



Western Cape Water Supply System Reconciliation Strategy

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Umvoto Africa

Administrative and Technical Support Group Meeting #10

12 August 2015

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Allocations from WCWSS

- **Allocations (Status Report): 584.1 million m³/a**
 - Domestic use allocation 410.5 million m³/a
 - Agricultural use allocation 173.6 million m³/a
- **Allocations (revised): 609.1 million m³/a**
 - Domestic use allocation 392.9 million m³/a
 - Agricultural use allocation 216.2 million m³/a
- **Availability (Yield): 582 million m³/a**



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Domestic Allocations

- City of Cape Town: 357.9 million m³/a
 - Temporary volume: 28.0 million m³/a
- West Coast DM: 22.8 million m³/a
- Drakenstein LM: 1.2 million m³/a
- Stellenbosch LM: 3.0 million m³/a
- Overberg Water: 4.0 million m³/a
- Piketberg & PPC: 2.9 million m³/a
- **Others industrial: 1.1 million m³/a**
- **Total domestic allocations 392.9 million m³/a**



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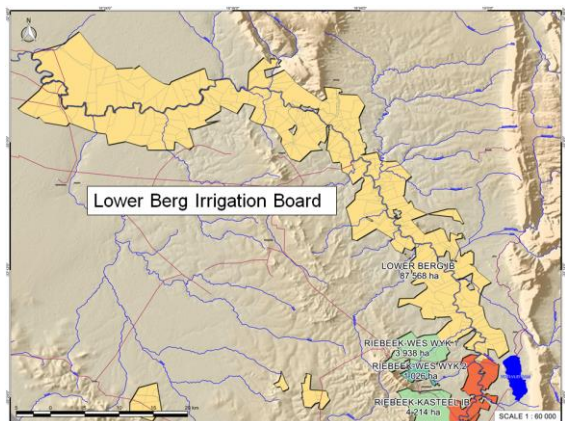
Agricultural Allocations

- Voëlvlei & Misverstand
 - Lower Berg IB: 27.7 million m³/a
 - Additional licences: 13.7 million m³/a
 - Additional releases: 0 million m³/a
- Theewaterskloof Dam/Berg River Dam
 - Riviersonderend part: 71.0 million m³/a
 - Upper Berg River IB: 59.3 million m³/a
 - Wynlands & Banhoek: 28.0 million m³/a
 - Summer streamflow: 16.5 million m³/a
- **Total Agriculture: 216.2 million m³/a**



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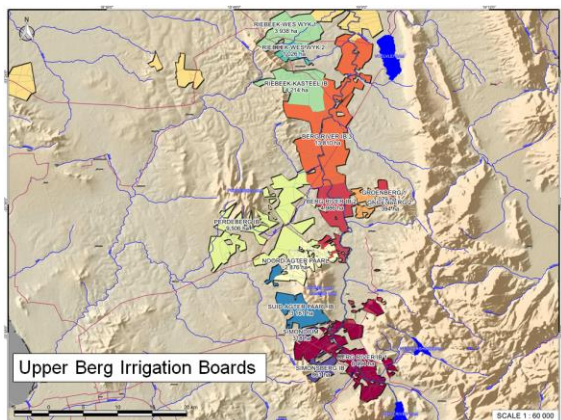
Agricultural Allocations Lower Berg River IB

Water User	Quota (m ³ /ha/a)	Area (ha)	Volume permitted	River losses / compensation	Allocated volume from WC WSS
Lower Berg IB – Summer (old quota)	3,000	3,597	10.79	3.60	14.39
Lower Berg IB – Summer (Add. releases)	2,000	3,597	7.19	2.40	9.59
Lower Berg IB – Summer (remaining; run-of-river)	2,000	3,597	7.19	-	-
Lower Berg IB – Wittewater	7,000	297	2.08	0.69	2.77
Lower Berg IB – Swartland Scheme	7,000	130	0.91	-	0.91
Lower Berg IB - Winter	7,000	2,292	16.04	-	-



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Agricultural Allocations Upper Berg River Main IB

