

**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 wet season. More of the EWR sites (six) had surface water in the river and wetland areas and are listed below:

- EWR 7 RW – G30G JAKK KOOKF, the Jakkals River;
- EWR 8 RW-G30F LANG BRAND, wetland area on the Langvlei River;
- EWR 10 R 1W-G30D KRUIS EENHE, Kruismans River;
- EWR11 RW-G30D KROM GOERG, Krom Antonies River;
- EWR 12 RW-G30E VERL WITTE, Verlorenvlei upstream of estuary; and
- EWR 16 W-G30A PAPP RIETF, wetland near the source of the Papkuils River

Two additional water quality samples were collected, one at Moutonshoek in the upper reaches of the Krom Antonies River as a possible reference or less impacted site and one on the Hol River just to get a better understanding of the water quality in the Hol River catchment as there are generally very little data available.

The F60 Tertiary catchment was not visited as it was established that there was currently still no surface water in the rivers as the system is mainly groundwater driven.

2. Challenges

There are large numbers 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. A request has been made to access the latest data from February 2022 to September 2022. 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 5th to the 9th September 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 9th September for further physical and chemical analysis. Samples were kept in a fridge and then transferred to a cooler box with ice bricks for transport to the laboratory.

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.

The water temperature (°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 the YSI Instrument. Temperature, conductivity and pH 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.

Two samples were collected at EWR 7, one at the site where the first dry season water quality sample was collected in April 2022 and one where the invertebrates were collected for the SASS Scores.

EWR 7 RW – G30G JAKK KOOKF – Location the same as for the Dry Season sample

Sampling point: EWR 7 RW – G30G JAKK KOOKF		Date:6 September 2022
Weather conditions @10:23		
Air temperature	Cool (10-20°C)	
% Cloud cover	0-25%	
Days since last rain	Two days	
Wind	Light	
In-situ measurements		
	Sanxin	YSI no measurements
Water temperature °C	14.9	
Dissolved Oxygen mg/l	-	
Electrical conductivity µS/cm	19.99 (upper limit of instrument)	
TDS mg/l	10.0 (upper limit of instrument)	
pH	8.09	
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	Some visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations		

