

**RESERVE DETERMINATION STUDY FOR SELECTED SURFACE WATER,
GROUNDWATER, ESTUARIES AND WETLANDS IN THE F60 AND G30 CATCHMENTS
WITHIN THE BERG-OLIFANTS WMA**

WP11340

Water Quality Survey Report

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1. Background

This report is a record of a site visit to the G30 Tertiary catchment (Sandveld) part of the study area (Papkuils, Verlorenvlei, Langvlei, Jakkals and Sandlaagte rivers) to collect surface river water quality samples at the end of the dry season. Only three of the EWR sites (EWR 7 RW – G30G JAKK KOOKF, the Jakkals River; EWR 10 R 1W-G30D VERL EENHE, Verlorenvlei River and EWR11 RW-G30D KROM GOERG, Krom Antonies River) had surface water in the river, but these were isolated pools with no connectivity.

The F60 Tertiary catchment was not visited as it was established that there was currently no surface water in the rivers.

2. Challenges

There is a large number of water quality monitoring points registered in the DWAF database for parts of the study area, but these were mostly associated with once-off surveys or routine sampling that was terminated in the early 1980's. The survey data will be used to examine "snap shots" of spatial changes (dry and wet season) in water quality to better understand how water quality changed along the length of the surveyed rivers at the selected EWR sites. This will add to the knowledge base of water quality behaviour in the catchments.

No recent water quality samples were collected in the study area after 2017, except for the samples collected by the Western Cape DWS Regional Office in the G30 catchment. The study area is very poorly monitored for water quality, even more so in the F60 tertiary catchment. The lack of monitoring is largely due to the lack of flow in the rivers for most of the year.

The lack of water quality data makes it challenging to determine reference and present-day conditions and even more challenging is the fact that both G30 and F60 tertiary catchment have non-perennial rivers linked to wetlands with definite wet and dry rainfall seasons with and without interaction with the groundwater and springs in the study areas.

The fact that the rivers are fed from different water resources (groundwater, surface water runoff and springs) does not enable one to confidently extrapolate water quality characteristics from one site to the next.

3. EWR water quality sampling

The site visit and water quality sampling were scheduled for the 3rd and 4th April 2022.

At each sampling site in-situ measurements were made, and subsurface water samples (500 ml) were collected from the shore using a sampling pole and transported to the A L Abbott & Associates (PTY) LTD laboratory in Woodstock, Cape Town, on the 4th April for further physical and chemical analysis. Samples were kept in a cooler box with ice bricks during transport.

The procedure followed at each sampling site were:

The sampling point was located using the Samsung Google Maps App.

The sampling bottles were marked with the date, sampling location and sampler name.

On site information was recorded on Water quality Sampling Field Observations sheets. An example is attached in Appendix A.

The water temperature ($^{\circ}\text{C}$), electrical conductivity ($\mu\text{S}/\text{cm}$), total dissolved salts (mg/ℓ), and pH were measured in-situ from the shore using a Sanxin PC5 handheld instrument. The dissolved oxygen (mg/ℓ) concentration was measured with a Lovibond SensoDirect 150 dissolved oxygen probe. Temperature and conductivity were also measured with this instrument and was used to confirm that both instruments were calibrated correctly.

One surface water sample was then collected at each site by lowering the sample bottle into the water to just below the water surface for the chemical analysis of the sample. Care was taken not to disturb the bottom sediment during sampling. The constituents to be analysed for, are pH, Electrical Conductivity, Total Dissolved Salts, Turbidity, Total Suspended Solids, orthophosphate, ammonia, nitrate and nitrite. The photograph below shows the equipment used.

All the samples were then stored in a cooler box with ice bricks for transport to the laboratory.

Photographs were taken at the sampling site; one facing upstream, one facing downstream, one facing across the river and one closeup of the water.



Figure 1: Sampling equipment used

4. Water quality sampling field observations and site photographs

The water quality sampling field observations at each of the EWR sites are summarised in the following tables and some of the photographs at the sampling sites are included.