Water User	Quota (m³/ha/a)	Area registered	Volume registered	River losses / compensation	Allocated volume from WCWSS
Berg River IB (quota 1)	4,000	3,299	13.19		58.6
Berg River IB (quota 2)	5,000	4,211	21.06		
Berg River IB (quota 3)	6,000	3,003	18.02		
Noord-Agter Paarl IB	5,000	980	4.90		
Suid-Agter Paarl IB	4,000	867	3.47		
Perdeberg IB	5,000	1,324	6.62		
Simondium IB	4,000	227	0.91		
Simonsberg IB	4,000	125	0.50		
Groenberg IB (Distr 1)	5,000	211	1.06		
Groenberg IB (Distr 2)	5,000	104	0.52		
Riebeeck Kasteel IB	6,000	224	1.35		
Riebeeck Wes IB Distr 1	6,000	115	0.69		
Riebeeck Wes IB Distr 2	6,000	135	0.81		
New Licences		107	0.57	0.19	0.75
Total Summer Allocation		14,933	73.65	(-) 14.3	59.3
Total Winter Allocation		1,259	5.94	-	-

Agricultural Allocations Zonderend and Vyeboom

Water User	Quota (m³/ha/a)	Area (ha)	Volume permitted	River losses / compensation	Allocated volume from WCWSS
Zonderend IB – Summer, BWP	6,000	4,452	26.71	1.60	28.31
Zonderend IB – Summer, V&V	6,000	1,566	9.40	0.56	9.96
Compensation				3.19	3.19
Zonderend IB – Winter	8,000	1,389	11.11	-	-
TWK direct	7,100	4,156	29.51	-	29.51
Vyeboom IB	7,100	1,852	13.15	-	-
Pump from Twk	7,100	3,500	1.5	-	-

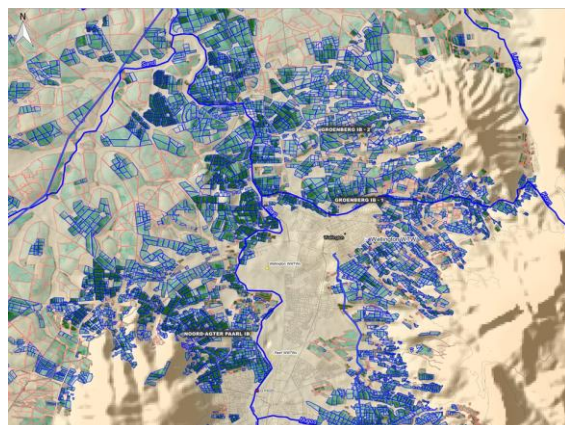
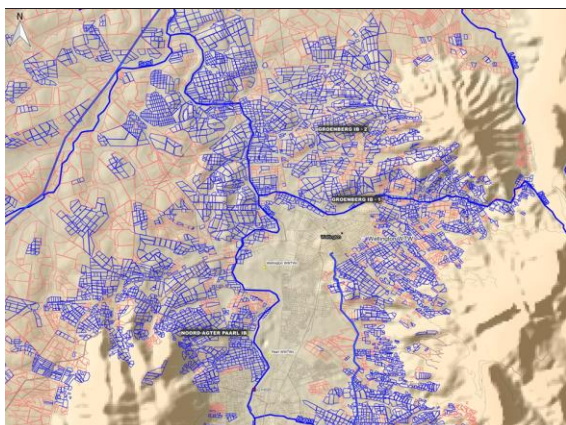
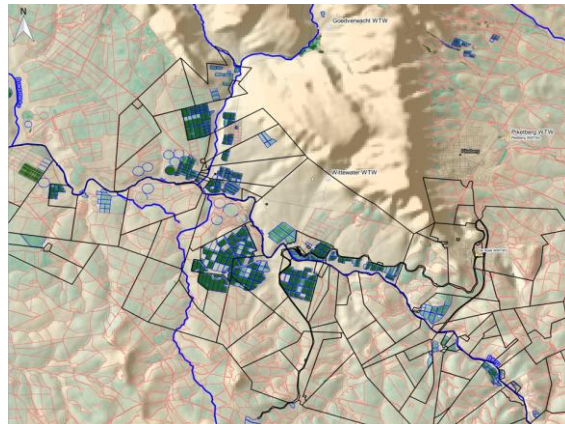
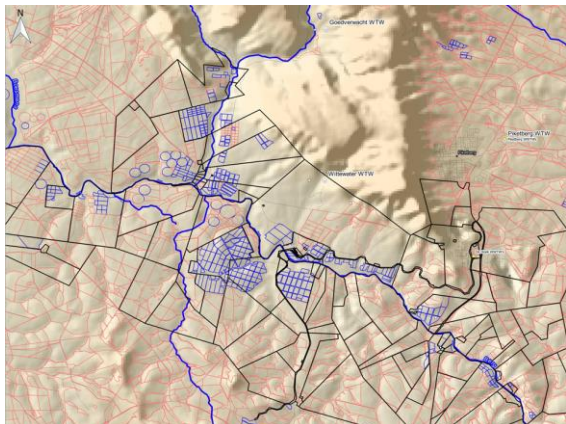
TWK direct includes Vyeboom IB

