


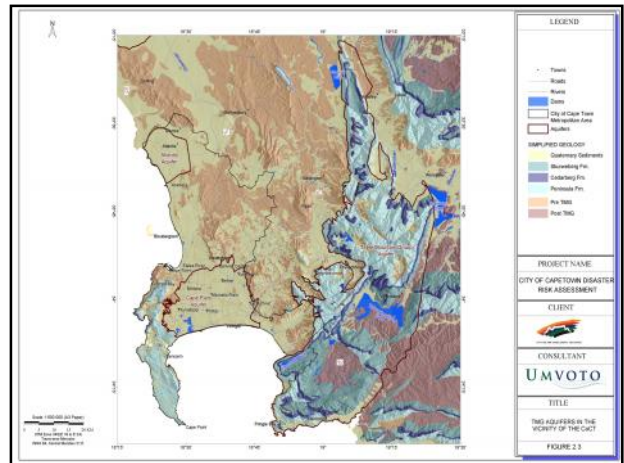


Cape Flats Aquifer Urban Groundwater Management

ER Hay, K Riemann, G Dor, A Kuhudzai
04 February 2014

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Agenda

- Groundwater Potential
- Groundwater Quality
- Considerations and Constraints
- Opportunities
 - Bulk Water Supply
 - Flood Mitigation & Fire Control
 - Food Security & Community Greening
 - Sanitation
 - Ecosystems and Catchment Management

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
Agenda continued



- Approach
 - Co-operative governance
 - Social Development
 - Resource Protection
- Way Forward

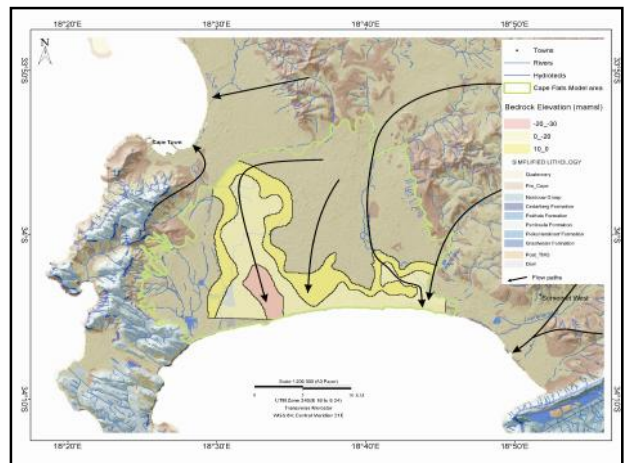
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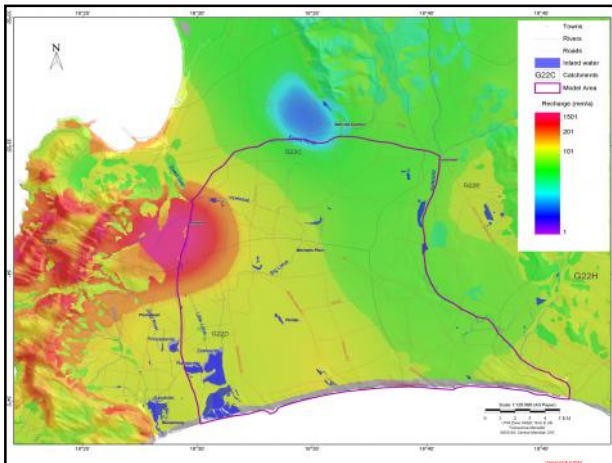
 

Groundwater Potential

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Quaternary Catchment	Groundwater Use [Million m ³ /a] GRA II						
	Total	Rural	Municipal	Agri. Irrigation	Agri. Pastoral	Industry	Other
G22C	0.9916	0.0000	0.0000	0.0000	0.0745	0.0000	0.0000
G22D	0.9090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
G22E	0.1900	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
G22H	0.1804	0.0000	0.0000	0.0000	0.0004	0.1790	0.0000
Total	10.5749	0.0090	0.0000	0.0000	0.1845	4.4340	0.0000