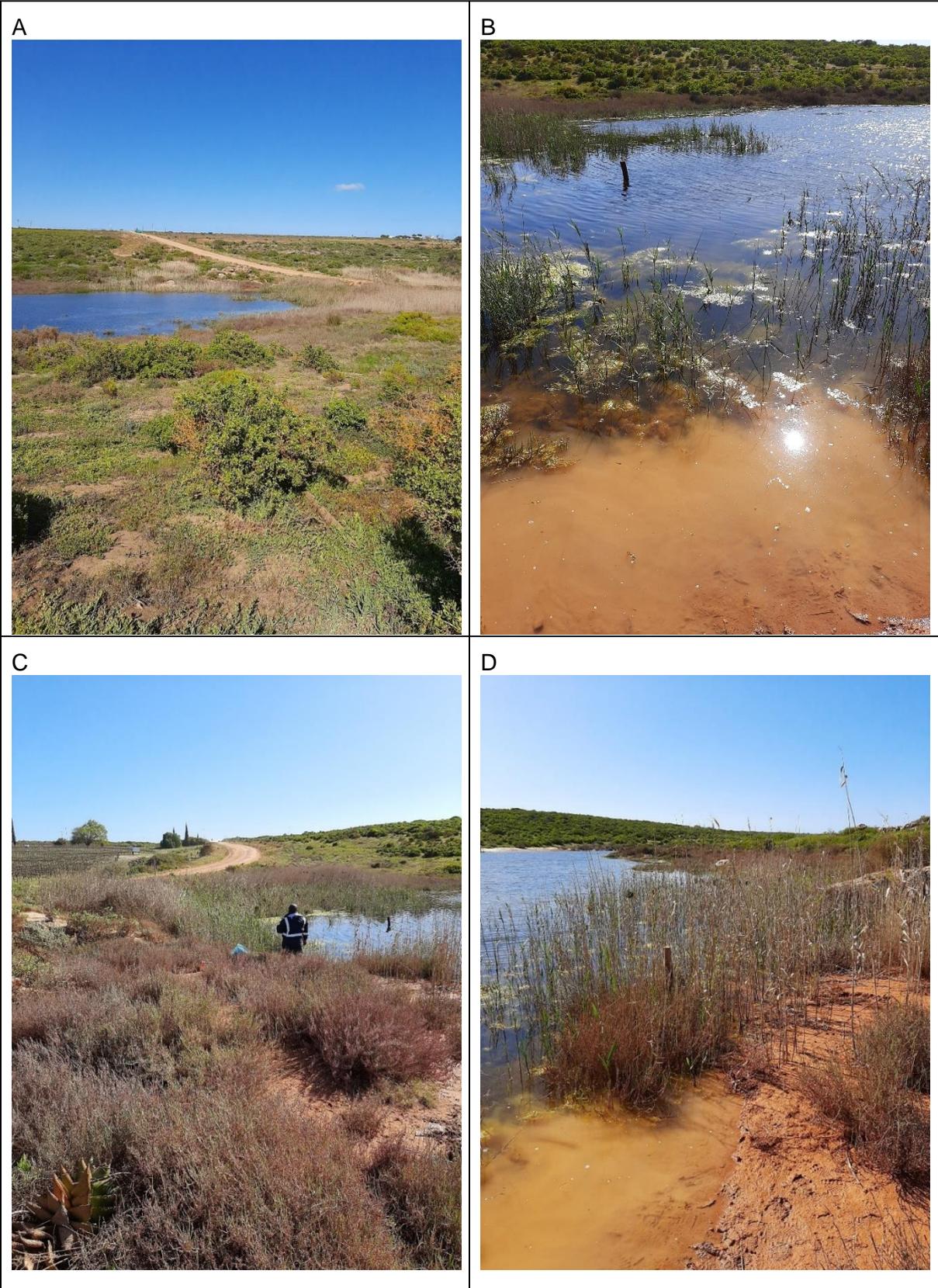


Figure 2: A EWR 7, B Closeup of the water at EWR 7, C Downstream view of EWR 7, and D Upstream view of EWR 7

EWR 7 RW – G30G JAKK KOOKF – water quality sample taken at the SASS sampling site

Sampling point: EWR 7 RW – G30G JAKK KOOKF		Date:6 September 2022
Weather conditions @09:16		
Air temperature	Cool (10-20°C)	
% Cloud cover	0-25%	
Days since last rain	Two days	
Wind	Light	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	10.6	10.6
Dissolved Oxygen mg/l	-	5.3
Electrical conductivity µS/cm	12.19 mS/m	8316
TDS mg/l	8.63 ppm	7510
pH	7.24	9.63
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	Some visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations		

