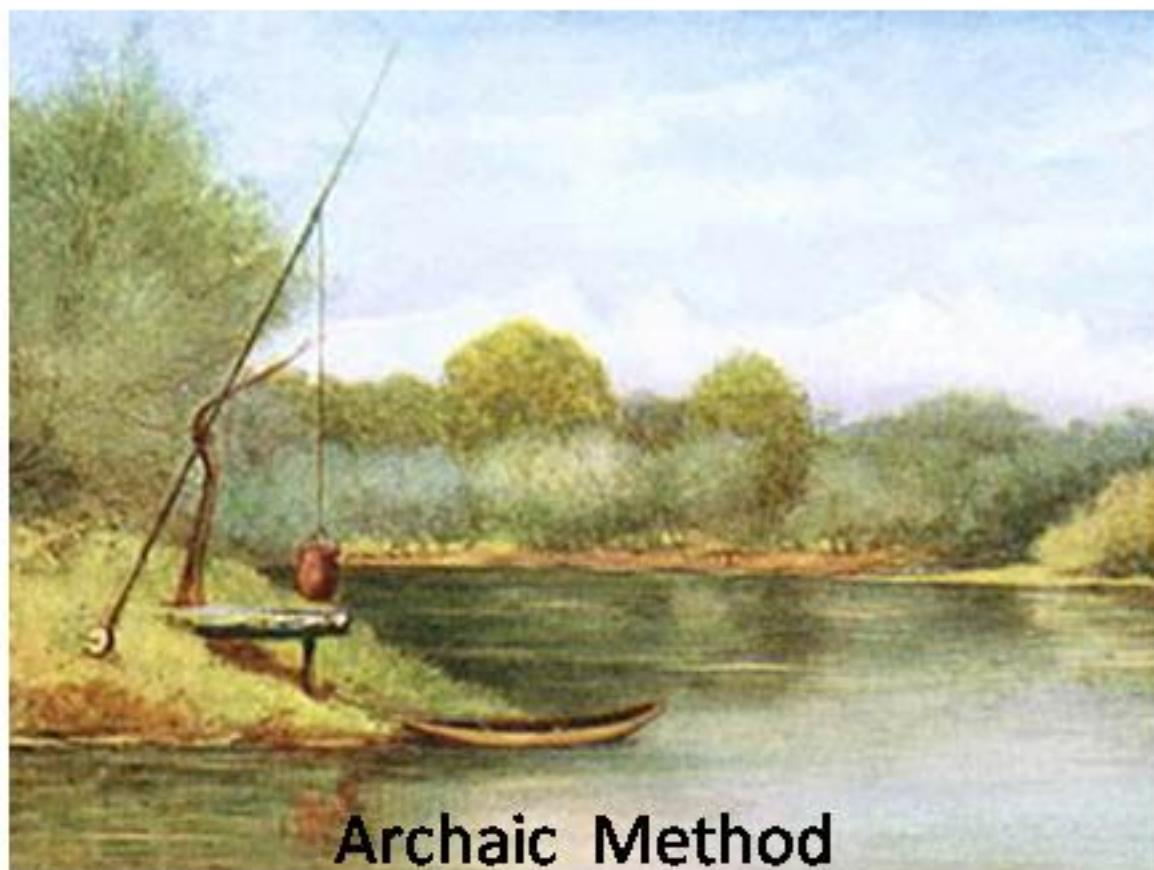
In a very specialized sphere of engineering, the year 1874 saw the invention of the Stoney Sluice of which Ransomes & Rapier were the original patentees and manufacturers. Prior to this invention, the sizes of sluice gates had been limited by the resistance to opening and closing resulting from the excessive sliding friction created by the pressure of water on the gates. The patent consisted of a free roller path between the gate and its abutments reducing the opening effort to only 1/80th of that required for a sliding gate of equal size. In effect, the gate was put on roller bearings and could now be controlled easily and accurately and closed under pressure with certainty.