EWR 7 RW – G30G JAKK KOOKF

Sampling point: EWR 7 RW – G30G JAKK KOOKF		Date:3 April 2022
Weather conditions @15:25		
Air temperature	Warm (20-30°C)	
% Cloud cover	0-25%	
Days since last rain	Not within last seven days	
Wind	Light	
In-situ measurements		
Water temperature °C	24.3	24.6
Dissolved Oxygen mg/l		17.4 ¹
Electrical conductivity µS/cm	19.99 (upper limit of instrument)	66.3 mS/cm
TDS mg/l	10.0 (upper limit of instrument)	
pH	7.9	
Visual observations		
Water clarity	Slightly muddy	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	No rocks, no algae visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations	The pool is used as a cattle watering hole	

¹ Incorrect measurement. High salinity interferes with the accuracy of the DO sensor.



Figure 2: EWR 7



Figure 3: Closeup of the water at EWR 7



Figure 4: Downstream view of EWR 7



Figure 5: Upstream view of EWR 7

EWR 11 RW-G30D KROM GOERG

Sampling point: EWR 11 RW-G30D KROM GOERG		Date:4 April 2022
Weather conditions @ 09:20		
Air temperature	Warm (20-30°C)	
% Cloud cover	50-75%	
Days since last rain	Not within last seven days	
Wind	None	
In-situ measurements		
Water temperature °C	17.8	17.8
Dissolved Oxygen mg/l		4.3
Electrical conductivity µS/cm	1622	1.585 mS/cm
TDS mg/l	1.05	
pH	7.4	
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	No rocks, no algae visible	
Foam	None visible	
Oily Sheen	Some visible	
Odour	No smell	
Other observations	<p>There were two pools at this site (one downstream of the low water bridge and one underneath the bigger road bridge) and both are used as cattle watering holes. Field measurements were taken at both pools, but they were almost identical, so a water quality sample was taken only at the pool underneath the bigger road bridge. An oily sheen was observed at this site which is typical of the sheen imparted by iron in groundwater seeping into the pool.</p>	



Figure 6: One of the pools at EWR 11 downstream of the low water bridge



Figure 7: The pool at EWR 11 underneath the road bridge



Figure 8: A closeup of the water at EWR 11 showing the oily sheen on the surface of the water where sub-surface flow seeps into the pool



Figure 9: Upstream view from EWR 11



Figure 10: Downstream view of EWR 11

EWR 10 RW-G30D VERL EENHE

Sampling point: EWR 10 RW-G30D VERL EENHE		Date:4 April 2022
Weather conditions @ 09:55		
Air temperature	Warm (20-30°C)	
% Cloud cover	25-50%	
Days since last rain	Not within last seven days	
Wind	None	
In-situ measurements		
Water temperature °C	18.4	18.4
Dissolved Oxygen mg/l		2.1
Electrical conductivity µS/cm	10.79	10.64
TDS mg/l		
pH	7.65	
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	No rocks, no algae visible	
Foam	None visible	
Oily Sheen	Some visible	
Odour	No smell	
Other observations	The pool is used as a cattle watering hole. The pond was filled with possibly Fennel leaved pondweed (<i>Stockenia pectinatus</i>). There was also one small dead fish.	



Figure 11: The pool at EWR 10



Figure 12: A closeup of the water at the pool at EWR 10 showing the dense stand of probably Fennel leaved pondweed



Figure 13: Upstream view of EWR 10

G3H001 Kruis River at Tweekuilen/Eendekuil

The gauging station, G3H001 (Kruis River at Tweekuilen/Eendekuil), was also visited, but as with many of the other sites, it was dry with no visible surface water. See Figures 14 to 16.



Figure 14: The gauging weir at G3H001.; the Kruis River at Tweekuilen/Eendekuil



Figure 15: Upstream view from the gauging weir



Figure 16: Downstream view from the gauging weir

EWR 8 RW-G30F LANG BRAND

This site was sampled by T Belcher on the 7th April and was part of a combined river and wetland site on the lower Langvlei River.