- ### Agricultural Allocations Zonderend and Vyeboom
- Zonderend IB
 - 1981 White Paper 23.5 million m³/a
 - 2003 BWP Agreement 31.5 million m³/a
 - 2015 V&V results 41.5 million m³/a
 - Vyeboom IB and TWK
 - 2003 BWP Agreement 14.7 million m³/a
 - 2015 V&V results 29.5 million m³/a

Agricultural Allocations Wynlands WUA & Banhoek IB

Water User	Quota (m³/ha/a)	Area (ha)	Volume permitted	Losses	Allocated volume from WCWSS
Wynlands WUA : Stellenbosch District	4,000	2,978	11.91	-	11.91
Wynlands WUA : Helderberg District	4,000	2,749	11.00	-	11.00
Wynlands WUA : Eerste Rivier District		514	1.95	-	1.95
Eerste Rivier Leiwater releases			1.20	-	1.20
Banhoek IB	4,000	450	1.80	-	1.80
Dasbos outlet			0.18	-	0.18

- ### Scheduled area under irrigation
- Boundaries of irrigation boards
 - Lower Berg IB
 - Information by Dept of Agriculture
 - Fields under irrigation
 - Landsat imagery Dec 2014
 - NDVI



Conclusions

- Total allocations of **609.1** million m³/a exceed system yield of 582 million m³/a
- Agricultural allocations exceed previous capped volume of 173.6 million m³/a
- Temporary allocation to CCT fully allocated to agriculture and not available for CCT
- Next intervention is required earlier than estimated in Status Report 2014

Recommendations

- Clarify outstanding queries regarding allocations
- Verify actual area under irrigation and water use by agriculture for all irrigation boards
- Determine equivalent allocation under different Assurance of Supply
- Update WRYM and WRPM
- Expedite the implementation of the next intervention

WCWSS – WRYM Modelling

- **Update irrigation allocations**
 - Link updated irrigation allocations to WCWSS setup
 - Change / add irrigation allocations as required
 - Irrigation in WCWSS are modelled as follows:
 - Irrigation allocations used UNLESS Present day requirements are LESS then allocation
 - Domestic allocations in WCWSS are not modelled; present day requirements are modelled



WCWSS – WRPM Modelling

- **Current System Reliability (assurance of supply)**

Demand Category	% Supply for different annual probabilities of failure (1 in ... years)									
	1	10	20	100	200	uncurt	10	20	100	200
Urban Nov'12)	359	100%	93%	85%	71%					
Urban: Domestic	168	100%	88%	76%	57%	168	168	147	127	96
Urban: Industrial	113	100%	97%	89%	71%	113	113	110	101	80
Urban: UAW	78	100%	100%	100%	100%	78	78	78	78	78
Agricultural	44	100%	90%	70%	50%	44	44	40	31	22
Sub-total (all)	403	100%	93%	84%	68%	403	403	375	337	276
Uberg IB Demand	75.1	100%	90%	70%	50%	75	75	68	53	38
Overberg Demand	3.5	100%	90%	70%	50%	4	4	3	2	2
Other demands than ch 55 & Berg R	46.2	100%	90%	70%	50%	46	46	42	32	23
Farm dams in U Berg	58.0	100%	90%	70%	50%	58	58	52	41	29
Sub-total (all)						183	183	165	128	91
Total (inc Uberg Fdams)		100%	92%	79%	63%	585	585	539	465	367
Total on Wcape system		100%	92%	80%	64%	527	527	487	424	338