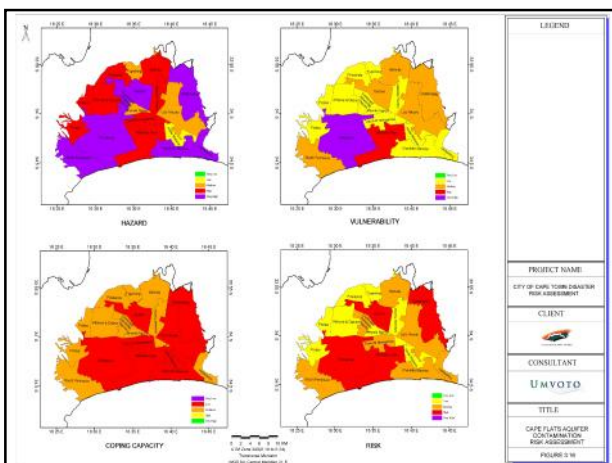
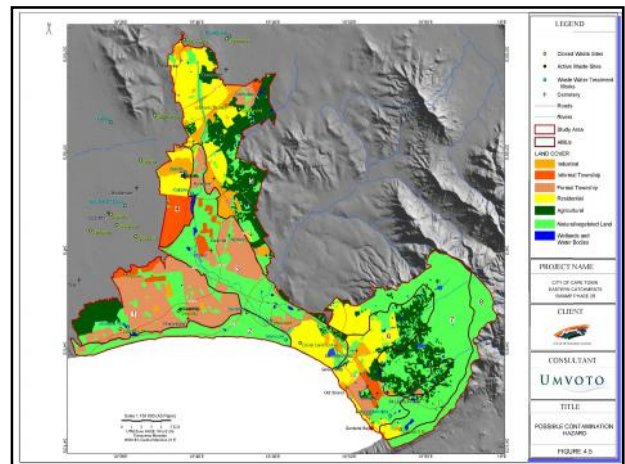
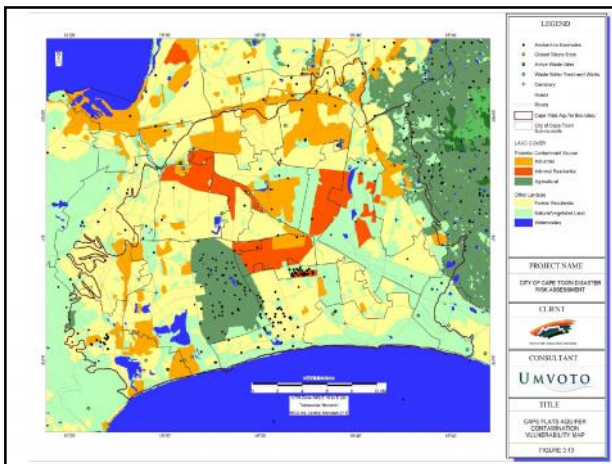
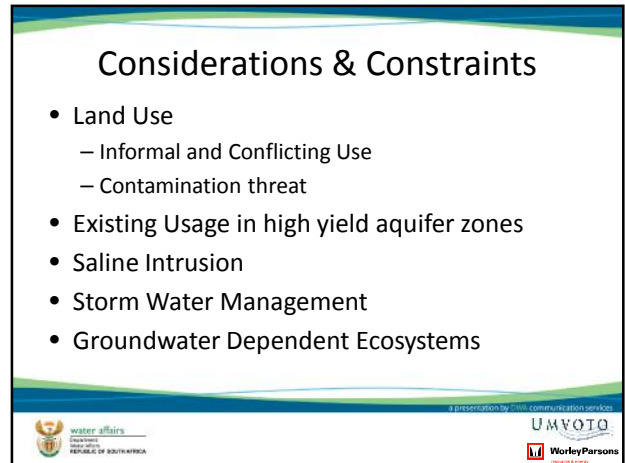
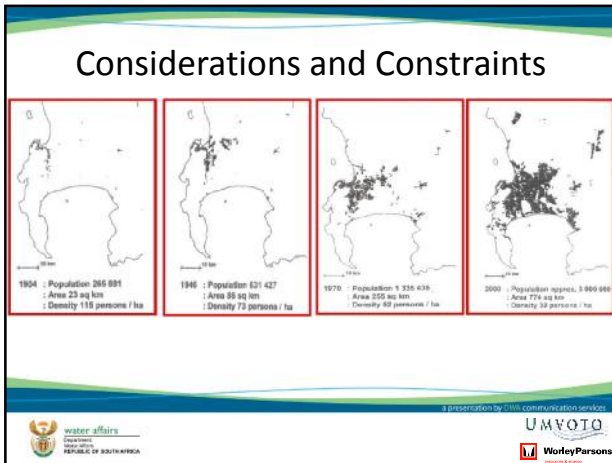
Quaternary Catchment	Groundwater Use [Million m ³ /a] WARMS							Schedule
	Total	Industry	Municipal	Agri. Irrigation	Agri. Pastoral	Industry	Other	
G22C	1.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
G22D	5.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000
G22E	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
G22H	1.700	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	9.100	1.000	0.000	0.000	0.000	0.000	0.000	0.000

Scenario ID	Wellfield total abstraction	Wellfield details	Effects
Scenario 2.1 Rate 1	18 Mm ³ /a Based on Vandoolaeghe (1989) and Fraser et al (2001)	20 wells, each pumping at 2 566 m ³ /d (30 l/s)	Cone of depression extends to coastline, direct seawater intrusion likely. Water levels drawn down to < 0 mamsl causing upconing of seawater and intrusion into wells
Scenario 2.1 Rate 2	3.7 Mm ³ /a	20 wells, each pumping at 500 m ³ /d (6 l/s)	Cone of depression does not extend to coastline, low risk of direct seawater intrusion. Water levels drawn down to < 0 mamsl causing upconing of seawater and intrusion into wells