Sampling point: EWR 8 RW-G30F LANG BRAND		Date:7 April 2022
Weather conditions @ 14:30		
Air temperature	Warm (20-30°C)	
% Cloud cover	25-50%	
Days since last rain	Within last seven days	
Wind	Light	
In-situ measurements		
Water temperature °C	16.4	
Dissolved Oxygen mg/l	4.3	
Electrical conductivity µS/cm	18.382	
TDS mg/l	14 443	
pH	7.18	
Visual observations		
Water clarity	Slightly muddy	
Colour	Colourless/clear	
Flow	Slow moving	
Algae on rocks	Lots visible	
Foam	None visible	
Oily Sheen	Some visible	
Odour	Fishy	
Other observations	Grazing of cattle, ostriches and sheep on the wider site. Site very overgrown with Phragmites, Juncus spp, and <i>Bolboschoenus maritimus</i> and little open water, water also shallow (<30 cm) with deep muddy substrate.	



Figure 17: View of the site taken from the sampling point looking southwards



Figure 18: View of the site taken from the sampling point looking northwards



Figure 19: View of the channel where the sample was taken



Figure 20: Another view of the channel where the sample was taken

5. Chemical analysis results

The water quality samples were analysed by A L Abbott & Associates (PTY) LTD laboratory and the results for the different EWR sites are presented below.

EWR 7 RW – G30G JAKK KOOKF

Water Quality Variable	Results
pH (at 25°C)	7.39
Electrical Conductivity (mS/m)	10100
Total Dissolved Solids (mg/l)	61200
Turbidity (NTU)	14.0
Total Suspended Solids (mg/l)	14
Ortho Phosphate (mg/l as P)	<.20
Ammonia Nitrogen (mg/l N)	<.10
Nitrate Nitrogen (mg/l N)	<.20
Nitrite Nitrogen (mg/l N)	<.20
Total Inorganic Nitrogen mg/l N) Calculated	<.50

EWR 10 RW-G30D VERL EENHE

Water Quality Variable	Results
pH (at 25°C)	7.35
Electrical Conductivity (mS/m)	990
Total Dissolved Solids (mg/l)	6800
Turbidity (NTU)	19.2
Total Suspended Solids (mg/l)	18
Ortho Phosphate (mg/l as P)	<.20
Ammonia Nitrogen (mg/l N)	<.10
Nitrate Nitrogen (mg/l N)	<.20
Nitrite Nitrogen (mg/l N)	<.20
Total Inorganic Nitrogen mg/l N) Calculated	<.50

EWR 11 RW-G30D KROM GOERG

Water Quality Variable	Results
pH (at 25°C)	7.65
Electrical Conductivity (mS/m)	157

Total Dissolved Solids (mg/l)	1044
Turbidity (NTU)	18.2
Total Suspended Solids (mg/l)	16
Ortho Phosphate (mg/l as P)	<.20
Ammonia Nitrogen (mg/l N)	<.10
Nitrate Nitrogen (mg/l N)	<.20
Nitrite Nitrogen (mg/l N)	<.20
Total Inorganic Nitrogen mg/l N) Calculated	<.50

EWR 8 RW-G30F LANG BRAND

Water Quality Variable	Results
pH (at 25°C)	Waiting for results
Electrical Conductivity (mS/m)	
Total Dissolved Solids (mg/l)	
Turbidity (NTU)	
Total Suspended Solids (mg/l)	
Ortho Phosphate (mg/l as P)	
Ammonia Nitrogen (mg/l N)	
Nitrate Nitrogen (mg/l N)	
Nitrite Nitrogen (mg/l N)	
Total Inorganic Nitrogen mg/l N) Calculated	

6. General comments and recommendations

The data collected during the dry season survey were limited as most of the EWR sites were dry, making the second wet season survey critical in gaining some understanding of the current water quality situation in die G30 and F60 catchments.

Where there was surface water to sample it was in isolated pools with high salinity and very low oxygen measurements.