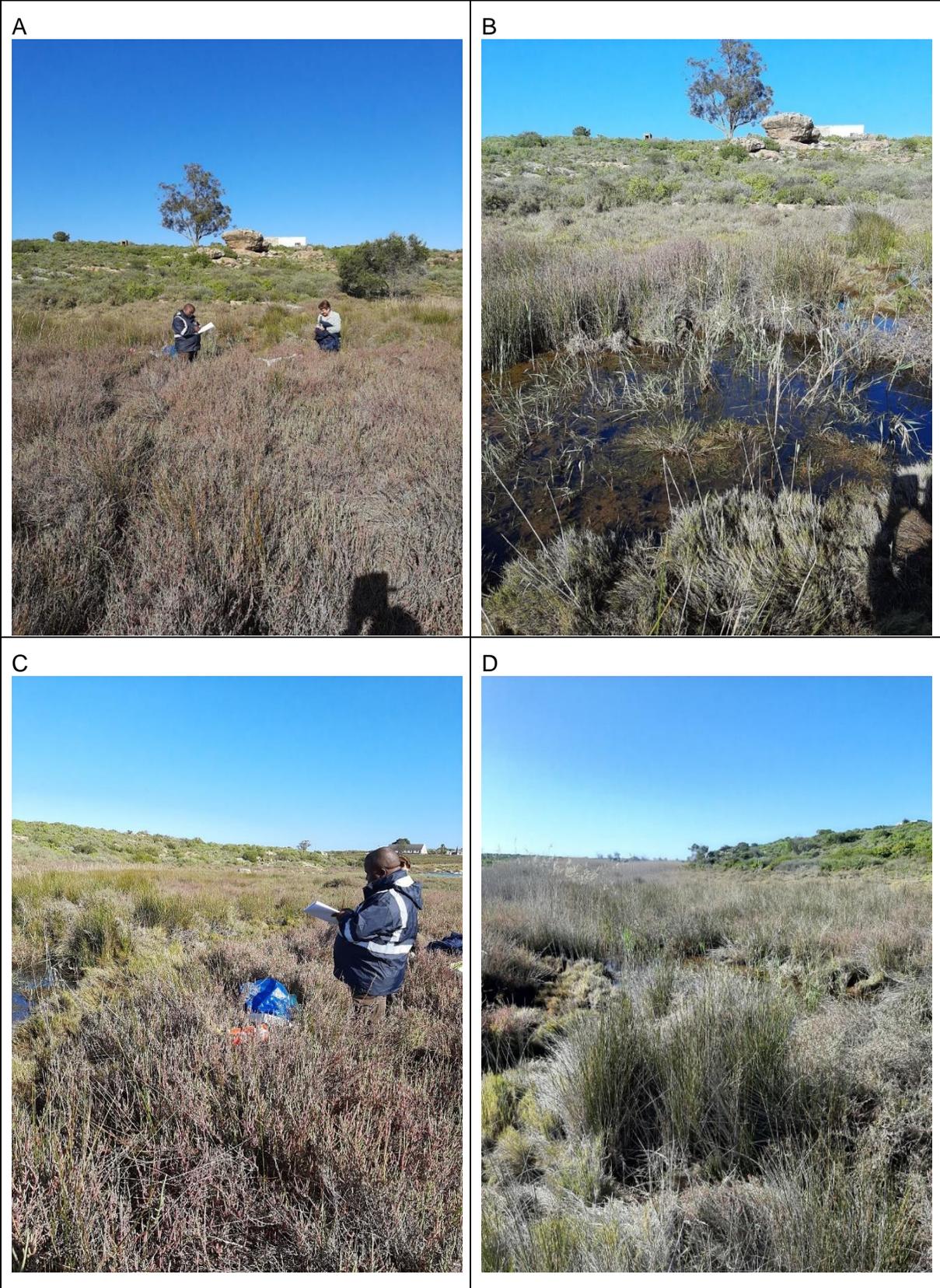


Figure 3: A EWR 7, B Closeup of the water at EWR 7, C Downstream view of EWR 7, and D Upstream view of EWR 7

EWR 8 RW-G30F LANG BRAND

Sampling point: EWR 8 RW-G30F LANG BRAND		Date:6 September 2022
Weather conditions @ 12:33		
Air temperature	Cool (10-20°C)	
% Cloud cover	0-25%	
Days since last rain	Two	
Wind	None	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	19.2	12
Dissolved Oxygen mg/l	-	14.03
Electrical conductivity µS/cm	13.37 mS/m	9593
TDS mg/l	9.51 ppm	8471
pH	7.8	7.8
Visual observations		
Water clarity	Clear	
Colour	Tea Coloured	
Flow	Slow-flowing	
Algae on rocks	Some visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	Rotten eggs	
Other observations	Water very shallow, approximately 5 cm	