Groundwater Quality

Constituent mg/L	Tredoux (1984)	Wessels & Greeff (1980)	NGDB (DWA 2006)
EC (mS/m)	73 – 138	33 – 2900	36.3 – 659
pH	6.9 – 7.5	6.9 – 8.6	5.7 – 8.6
Chloride	70 – 255	30 – 9246	28.1 – 2100
Sulphate	25 – 43	4.8 – 1750	5.5 – 350
Alkalinity	261 – 275	112 – 902	8.5 – 437
Sodium	43 – 142	20 – 7000	20.3 – 1048
Potassium	1.5 – 3.3	0.5 – 300	0.66 – 53.6
Calcium	95 – 96	11 – 1370	3.2 – 260
Magnesium	0.4 – 2.6	6 – 1000	5.4 – 119

Constituent mg/L	Waste Disposal Sites		Sewage treatment works	
	Unpolluted	Polluted	Unpolluted	Polluted
EC (mS/m)	121 – 138	199 – 970	73	220
pH	6.9 – 7.5	6.4 – 6.8	7.2	6.7
Chloride	210 – 255	187 – 1150	70	132
Sulphate	27 – 43	35 – 70	25	32
Alkalinity	266 – 275	891 – 3160	281	879
Nitrate	< 0.1	0.2 – 0.6	< 0.1	24
Sodium	123 – 142	148 – 779	43	116
Potassium	1.5 – 3.3	21 – 444	1.7	46
Calcium	95 – 96	53 – 226	97	159
Magnesium	17.7 – 26	11 – 88	8.1	22
Ammonium	0.5	23 – 668	0.5	115

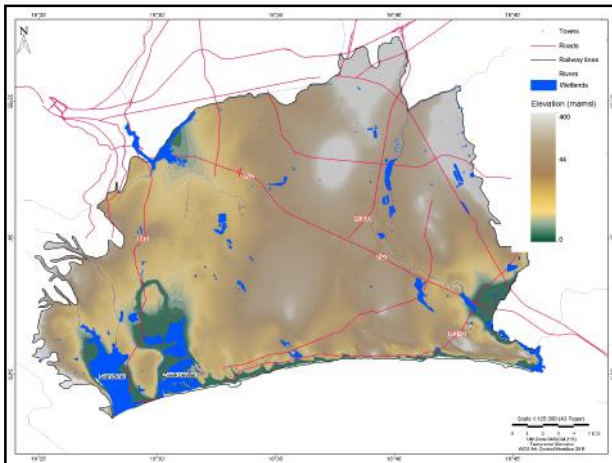


Flood risk	Area description
Flood prone areas	Areas along the Kuils River including Barney Molokwane corner, Sebata Dalindyebo square, and Silvertown
Recorded flooding in 2001	Silvertown and Sebata Dalindyebo square
Informal areas adjacent to storm water ponds	Nonqubela, Victoria Mxenge, Washington square, Mandalay, and Site C
Informal settlements adjacent to flood plain areas	Soloman Mahlangu, Trevor Vlakazi, and Silvertown

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Opportunities

- Bulk Supply
- Flood Mitigation & Fire Control
- Food Security & Community Greening
- Local Scale Sanitation
- Ecosystems and Catchment Management

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Opportunities

- Bulk Water Supply
 - Cost benefit question
 - High Yield Zones in use
 - Impact on existing users
 - Saline intrusion
 - Better use can be made of aquifer potential
 - Rather turn constraints and considerations into opportunities

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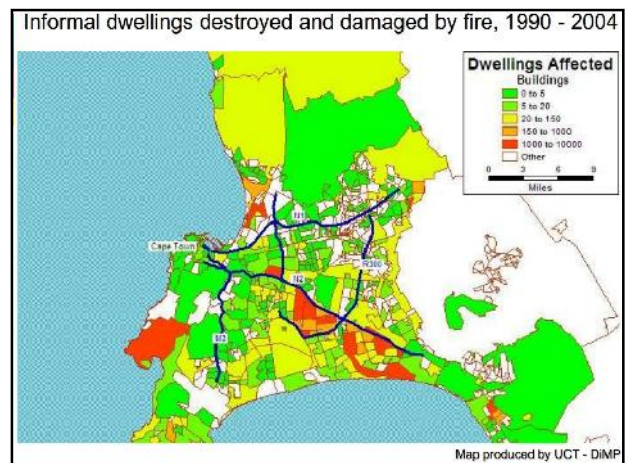
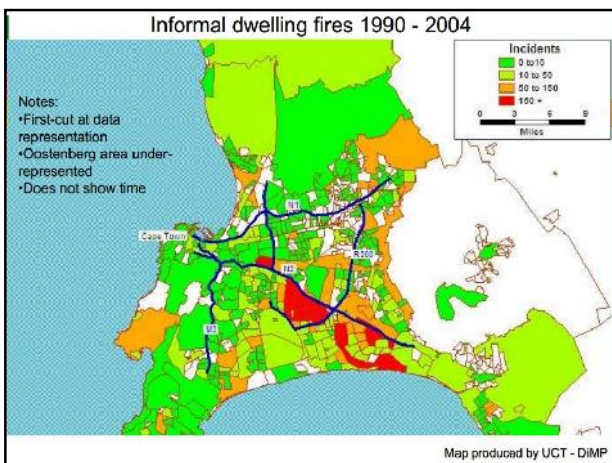
Opportunities