WCWSS – WRPM Modelling

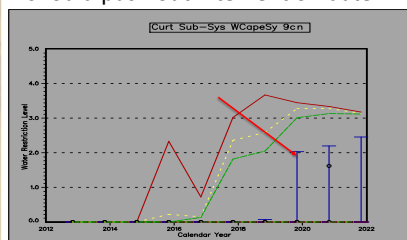
- **Proposed System Reliability (assurance of supply)**

Demand Category	% Supply for different annual probabilities of failure (1 in ... years)										
	10	20	100	200	uncurt	10	20	100	200		
Urban (year ending Nov'12)	359	100%	93%	85%	71%						
Urban: Domestic	168	100%	88%	76%	57%	168	168	147	127	96	
Urban: Industrial	113	100%	97%	89%	71%	113	113	110	101	80	
Urban: UAW	78	100%	100%	100%	100%	78	78	78	78	78	
Agricultural	44	100%	75%	50%	20%	44	44	33	22	9	
Sub-total (all)	403	100%	91%	81%	65%	403	403	368	328	263	
Uberg IB Demand	75.1	100%	75%	50%	20%	75	75	56	38	15	
Overberg Demand	3.5	100%	75%	50%	20%	4	4	3	2	1	
Other demands than ch 55 & Berg R	46.2	100%	75%	50%	20%	46	46	35	23	9	
Farm dams in U Berg	58.0	100%	75%	50%	20%	58	58	44	29	12	
sub-total						183	183	137	91	37	
Total (inc Uberg Fdams)		100%	100%	86%	72%	51%	585	585	505	419	299
Total on Wcape system		100%	88%	74%	55%	527	527	462	390	288	



WCWSS – WRPM Modelling

- **Adjusting assurance of supply to irrigation should push out intervention date.**



Modelling Questions (1)

- **Model other sources for Cape Town, West Coast, all users**
 - Cape Town sources include Langebaan Road, Table Mountain Dams, Newlands Reservoir (14 million m³/a)
- **Confirm operating rule for summer water allocations to agriculture**
 - What if not required during summer but required in winter? 16.5 million m³/a
 - Consider adjusting summer demand patterns
 - Consider impact of using summer water allocation in 'winter months'



Modelling Questions (2)

- **How to use farm dams to mitigate reduced assurance of supply to irrigators?**
 - Need information about licensed / unlicensed dams in the Klein Berg catchment and in the La Motte catchment (near Franschoek)



Other modelling / system augmentation

- Berg River-Voelvllei Augmentation Scheme (BR-VAS)
 - Option investigated by Aurecon (Feasibility study, 2012)
- TMG aquifer
 - What if not required during summer but required in winter? 16.5 million m³/a
 - Consider adjusting summer demand patterns
- Status of SFRA (forestry / AIP)
 - Project to determine status of AIPs in Berg River catchment currently in progress (Aurecon)
 - Status / policy regarding forestry

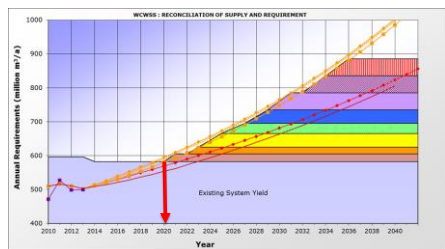


Status of the Dams

WCSS Dams	Capacity (Million m ³)			Storage 03-Aug-15				Storage 04-Aug-14			
	Gross	Dead	Nett	Gross	% Gross	Nett	%Nett	Gross	% Gross	Nett	%Nett
Steenbras Upper	31.7	2.0	29.7	31.7	100.0%	29.7	100.0%	31.4	98.9%	29.4	96.8%
Steenbras Lower	33.5	0.0	33.5	24.3	72.6%	24.3	72.6%	33.0	98.5%	33.0	98.5%
Wemmershoek	58.6	0.2	58.4	38.4	65.6%	38.2	65.5%	58.6	100.0%	58.4	100.0%
Voelvllei	165.4	7.1	158.3	79.6	48.1%	72.5	45.8%	165.4	100.0%	158.3	100.0%
Theewatersloof	480.2	47.9	432.3	327.0	68.1%	279.1	64.6%	480.2	100.0%	432.3	100.0%
Berg River Dam	130.0	3.0	127.0	102.4	78.8%	99.4	78.3%	130.0	100.0%	127.0	100.0%
Total	899.4	60.2	839.2	603.5	67.1%	543.3	64.7%	898.5	99.9%	838.3	99.9%



