

# Water Wells

### Monitoring, Maintenance, Rehabilitation

Proceedings of the International Groundwater Engineering Conference held at Cranfield Institute of Technology, UK.

6-8 September, 1990

Edited by

#### P. HOWSAM

Silsoe College Cranfield Institute of Technology UK



E. & F.N. SPON An imprint of Chapman and Hall LONDON · NEW YORK · TOKYO · MELBOURNE · MADRAS

## Contents

	Preface Acknowledgements	ix xi			
	PART ONE OVERVIEWS	1			
1	<b>Boreholes and wells: their monitoring, maintenance and rehabilitation</b> L. CLARK	3			
2	Well maintenance and rehabilitation in North America: an overview S.A. SMITH	8			
	PART TWO CAUSES	17			
3	Well performance deterioration: an introduction to cause processes P. HOWSAM	19			
4	An evaluation of the risk of microbial clogging and corrosion in boreholes D.R. CULLIMORE				
5	<b>Influence of chemical regeneration on iron bacterial</b> <b>population and ochre depositis in tubewells</b> F. BARBIČ and I. SAVIĆ				
6	<b>Tubewell fouling at a salinity interception scheme,</b> <b>Wakool, NSW, Australia</b> R.G. McLAUGHLAN and R.M. STUETZ				
7	Well deterioration in Sindh, Pakistan C.C. LEAKE and T.KAMAL	59			

8	PART THREE DIAGNOSIS AND MONITORING Biofouling monitoring methods for preventive	73	19	Borehole yield development techniques in an iron-rich aquifer M.J. PACKMAN	195
0	maintenance of water wells	75			
	S.A. SMITH and O.H. TUOVINEN	75	20	Eucastream suction flow control device: an element for	
	S.A. SMITH and O.H. TUOVINEN			optimization of flow conditions in wells	209
9	The use of borehole CCTV surveys T. COSGROVE	82		R. PELZER and S.A. SMITH	
10	Well problem identification and its importance in well			PART FIVE REHABILITATION IN PRACTICE	217
	rehabilitation	87		and a state of the source of the second s	
	N. MANSUY, C. NUZMAN and D.R. CULLIMORE		21	Application of physico-chemical treatment techniques to a	
	Contraction of the second s			severely biofouled community well in Ontario, Canada	219
11	Monitoring and prevention of iron biofouling in			J. GEHRELS and G. ALFORD	
11	groundwater abstraction systems	100			
	S.F. TYRREL and P. HOWSAM	100	22	A case study – rehabilitation of an iron biofouled public	
	S.F. I I KKEL allu F. HOW SAM			supply borehole, Otter Valley, South Devon, UK	236
	The second standard and second standard standard standard standard standard standard standard standard standard	107		G.G. BOWEN	230
12	Diagnostic analysis of well performance data	107		G.G. DOWLIN	
	Ch. Ata-Ur-REHMAN		0.0		
			23	A case study of screen failure and borehold rehabilitation	and the second
13	Predicting and interpreting well behaviour and			in the lower greensand aquifer of southern England	244
	well efficiency	114		D. BANKS	
	R. HERBERT and J.A. BARKER				
		1 m m	24	The alluvion river complex of the Loire, France	261
14	Identifying causes for large pumped drawdowns in an			G. GOUESBET	
	alluvial wadi aquifer	130			
	M.W. GROUT and K.R. RUSHTON		25	Rehabilitation of deteriorated tubewells in Punjab scarps	291
				K.G. AHMAD	
	DADE FOUR CLIDES	140	26	Monitoring, maintenance and rehabilitation of water supply	
	PART FOUR CURES	149		wells in India – state of art	303
	and the second state of th			P.N. PHADTARE and G. GHOSH	000
15	Well performance deterioration: an introduction to				
	cure processes	151	27	Village based handpump maintenance – experiences	
	P. HOWSAM		<i>21</i>	from Sri Lanka	044
					314
16	Effect of acidisation on chalk boreholes	158		J. HETTIARACHI and S.W. ERIKSEN	
	D. HARKER		2.0		
			28	Rehabilitation of problem wells in Orissa Drinking	
17	Water well regeneration – new technology	168		Water Supply Project	321
17	K.F. PAUL			R. KUMAR DAW	
	All determined in Shalls Full and a share of the				
4.0	The use of high pressure water jetting as a rehabilitation		29	Monitoring, maintenance and rehabilitation strategies	
18		180		for biofouling control in water wells in Rio Negro, Argentina	338
	technique	100		R.E. ALCALDE and M.A. GARIBOGLIO	
	J. FOUNTAIN and P. HOWSAM				

#### vi

vii

30	<b>Rehabilitation of irrigation wells in Northern Oman</b> – a case study J.A. BALDWIN	344
	PART SIX ECONOMIC AND MANAGEMENT FACTORS	351
31	Benefits of proper monitoring and maintenance C.G.E.M. VAN BEEK and F.A.M. HETTINGA	353
32	Optimisation of groundwater sources J.E. CAMPBELL	361
33	<b>Rehabilitate or renew? An example in Western Zambia</b> S.E. SUTTON and J.S. SUTTON	371
34	Monitoring and diagnosis for planning borehole rehabilitation – the experience from Lima, Peru S. PURI and C.V. FLORES	377
35	<b>Rural well rehabilitation and maintenance in Welo,</b> <b>Ethiopia</b> M.J. JONES	391
36	The management of irrigation tubewells I. SMOUT	404
	Index	419