

PROGRESS REPORT

October 2011

1 INTRODUCTION

The third Strategy Steering Committee (SSC) meeting was held on the 29th of September 2011, to present and discuss progress with the implementation and update of the Reconciliation Strategy for the Crocodile West Water Supply System.

The meeting was attended by 46 stakeholders representing key national and provincial government departments, municipalities, water service providers, industry and agriculture as well as Non Governmental Organisations . (The membership list of the SSC is attached to this report as Appendix A.)

Feedback was given on progress with various activities by SSC members and the Professional Service Provider gave presentations on the technical work undertaken in support of the committee.

The main aspects covered were as follows:

- Development of a water quality (salinity) simulation model to evaluate potential water resource development options and to perform analysis to determine the most beneficial operating rules.
- Verification of the decision support modelling system to replicate the observed drought as experienced by the irrigators supplied from Roodekopjes and Klipvoor dams.
- Determine system water balances for scenarios of alternative bulk water supply projects which were put forward by Tshwane Metro and Magalies Water as possible future bulk water supply schemes.
- Feedback from municipalities on their Water Conservation and Water Demand Management (WC/WDM) plans and initiatives.
- Presentation by Magalies Water describing their proposed bulk water expansion plans.
- Officials from DWA presented results of a water quality assessment study and what progress was made with the Harties Metsi a Me project.
- Progress with the planning of the Mokolo-Crocodile Water Augmentation Project (MCWAP), which has the purpose to ensure sufficient water is made available to support the future water needs in the Lephalale Area for electrical power generation, related coal mining to harness the Waterberg coal reserve and associated increasing urban water use to cater for the influx of people.
- Current activities by the DWA Directorate Water Resource Planning System to develop integrated operating rules for the entire system and establish a System Operation Forum to oversee the

implementation thereof. It is anticipated that the first meeting of the SOF will be towards the end of the year 2011.

- Finally, perspectives were given on the proposed revision of the strategy and the committee made recommendations on the way forward.

2 PROGRESS WITH SUPPORT ACTIVITIES AND THE IMPLEMENTATION OF THE STRATEGY

2.1 WATER QUALITY MANAGEMENT

2.1.1 Salinity

The calibration of the water quality (salinity) model is currently being completed to simulate the implications different scenarios and development options could have on the total dissolved solids (TDS), in the system. The calibration results indicate that, despite significant gaps in data and lack of historical records, acceptable calibrations were achieved in the upper and middle parts of the catchment. The calibration of the lower portion of the catchment is currently being conducted and the results will be summarised in a report and integrated into the Water Resource Planning Model.

2.1.2 Harties Metsi A Me Project

The DWA has been conducting the Harties Metsi A Me project since 2005 to improve amongst other the water quality in the Hartbeespoort Dam. The project is regarded as a total remediation programme for the dam which is severely impacted by upstream pollution sources and eutrophication. Several strategies are being implemented to ensure an active approach to the improvement of the dam's water quality and biodiversity. More information on the project can be obtained from www.dwa.gov.za/projects.

2.1.3 Water quality assessment

The DWA is currently reviewing the water quality status of the catchment through compliance against Resource Water Quality Objectives (RWQO's). Preliminary RWQO's have been set for the catchment based on both international and local standards as well as the specific user profile for various sections of the river. The assessment identified trends and non-compliance in particular with respect to pH and phosphate as problems in the catchment. Furthermore the water quality downstream of Hartbeespoort Dam deteriorates and DWA will identify possible sources of the pollution in order to formulate appropriate interventions. The establishment of a DWA Crocodile West Water Quality Technical Task Team has been identified as the way forward. A phased approach should also be adopted including activities such as a situation assessment and RWQOs compliance analysis.

2.2 WATER REQUIREMENTS

Projected future water requirements are continuously being updated and revised information were obtained from water users and service providers, e.g. Tshwane Metro and Magalies Water. The system

water balance and reconciliation scenarios were revised taking into consideration water requirements and water sources, including return flows.

In particular Tshwane's plans to upgrade the level of service to households in the Hammanskraal area, and the associated increased licence granted for abstractions from Leeuwkraal Dam at Temba water treatment works (abstracting water from the Apies River) were included in the domestic water requirement projections. Water requirement projections and supply plans were received from and discussed with Magalies Water, for selected areas in the catchment, and were considered as an alternative water requirement projection scenario. The City of Tshwane's Potable water augmentation program was also reviewed and evaluated as a scenario.