Implications



Next intervention required by 2020



Agricultural Allocations Additional licences

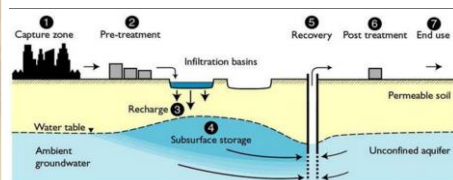
Applicant	Irrigation Board	BEE %	Area (ha)	Volume allocated (m ³ /a)
Neethling Broers	Riebeeck / Upper			
Wynkeldershoek Workers Trust	Berg Zone 3	40%	30	180 000
Adama Appollo Trust	Upper Berg Zone 2	40%	77	385 000
Platklouf Workers Trust	Lower Berg IB	45%	215	1 505 000
Le Roux Group Workers Trust	Lower Berg IB	33.5%	215	1 505 000
Lynol Petersen Family Trust	Lower Berg IB	30%	215	1 505 000
McISA Agri Tourism Wittewater	Lower Berg IB	100%	215	1 505 000
Aqua Empower Bovenvllei	Lower Berg IB	30%	73.93	517 510
Piketberg Sunrise Farms (Pty) Ltd	Lower Berg IB	30%	214.3	3 579 490
Total				10 862 000



Cape Flats Aquifer Strategy



Concept: Urban Aquifer Management



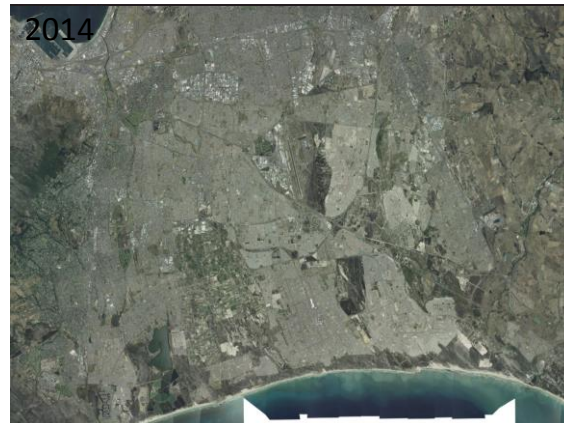
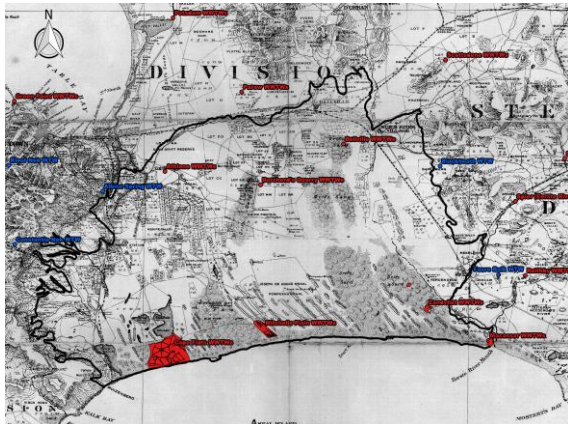



Table of Contents

- Stop potential pollution sources
- Local scale supply
- Bulk supply
- Bioremediation
- Local scale sanitation




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Stormwater and Canal Rehabilitation






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Stormwater and Canal Rehabilitation

Product	Quantity	Price
Kaytech Soilsaver	1m ²	R 8.33
Artificial Wetland (shaping and vegetation)	1m ²	R 380
Laywork (filter), shaping and vegetation	1m ²	R 2 500



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Local scale supply - Schools



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School Fields

Planning Districts	No. Schools	No. Schools in Study Area
Mitchells Plain/khayelitsha	181	181
Cape Flats	158	158
Northern	57	0
Tygerberg	178	143
Table View	80	11
Blauwberg	50	0
Heiderberg	47	1
Southern	120	69