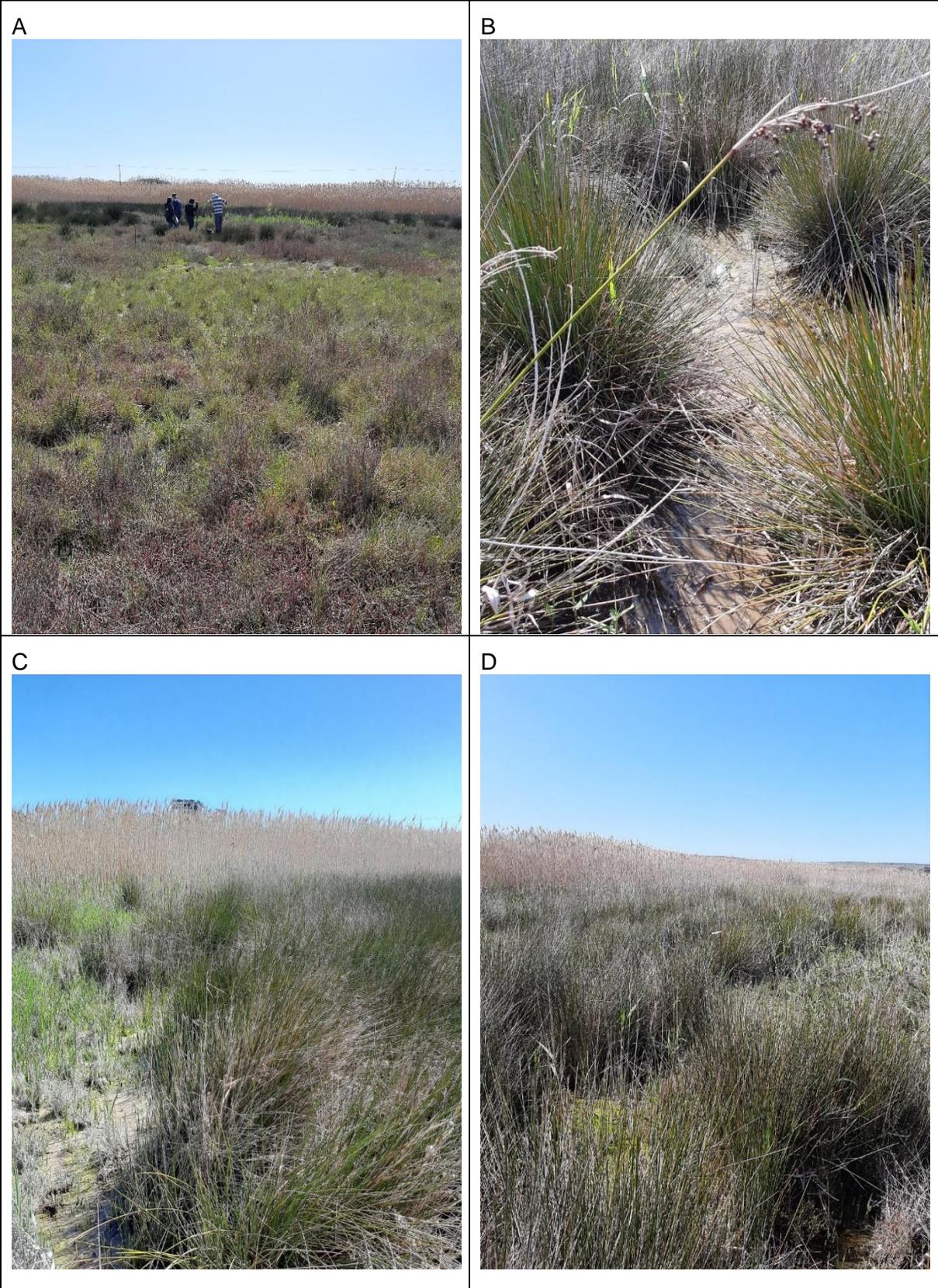


Figure 4: A EWR 8, B Closeup of the water at EWR 8, C Downstream view of EWR 8, and D Upstream view of EWR 8

EWR 10 RW-G30D KRUIS EENHE

Sampling point: EWR 10 RW-G30D KRUIS EENHE		Date:7 September 2022
Weather conditions @ 11:30		
Air temperature	Warm (20-30°C)	
% Cloud cover	0-25%	
Days since last rain	Three	
Wind	Light	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	15.4	15.3
Dissolved Oxygen mg/l	-	13
Electrical conductivity µS/cm	724	5060
TDS mg/l	517	4036
pH	7.64	8.09
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Slow-flowing	
Algae on rocks	No rocks, no algae visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations		



Figure 5: A EWR 10, B Closeup of the water at EWR10, C Downstream view of EWR 10, and D Upstream view of ERW 10

EWR 11 RW-G30D KROM GOERG

Sampling point: EWR 11 RW-G30D KROM GOERG		Date:7 September 2022
Weather conditions @ 08:45		
Air temperature	Cool (10-20°C)	
% Cloud cover	0-25%	
Days since last rain	Three	
Wind	Light	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	11.5	11.7
Dissolved Oxygen mg/l	-	10.8
Electrical conductivity µS/cm	306	191.3
TDS mg/l	217	166.4
pH	7.36	Measurement suspect
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Slow flowing	
Algae on rocks	No rocks, no algae visible	
Foam	None visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations		