2.2.1 Mining water requirements

Current mining water requirements are based on recent (2009) measured water supply from Rand Water and Magalies Water, updated with a 5-year lag in water requirement growth projections from a previous (2007) study. Mining water requirements and applications known to Magalies Water were also received, and included as part of the Magalies Water requirement projections scenario.

2.2.2 Irrigation and rural water requirements

Irrigation water requirements were assumed to remain constant in line with the current reconciliation strategy. Improvements were made in the modelling assumptions of the irrigation supplied from aquifers in the Lower Crocodile and the irrigation water requirements of the Irrigation Boards and Hartbeespoort Government Water Scheme were refined to simulate the variability between dry and wet years.

Due to the limited water available for primary domestic and strategic water users (see water balance results in the next section) any additional water for irrigation, such as provisions for emerging farmers will have to be sourced from the allocations already made to the irrigation sector.

Where rural water requirements are not linked to surface water supply schemes, these have been assumed to be supplied from groundwater.

2.3 WATER BALANCE

2.3.1 Water Resources Planning Model (WRPM)

The Water Resource Planning Model (WRPM), was configured and monthly stochastic based risk analysis were carried out to determine the water balances for the system for current and future development scenarios. Simultaneously monthly salinity or Total Dissolved Solids (TDS) were simulated for the catchment where the model has been calibrated - upstream of Roodekopjes Dam, Klipvoor dam as well as the Elands sub-catchment upstream of Vaalkop Dam. The Lower Crocodile sub-catchment salinity modules will be incorporated into the WRPM once the calibration has been completed.

It should be noted the same integrated network model applied for evaluation of development options in this assignment, will be used for the analysis of operating rules, which is being conducted in a separate study.

2.3.2 Water balance scenarios

Water balances were carried out for three possible development scenarios with the aim to determine what the surplus available water (if any) are in the year 2010 and will be in the year 2015, 2020 and 2025.

The three scenarios are listed below and discussed in the following sections:

- **Base Scenario:** This target starter scenario incorporated abstractions of approved licences, increasing supply from the Vaal River through the Rand Water bulk supply system, and the areas north of the Magaliesburg being supplied with the increasing return flows. The future water requirement and return flow scenarios were according to the High Population growth also allowing for improved level of services.
- **Tshwane Potable Water Augmentation Scenario:** Consisting of six water treatment works that will abstract water from rivers or dams, which all receives treatment wastewater that are discharged in the upstream catchments. The source of water is both rain generate runoff and treated wastewater.
- **Magalies Water water requirement scenario:** Apply the water requirement scenario of Magalies water where it was substantial higher that the Base Scenario (see details in Section 2.3.4).

2.3.3 Base Scenario

The water balance for the target starter planning scenario of Crocodile West River catchment was determined with the updated water requirements and water availability, and the water balance is reflected in **Figure 3**. Surplus was determined at Hartbeespoort Dam as well as at Roodeplaat Dam and Rietvlei Dam. Due to the projected growth in use of local resources as well as other factors, the surplus in the catchment is expected to reduce to a minimum of 30 million m³/a by the year 2020, and then increases again to 48 million m³/a by the year 2025.