- Flood Mitigation and Fire Control
 - Known Hazards
 - Annual Recurrence
 - Floods exacerbated by high ground water table
 - Opportunity to train first Responders (fire)
 - Community Investment & benefit

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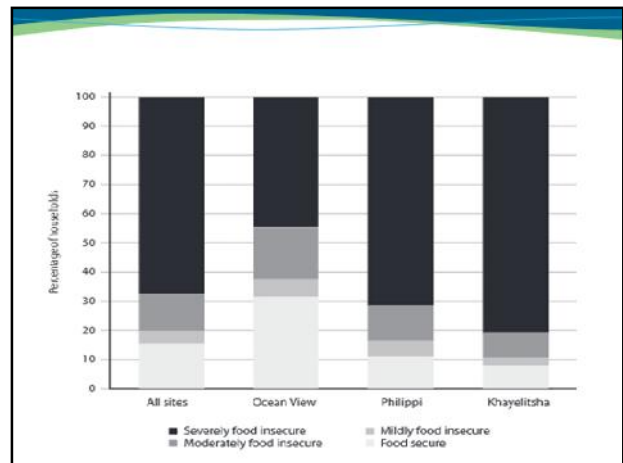
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Opportunities

- Food Security & Community Greening
 - WC&WDM measure
 - Low Yields acceptable
 - Local Scale Wellfield Development
 - Existing Private Sector engagement
 - NGO Engagement
 - Learners to Elders involved
 - Community investment and benefit

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Opportunities

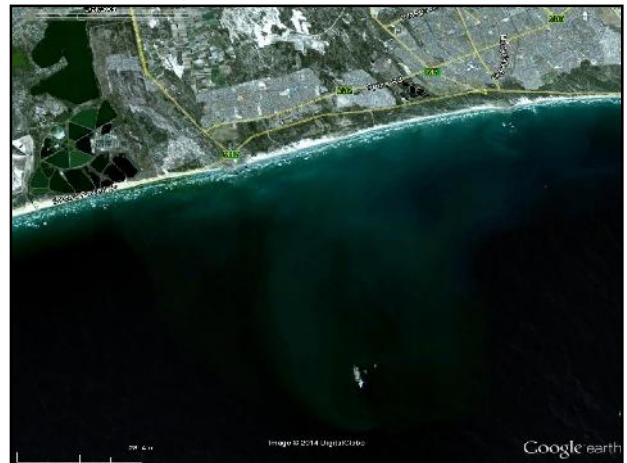
- Local Scale Sanitation
 - WC&WDM measure
 - Low Yields acceptable
 - Local Scale Wellfield Development
 - Requires soft and hard engineering skills
 - Flexible infrastructure – low cost/loss if informal settlements upgraded
 - Community investment and benefit

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Opportunities

- Ecosystem Catchment Management – Landscape Mimicry
 - Hydraulic Barrier to algal bloom
 - Back Barrier Wetland network for water purification
 - Cape Flats Wetland Network for Flood, Grey and Storm water control
- Onshore, Near Shore, Off shore water exchange management

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SENSITIVE URBAN GROUNDWATER MANAGEMENT

- Pump All Year
 - Local Scale Sanitation
 - Ecosystem Catchment Management
 - Onshore Nearshore Offshore Water Exchange
- Pump in Summer
 - Flood Mitigation
 - Fire Control
 - Food Security & Community Greening

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Approaches

- Cooperative Governance (City & Province)
 - Water Conservation & Demand Management
 - Catchment Stormwater and River Management
 - Disaster Risk Management
 - Environmental Resource Management
 - Spatial Planning & Urban Design
 - DEDT
 - DEA DP (BRIP)

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Way Forward

- Proposal Call for Conceptual and Reconnaissance Level Studies
- Proposal Call for Design Procure Construct with Community Facilitation and Training
- Community Operated Well fields with Expert Input as required

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