Figure 6: A EWR 11, B Closeup of the water at EWR 11, C Downstream view of EWR 11, and D Upstream view of EWR 11

EWR 12 RW-G30E VERL WITTE

Sampling point: EWR 12 RW-G30E VERL WITTE		Date:8 September 2022
Weather conditions @ 09:00		
Air temperature	Cool (10-20°C)	
% Cloud cover	0-25%	
Days since last rain	Four	
Wind	None	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	12.8	12.8
Dissolved Oxygen mg/l	-	8.94
Electrical conductivity µS/cm	1980	1271
TDS mg/l	141 ppm	1079
pH	6.97	6.95
Visual observations		
Water clarity	Clear	
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		



Figure 7: A EWR 12, B Closeup of the water at EWR 12, C Downstream view of EWR 12, and D Upstream view of EWR 12

EWR 16 W-G30A PAPP RIETF

Sampling point: EWR 16 W-G30A PAPP RIETF		Date:8 September 2022
Weather conditions @ 13:30		
Air temperature	Warm (20-30°C)	
% Cloud cover	0-25%	
Days since last rain	Four	
Wind	Light	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	22.4	20.1
Dissolved Oxygen mg/l	-	12.4
Electrical conductivity µS/cm	1372	1082
TDS mg/l	966	806
pH	6.02	5.9
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Still/calm	
Algae on rocks	No rocks, no algae visible	
Foam	Some visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations		