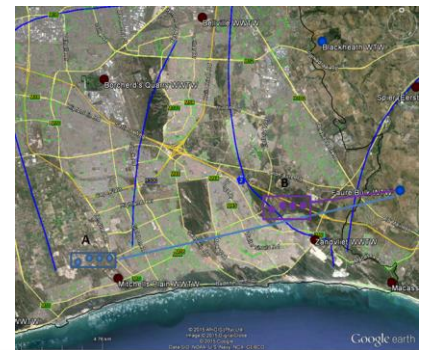
	Specification	Cost
Drilling	30m at 5"	R 40 000
Pump	Solar & all equipment (3 bar)	R 50 000
Pump	Electrical (3 bar)	R 15 000
Electricity pumping	R 1000/month * 8 month	R 8 000
Irrigation system	Canon Sprayer	R 35 000
Irrigation system	Sprinkler system & installation	R 150 000
Irrigation system	Basic sprinkler & installation	R 2 000
Fencing	razer wire (R2000/m)	R 24 000
Kiosk	130cm x 80cm	R 17 000
Brick housing	(2x2x1m) with lockable manhole cover and plinth	R 28 000
Artificial wetland	5x5m	R 9 500
Wetland Fencing		20 7000



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CFA supplementing Bulk Supply



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Bulk Supply reservoirs



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Hydrochemical data 1987 - 2012



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Cost of artificial wetland

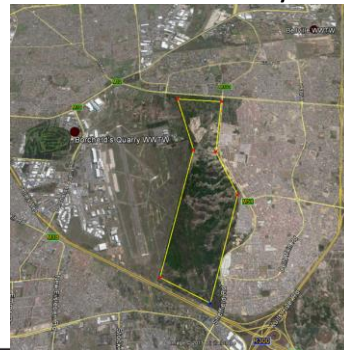
A Plant	Flow/day (m3)	Wetland Area (hectares)	Wetland Cost	B Plant	Flow/day (m3)	Wetland Area (hectares)	Wetland Cost
Athlone	133245.5	13	R 50 633 282	Athlone	133245.5	13	R 50 633 282
Bellville	51370.68	5	R 19 520 860	Bellville	51370.68	5	R 19 520 860
Borchard's	35457.26	4	R 13 473 759	Borchard's	35457.26	4	R 13 473 759
Cape Flats	113120.5	11	R 42 985 808	Cape Flats	113120.5	11	R 42 985 808
Macassar	36476.71	4	R 13 861 151	Macassar	36476.71	4	R 13 861 151
Mitchell's	36307.4	4	R 13 796 811	Mitchell's	36307.4	4	R 13 796 811
Zandvliet	79717.26	8	R 30 292 559	Zandvliet	79717.26	8	R 30 292 559



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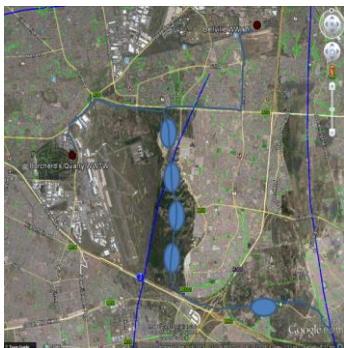
Bellville and Borchard's Quarry WWTW



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Bellville and Borchard's Quarry WWTW



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Land available for artificial wetlands

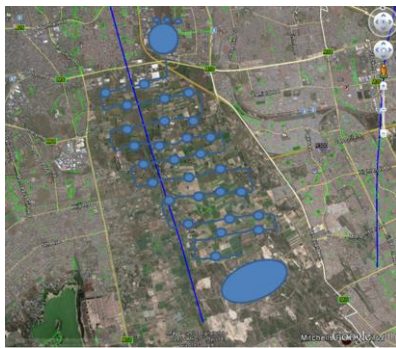
	Required Wetland Area (hectares)	Available area (hectares)
Athlone	13	17
Bellville	5	500
Borchards	4	500
Cape Flats	11	150
Macassar	4	20
Mitchell's	4	18
Zandvliet	8	30



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Bioremediation



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Current state of CFA



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