Large irrigation and flood control schemes, which had before seemed impracticable, were now put in hand and for many years the world history of irrigation and water control was largely a record of progress of Ransomes & Rapier in the design and manufacture of sluice and lock gates and the machinery for operating them. Some of the earliest installations were on the Rivers Thames and Clyde, the Manchester Ship Canal and on the first hydroelectric power station at Niagara Falls. In 1902, sluice gates were made for the first Aswan Dam on the River Nile in Egypt and were followed by similar works on the Nile at Isnq, Nag Hammadi, Asyit and the Delta Barrage, while upstream in the Sudan, 80 deep sluices were fitted in the Sennar Dam and 375 gates in the distributor canals which control the water for irrigating the rich Sudanese cotton growing areas. Many other important installations were built in India, Pakistan, Iraq, Iran, South Africa, Australia, New Zealand, China, Canada, Mexico, Argentina, Brazil and 50 other countries throughout the world. In 1960, Ransomes & Rapier decided to concentrate their design and manufacturing resources on the production of a wide range of contractors' plant and mobile cranes, and general engineering products were gradually phased out.

Technical details were acquired during the following experience and course:

- I had gained experience of Agricultural irrigation when I served as Company Development Manager. One of whose duties was to manage and supervise the irrigation of about 250 hectares of tea at Chivanjee Tea Estate, Tukuyu Tea Estates, Tukuyu, Rungwe District, Tanzania c 1982 -1987
- Silsoe College, Cranfield University, 1990 Post Graduate, Post Experience, Water Management Course
- MTIDP Mambilla T. E. Nigeria 1993 – 1997

An overview of various irrigation methods employed from ancient times up until the 20th Century follows:

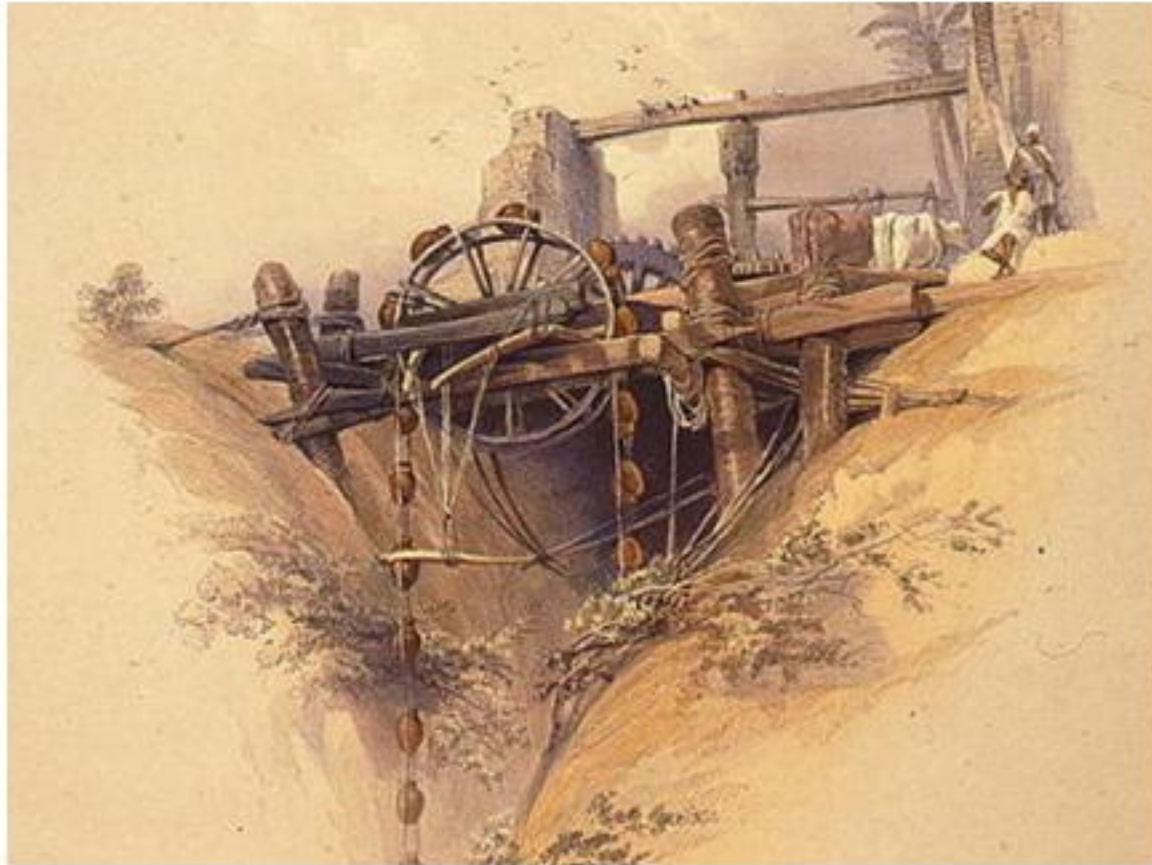


Archaic Method

Pot and arm method

An example of an irrigation system common in the [Indian subcontinent](http://en.wikipedia.org/wiki/Indian_subcontinent).