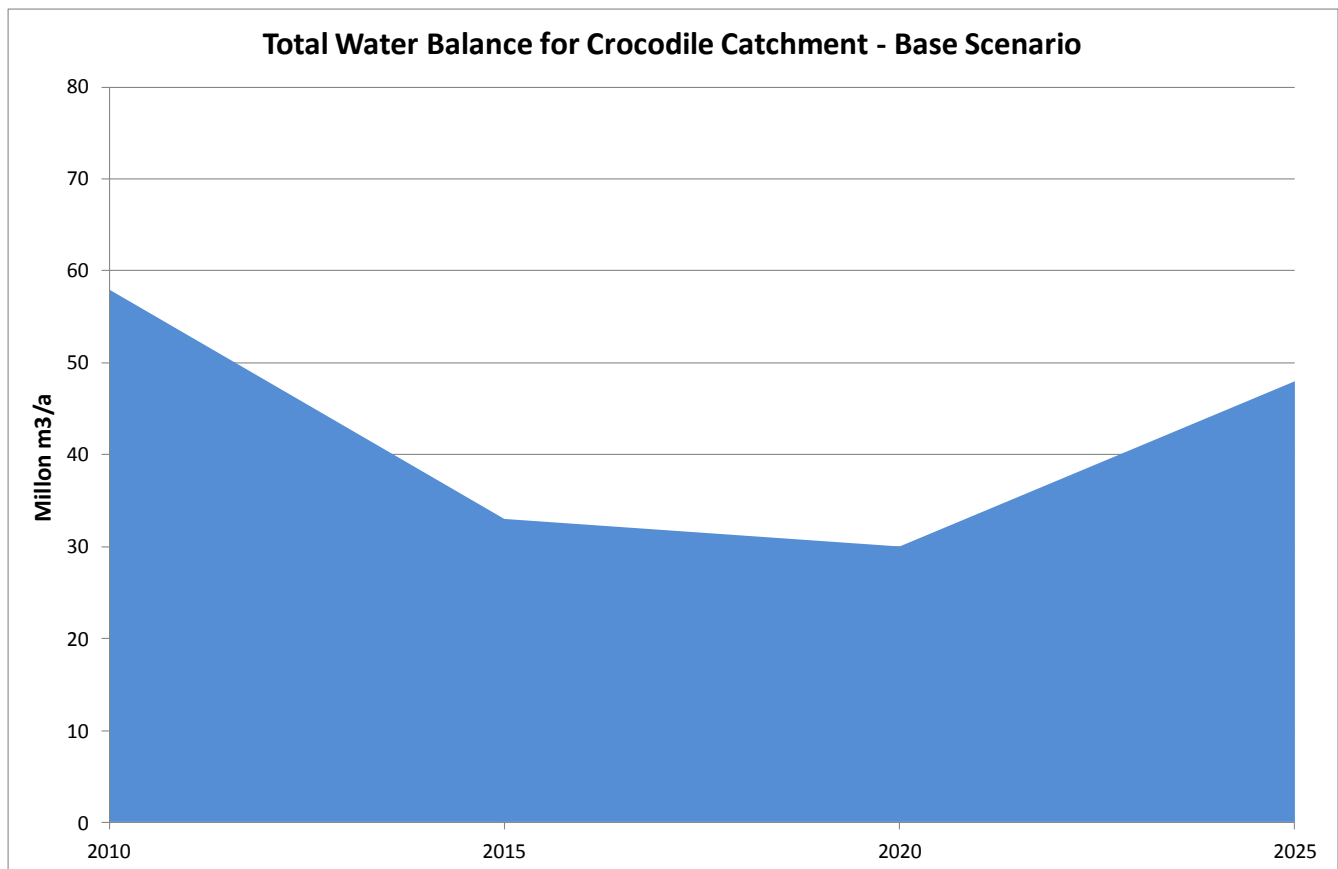


Figure 3: Water balance at key points in the Crocodile River catchment for the Base Scenario

2.3.4 Tshwane Potable Water Augmentation Scenario

The affect of Tshwane Metro’s planned Water Augmentation Program on the water balance were simulated by including the infrastructure capacity upgrades as envisaged by their program and applying the water requirements and return flows of the Base Scenario. The program entails six in-direct re-use plants, some new and some upgrades in capacity of existing plants, to be implemented over the next 7 number of years as indicated in **Table 1**. The water balance for the Crocodile River catchment was re-calculated and is reflected in **Figure 4**. As can be seen the proposed plan significantly reduces the surplus water available in the system, particularly from the year 2017 onwards when a number of the treatment plants are planned to come simultaneously online. From the year 2025 the water balance indicate surplus water will be available which is as a result of increasing return flows over time.

It is estimated that the water to be supplied to Tshwane from the Vaal River System (through the Rand Water supply system) will reduce by 76 million m³/annum once all plants are implemented.