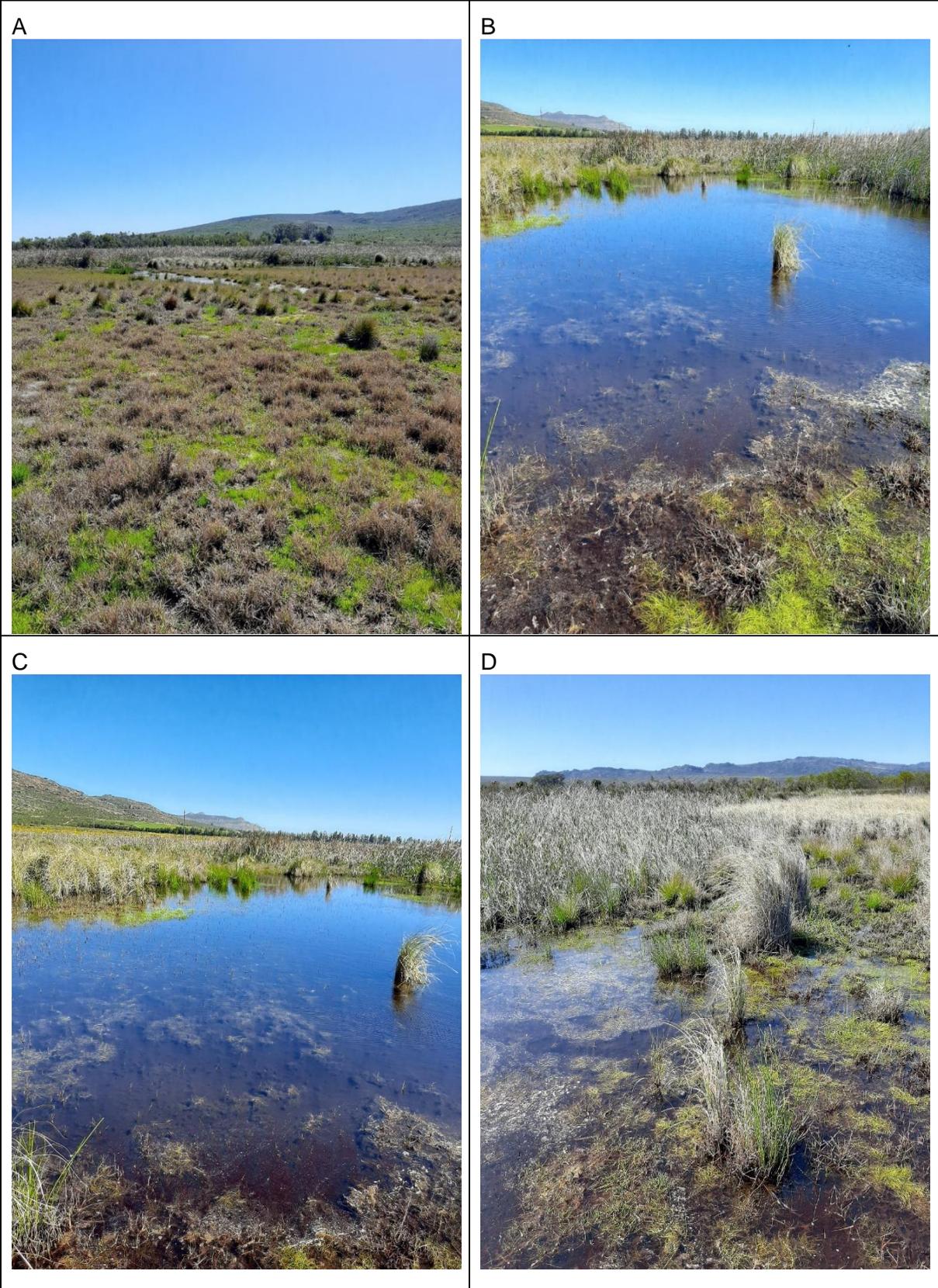


Figure 8: A EWR 16, B Closeup of the water at EWR 16, C Downstream view of EWR 16, and D Upstream view of EWR 16

KROM ANTONIES AT MOUTONSHOEK

Sampling point: KROM ANTONIES AT MOUTONSHOEK		Date:7 September 2022
Weather conditions @ 14:00		
Air temperature	Warm (20-30°C)	
% Cloud cover	0-25%	
Days since last rain	Four	
Wind	None	
In-situ measurements		
	Sanxin	YSI
Water temperature °C	15.2	14.9
Dissolved Oxygen mg/l	-	15.22
Electrical conductivity µS/cm	45.9	31.8
TDS mg/l	32.4	26.0
pH	5.26	5.15
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Moderate flowing	
Algae on rocks	None visible	
Foam	Some visible	
Oily Sheen	None visible	
Odour	No smell	
Other observations	Saw a water snake	