http://en.wikipedia.org/wiki/Irrigation#Types_of_irrigation

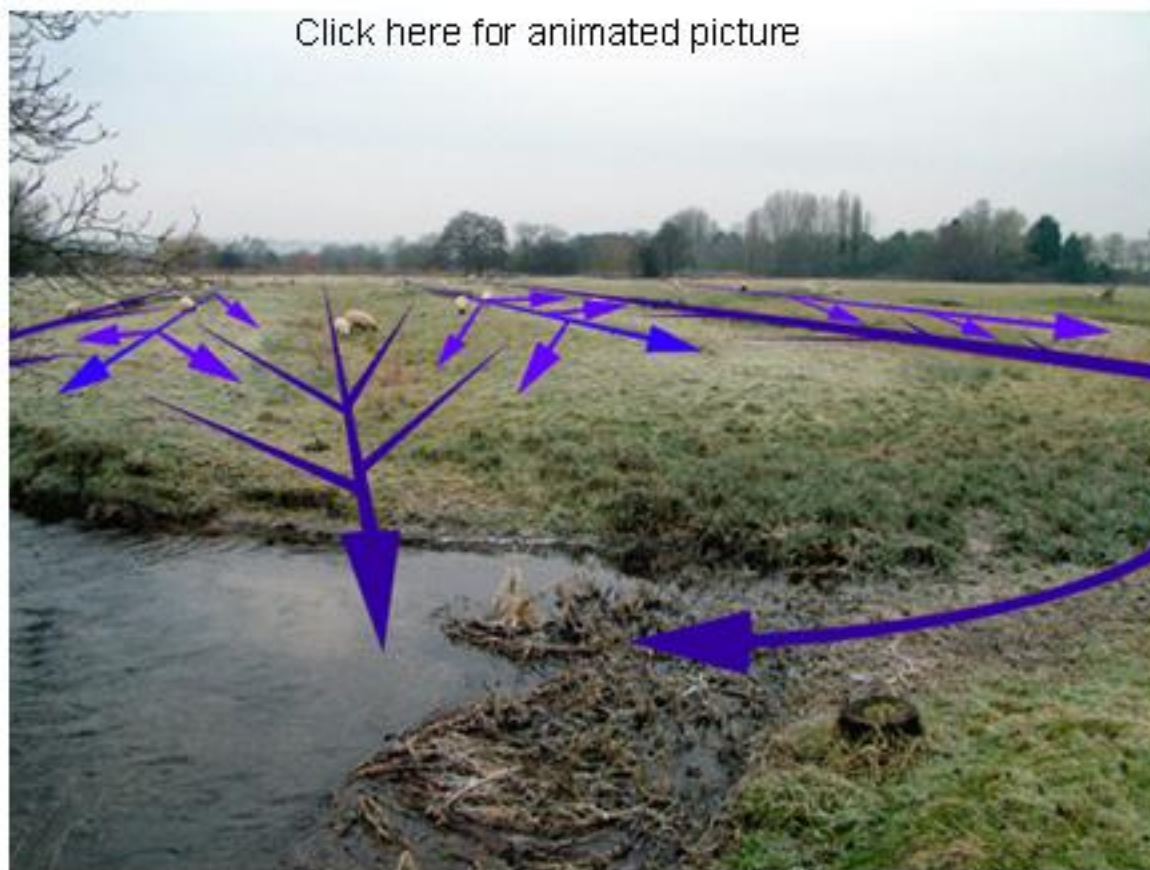


Archalc Method

Animal-powered irrigation, Upper Egypt, c 1840,
http://en.wikipedia.org/wiki/Irrigation#Types_of_irrigation

Dorset Water Meadow Irrigation for early season grass production from 17th to 20th century

Click here for animated picture



<http://www.strollingguides.co.uk/books/wiltshire/places/harnham.php>

Areas Irrigated in Various Countries over one million Ha circa 1974

TABLE 1.1 Irrigated Areas in Countries Having More Than One Million Hectares of Irrigated Land

Country	Cultivated Land 1000 ha	Irrigated Land	
		1000 ha	Percent
1. Afghanistan	7,980	2,900	31
2. Argentina	26,028	1,555	6
3. Australia	44,610	1,581	4
4. Bulgaria	4,516	1,001	24
5. Chile	4,632	1,500	32
6. China and Formosa	111,167	76,500	69
7. Egypt	2,852	2,852	100
8. India	164,610	38,969	24
9. Indonesia	18,000	6,800	38
10. Iran	16,727	5,251	31
11. Iraq	10,163	4,000	39
12. Italy	14,409	3,500	29
13. Japan	5,446	2,626	48
14. Korea	2,311	1,070	46
15. Mexico	23,817	4,200	18
16. Pakistan	21,700	12,400	57
17. Peru	2,979	1,116	37
18. Philippines	11,145	1,090	10
19. Spain	20,626	2,435	12
20. Sudan	7,000	2,520	25
21. Thailand	11,200	3,170	28
22. Turkey	26,068	1,724	7
23. USA	192,318	21,489	11
24. USSR	232,609	11,500	5
25. Venezuela	5,214	1,000	19
26. Vietnam	5,083	3,040	60
27. Other countries	463,790	17,848	4
World's total	1,457,000	233,637	16

A Synopsis of my Irrigation Experience at Mambilla

I worked as Factory Development Manager at Mambilla Tea Estate (Nigerian Beverages Production Company Limited), Mambilla Plateau, Taraba State, Nigeria from 1993 to 1997. This was financed by the European Development Fund. The project known as Mambilla Tea Intergrated Development Programme (MTIDP) was managed by HVA Amsterdam, which also included a smallholder farmers' project with about 250 ha under tea, (I was employed by Bohea Ltd a subsidiary of HVA).

The Project was to renovate the old estate and expand it to 750 hectares with most tea being under irrigation. My main function was to develop the Factory complex to handle the increasing crop but at one critical stage the Irrigation Manager was on leave and I was able to help save about 30 hectares of droughted new planting by introducing portable move, hop along system, irrigation with old equipment found on site.

The Birth of an Irrigation Dam

Tunga Dam

Kakara Tea Estate

Mambilla Plateau, Taraba State

Nigeria

Contractor: SGEN

Kakara, Kusuku and Tunga dam map

Kakara, Kusuku and Tunga Dam, Google Map, hyper link:

http://maps.google.co.uk/maps?f=q&source=s_q&hl=en&geocode=&q=Kusuku++nigeria&sll=53.800651,-4.064941&sspn=11.25,28.168945&ie=UTF8&ll=6.868314,11.143913&spn=0.073796,0.110035&t=h&z=13>