Table 1 Tshwane Potable Water Augmentation Scenario

Sub-catchment	WPP	Current yield		Additional yield	Total future yield		Additional Yield Date
		MI/day	million m ³ /a	MI/day	MI/day	million m ³ /a	
Hennops	Rietvlei	40	15	50	90	33	2017
	Hennops	0	0	60	60	22	2017
Apies	Bon Accord	0	0	30	30	11	2017
	Temba	60	22	60	120	44	2014
Pienaar	Roodeplaat	60	22	30	90	33	2016
Tolwane	Nooitgedacht	0	0	40	40	14	2018
Total		160	59	270	430	157	

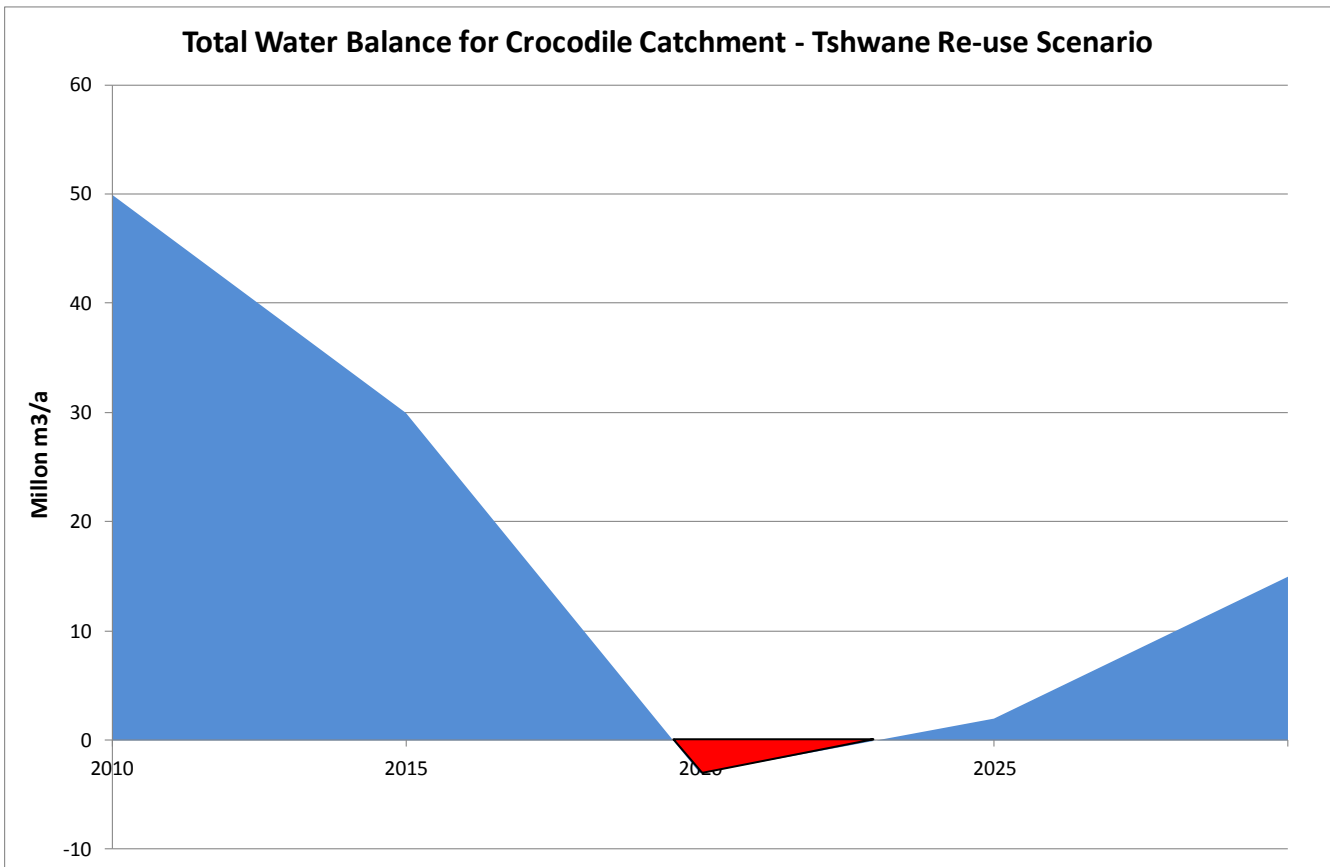


Figure 4: Surplus available at key points in the Crocodile River catchment for the Tshwane Potable Water Augmentation Scenario

2.3.5 Magalies Scenario

A comparison of the Magalies Water Scenario compared to the Base Scenario information indicated that water requirement projections of Rustenburg and areas linked to Vaalkop Dam were very similar for both scenarios. The Magalies water requirement projection linked to Pienaars sub-catchment and Roodeplaat Dam were found to be significantly higher compared to be Base Scenario particularly over the long term future in year 2025. The water balance for the Magalies Scenario was therefore focused on the Pienaars sub-catchment (including Roodeplaat, Leeuwkraal and Bon Accord dams).