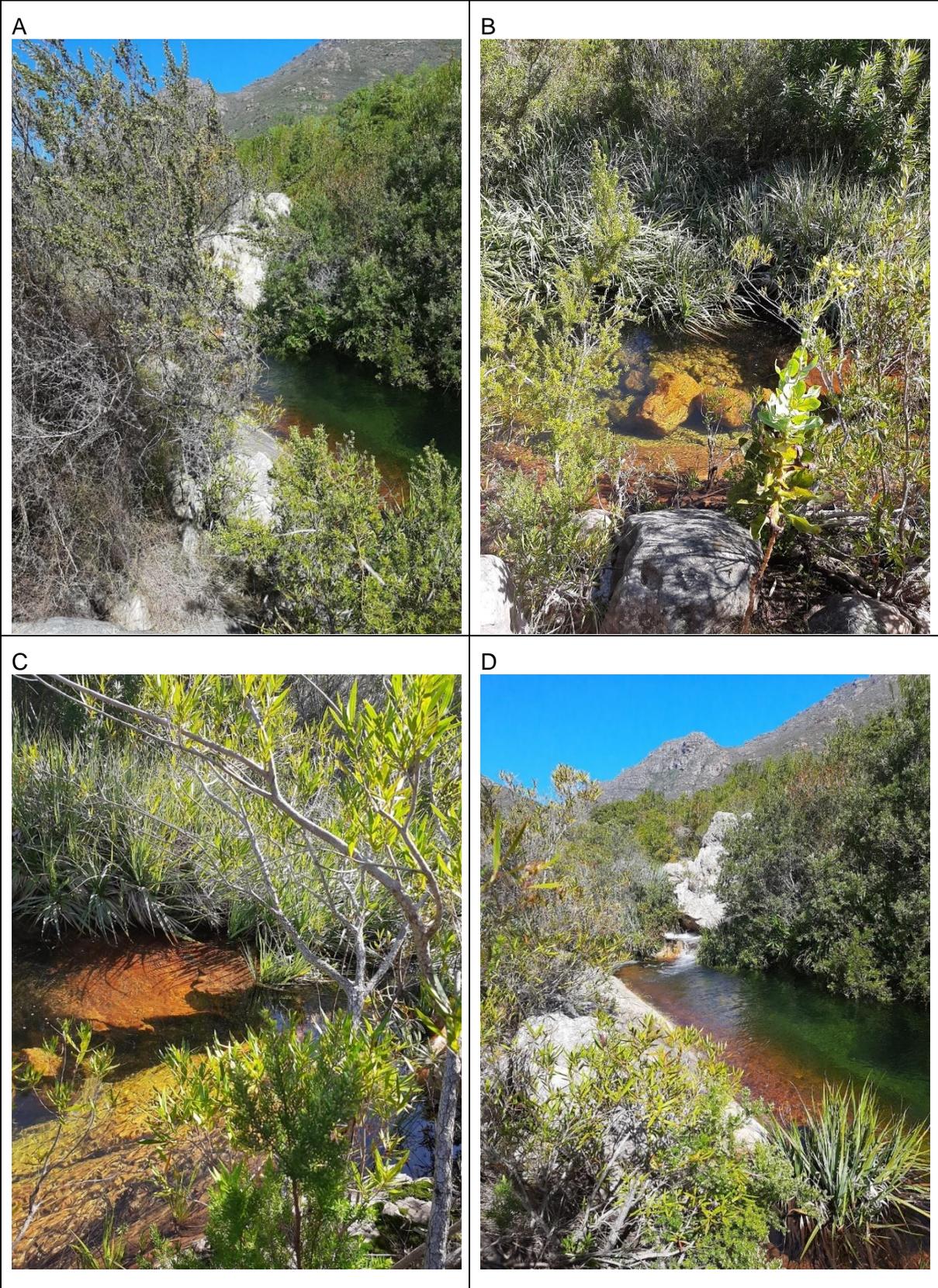


Figure 9: A Water quality site in the Krom Antonies River at Moutonshoek, B Closeup of the water, C Downstream of the site, and D Upstream of the site

HOL RIVER

This site was sampled by Mr Dana Grobler 8th September 2022. This was not an EWR site, but a water quality samples was collected to gather water quality information in the Hol River catchment.

Sampling point: EWR 8 RW-G30F LANG BRAND		Date:8 September 2022
Weather conditions @ 12:58		
Air temperature	Warm (20-30°C)	
% Cloud cover	0-25%	
Days since last rain	Four	
Wind	None	
In-situ measurements – none were recorded		
Water temperature °C		
Dissolved Oxygen mg/l		
Electrical conductivity µS/cm		
TDS mg/l		
pH		
Visual observations		
Water clarity	Clear	
Colour	Colourless/clear	
Flow	Slow moving	
Algae on rocks	None visible	
Foam	None visible	
Oily Sheen	Some visible	
Odour	No smell	
Other observations	This was a once off sample as there was water in the river and the results of the sample can give some indication of the water quality in the Hol River.	



Figure 10 A View of the Hol River taken from the sampling point looking downstream and B looking upstream

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 - Location the same as for the Dry Season sample

Water Quality Variable	Results from sample collected on 6 September 2022
pH (at 25°C)	7.12
Electrical Conductivity (mS/m)	2200
Total Dissolved Solids (mg/l)	14600
Turbidity (NTU)	0.88
Total Suspended Solids (mg/l)	19
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 7 RW – G30G JAKK KOOKF - water quality sample taken at the SASS sampling site

Water Quality Variable	Results from sample collected on 6 September 2022
pH (at 25°C)	6.57
Electrical Conductivity (mS/m)	1225
Total Dissolved Solids (mg/l)	8200
Turbidity (NTU)	2.9
Total Suspended Solids (mg/l)	6
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 from sample collected on 6 September 2022
pH (at 25°C)	6.9
Electrical Conductivity (mS/m)	1214
Total Dissolved Solids (mg/l)	7998
Turbidity (NTU)	37.0
Total Suspended Solids (mg/l)	41
Ortho Phosphate (mg/l as P)	<.20
Ammonia Nitrogen (mg/l N)	0.28
Nitrate Nitrogen (mg/l N)	1.5
Nitrite Nitrogen (mg/l N)	<.20
Total Inorganic Nitrogen mg/l N) Calculated	1.98