NB Look 2 miles East of Kusuku for the Dam and Lake

TUNGA DAM OVERFLOW TUNNEL UNDER CONSTRUCTION

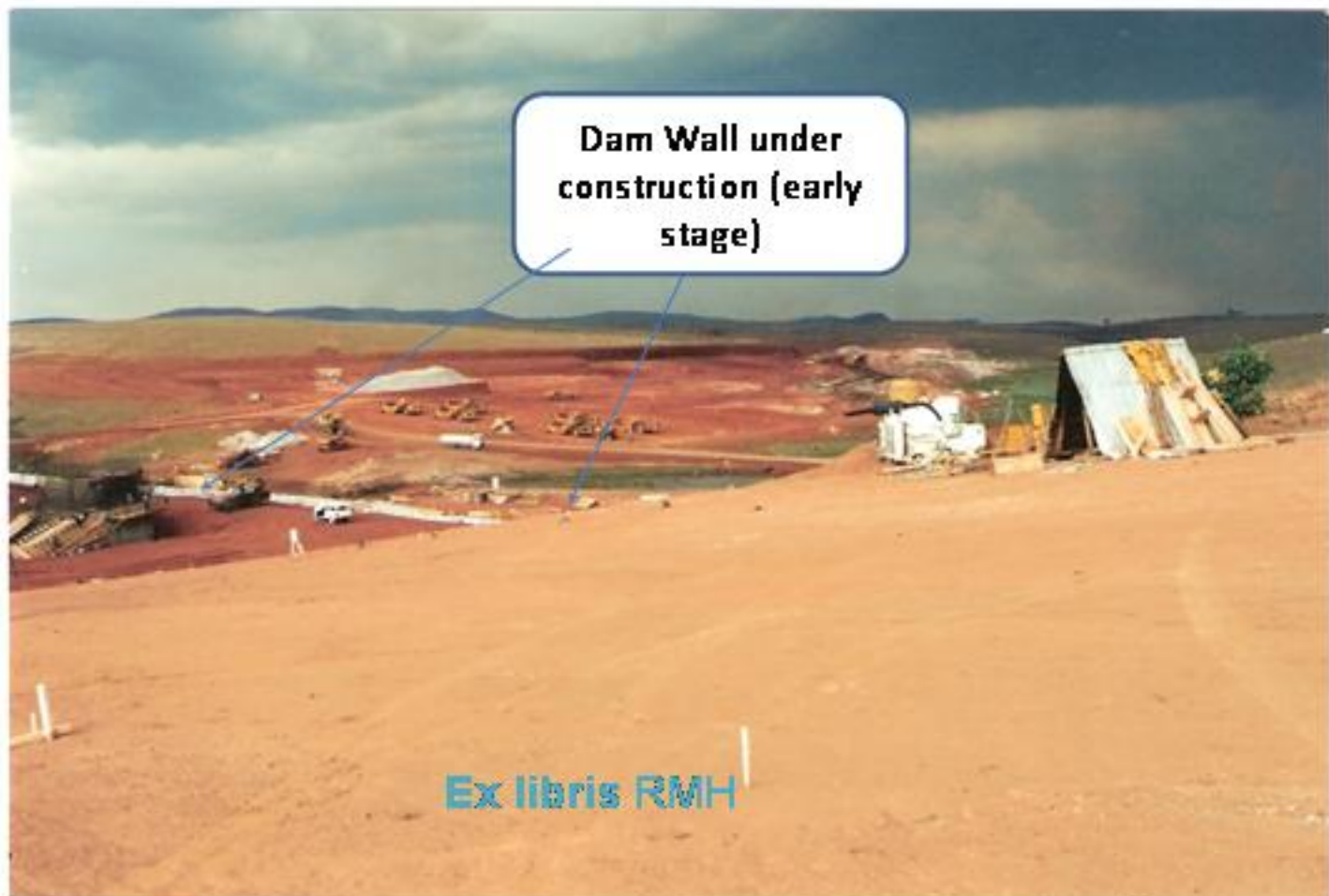


Overflow
Tunnel

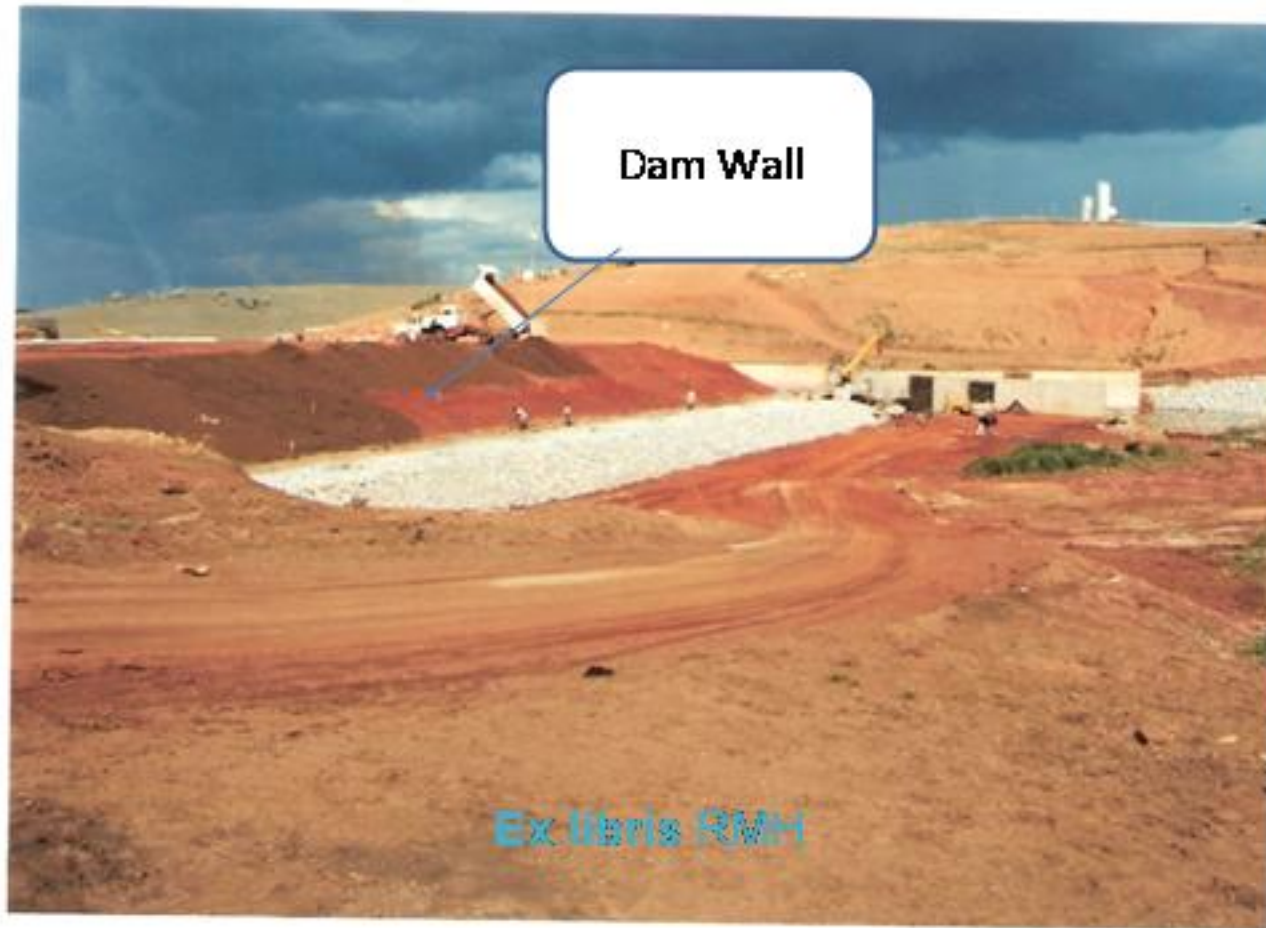
Two Sgen employees

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THE CONSTRUCTION OF TUNGA DAM KAKARA TEA ESTATE MAMBILLA NIGERIA



TUNGA DAM HALF CONSTRUCTED



TUNGA DAM MAMBILLA KAKARA TEA ESTATE NBPC LTD



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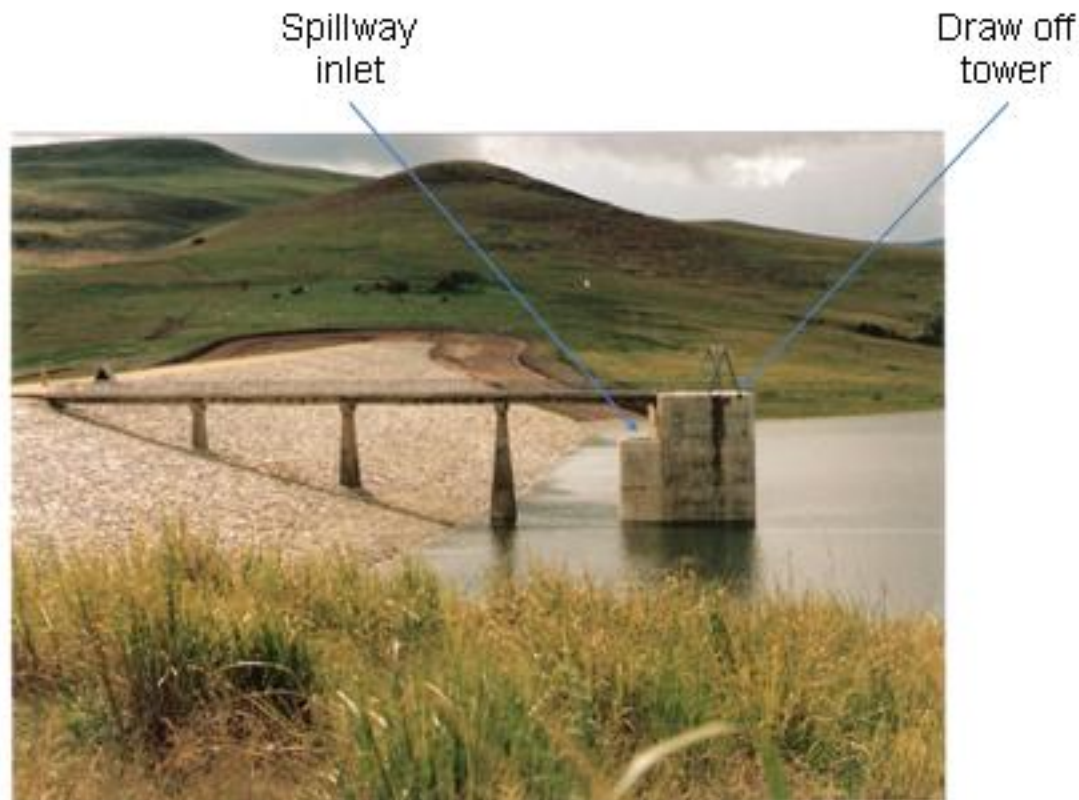
TUNGA DAM, WALL LEAKAGE COLLECTION POINTS

**Robin Reid
Anderson
Deputy
Programme
Manager**



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TUNGA DAM, DRAW OFF TOWER and Spillway with dam part filled



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**A problem with earth fill dams, High
Rainfall (3000mm) and inadequately
constructed spillway (Spain circa1990)
Concrete lined spillway washed out**



**Concrete Lined
Spillway**

TUNGA DAM, TESTING DRAW OFF TOWER AND SPILLWAY

Robin Reid Anderson
Deputy Programme
Manager



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TUNGA DAM, MEASUREMENT OF LEAKAGE circa1995



**Robin Blake
Programme
Manager MTIDP
& MD Nigerian
Beverages
Production
Company Ltd**

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MAMBILLA T.E. CONVEYANCE PIPE LAYING BY SGEN circa 1994



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PIPING LAID READY FOR PRESSURE TESTING BY SGEN



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KAKARA T. E. PUMP SET BEING INSTALLED BY SGEN



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