The results of the water balance are presented in **Figure 5**, which indicates the current surplus would decrease and become a deficit by about the year 2018.

The resulting water balance for the Upper Crocodile, i.e. Hartbeespoort Dam (not shown graphically) indicates there will be a surplus of about 20, 15, and 25 million m³/annum respectively in the years 2015, 2020 and 2025.

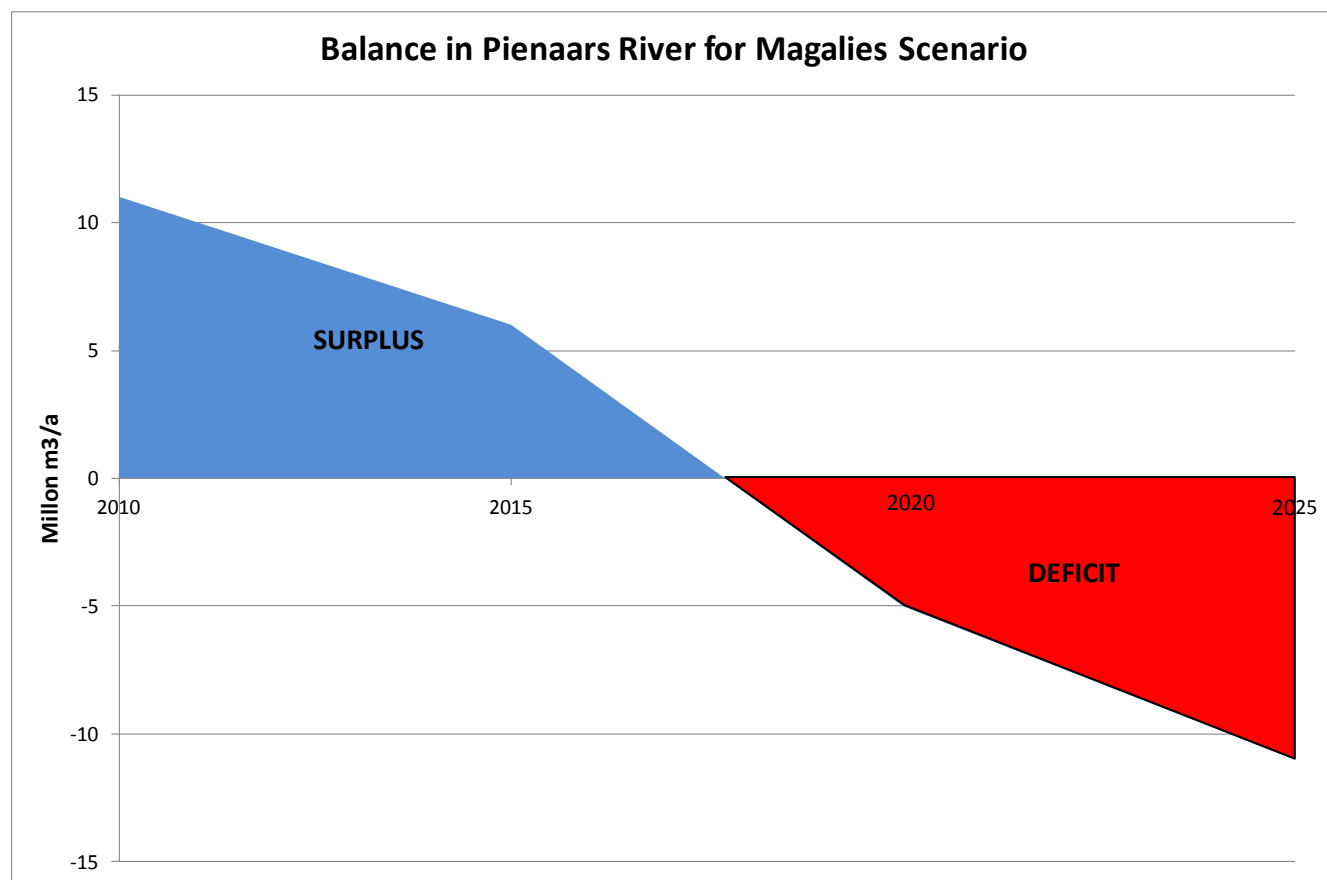


Figure 5: Water balance in the Pienaars River for the Magalies Scenario

2.4 PERSPECTIVE ON RECONCILIATION

Given the water balance results presented in the previous section the following concluding perspectives have relevance:

- Surplus water is available for re-use or transfer to other catchment given the water balance results for the Base Scenario (see Figure 3).
- The surplus water will be depleted by the year 2020 with the implementation of the Tshwane Potable Water Augmentation Program. Further increases in return flow, after the year 2020, will result in a small surplus of 13 million m³/annum in the year 2030.
- The alternative water requirement scenario of Magalies Water for the Pienaars sub-system is unsustainable over the long term due to the large deficit in supply depicted in Figure 5 in the Pienaars sub-catchment.

It was also identified that additional water is needed for transfer from the Crocodile River System to the Lephalale Area by the year 2016. The required volumes of water to be transferred are uncertain and will be determined once developers (potential water users) can provide committed timelines of projected water requirements. The DWA officials tasked with the MCWAP planning are engaging with potential water users and the SSC will monitor the situation and recommend revisions of the water balance when needed.

The system's water balance pendulum has swung from what it was in the 2009 versions of the strategy where large quantities of transfers are needed to support the proposed developments in the Lephalale Area to the current situation where the release of the Integrated Resource Development Plan of the Department of Energy points to small water transfer requirements and surplus as depicted for the Base Scenario. The Reconciliation Strategies focus is now on how the expected surplus of water in the catchment be better utilised both within and outside of the Crocodile catchment.

Different water requirement projections exist with discrepancies in water requirements for some areas of the catchment, such as the old Nokeng Tsa Tsaemane municipal area (subsequently incorporated into Tshwane). The differences in water requirement projections will have an impact on the water balance of the catchment, and the correct/most likely water requirements need to be confirmed to allow the update of the strategy to be finalised. The way forward was identified to be a joint workshop between Tshwane Metro, Magalies water and other relevant role players to defining water requirement projections for areas where discrepancies in water requirement projections currently exist.

Although a surplus of water is calculated in the Crocodile River system, and possible uses of this water have been identified, the following important considerations should be kept in mind:

- 1) The Waterberg coal reserve will be developed. Development may be taking longer than originally anticipated, but water planning scenarios should accommodate any potential growth in its planning for sufficient water supply in future. Thus strategically provision should be made for reserving water for development in the Lephalale area.
- 2) The surpluses in the Crocodile River system pose a strategic resource available which should be managed responsibly to ensure optimal development in the catchment.
- 3) The Olifants River catchment to the east is under severe pressure and some of this water could be transferred to the mines in this area, albeit at a high cost.

- 4) WC/WDM as well as the validation and verification of exiting lawful water use are essential for the sustainable management of the resources in the catchment. (North West region has received funding and is in the process of procuring a professional service provider for validation and verification studies).

2.5 RECOMMENDATIONS

The following recommendations were put forward as actions for further studies and the updating of the Strategy:

- Validation and verification of existing lawful use to confirm excess and establish assurance criteria for irrigators in the Lower Crocodile sub-catchment;
- A technical workshop should be held to confirm water requirements with all users and to coordinate the planning between the bulk service providers in the area;
- Evaluation of operating rules and integration with long-term planning scenarios;
- Engage water users through the proposed System Operation Forum as part of the *Crocodile West Annual Operating Analysis* study;
- Review spatial and temporal distribution in water requirements and return flows;
- Apply the Water Resources Planning Model to determine annual projected surplus in sub-systems (location and timing);
- Commission a new study to develop long term water requirement scenarios up to the year 2050.

With regards to the recommendations made by DWA in respect to the Water Quality studies being undertaken, the following recommendations will be taken into account with the updating of the Strategy:

- Salinity impacts needs to be managed;
- Management of eutrophication due to increasing nutrient loads and concentrations;
- Set final Resource Water Quality Objectives (RWQOs);
- Investigate management options for achieving the set RWQOs; and
- DWA should consider the development of a water quality action and implementation plan.

3 GENERAL INFORMATION

More information on this study can be found at the following link:

<http://www.dwa.gov.za/Projects/crocodilemaintanance/default.aspx>.

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