EWR 10 RW-G30D KRUIS EENHE

Water Quality Variable	Results from sample collected on 7 September 2022
pH (at 25°C)	7.19
Electrical Conductivity (mS/m)	650
Total Dissolved Solids (mg/l)	4400
Turbidity (NTU)	1.8
Total Suspended Solids (mg/l)	<5
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 from sample collected on 7 September 2022
pH (at 25°C)	7.78
Electrical Conductivity (mS/m)	28.8
Total Dissolved Solids (mg/l)	202
Turbidity (NTU)	1.4

Total Suspended Solids (mg/l)	<4
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 12 RW-G30E VERL WITTE

Water Quality Variable	Results from sample collected on 8 September 2022
pH (at 25°C)	7.62
Electrical Conductivity (mS/m)	194
Total Dissolved Solids (mg/l)	1300
Turbidity (NTU)	4.4
Total Suspended Solids (mg/l)	7
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 16 RW-G30A PPK RIETF

Water Quality Variable	Results from sample collected on 8 September 2022
pH (at 25°C)	7.63
Electrical Conductivity (mS/m)	129
Total Dissolved Solids (mg/l)	868
Turbidity (NTU)	3.8
Total Suspended Solids (mg/l)	23
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

KROM ANTONIES RIVER AT MOUTONSHOEK

Water Quality Variable	Results from sample collected on 7 September 2022
pH (at 25°C)	8.49
Electrical Conductivity (mS/m)	12.3
Total Dissolved Solids (mg/l)	78
Turbidity (NTU)	0.55
Total Suspended Solids (mg/l)	<4
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

HOL RIVER

Water Quality Variable	Results from sample collected on 8 September 2022
pH (at 25°C)	6.98
Electrical Conductivity (mS/m)	720
Total Dissolved Solids (mg/l)	4820
Turbidity (NTU)	24
Total Suspended Solids (mg/l)	8
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

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, end of wet season 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.

More data were collected at the end of the wet season as there was more water at the EWR sites. However not all the EWR sites had water as it has been a dryer wet season and the local people estimate that they had about half of their average rainfall for the 2022 wet season.

No surface water samples were collected in the F60 catchment as the system is groundwater driven.

As only four EWR sites had water (pools) during the dry season, only the data from these four EWR sites can be compared to the wet season data for those specific sites

EWR 7 RW – G30G JAKK KOOKF - Location the same as for the Dry Season sample

Water Quality Variable	Dry Season	Wet Season	Change
pH (at 25°C)	7.39	7.12	↓
Electrical Conductivity (mS/m)	10100	2200	↓
Total Dissolved Solids (mg/l)	61200	14600	↓
Turbidity (NTU)	14.0	0.88	↓
Total Suspended Solids (mg/l)	14	19	↑
Ortho Phosphate (mg/l as P)	<.20	<.20	-
Ammonia Nitrogen (mg/l N)	<.10	<.10	-
Nitrate Nitrogen (mg/l N)	<.20	<.20	-
Nitrite Nitrogen (mg/l N)	<.20	<.20	-
Total Inorganic Nitrogen (mg/l N) Calculated	<.50	<.50	-

EWR 8 RW-G30F LANG BRAND

Water Quality Variable	Dry Season	Wet Season	Change
pH (at 25°C)	6.83	6.9	↑
Electrical Conductivity (mS/m)	1501	1214	↓
Total Dissolved Solids (mg/l)	12400	7998	↓
Turbidity (NTU)	8.7	37.0	↑
Total Suspended Solids (mg/l)	9	41	↑
Ortho Phosphate (mg/l as P)	<.20	<.20	-
Ammonia Nitrogen (mg/l N)	<.20	0.28	↑
Nitrate Nitrogen (mg/l N)	<.20	1.5	↑
Nitrite Nitrogen (mg/l N)	<.20	<.20	-
Total Inorganic Nitrogen (mg/l N) Calculated	<.60	1.98	↑

EWR 10 RW-G30D KRUIS EENHE

Water Quality Variable	Dry Season	Wet Season	Change
pH (at 25°C)	7.35	7.19	↓
Electrical Conductivity (mS/m)	990	650	↓
Total Dissolved Solids (mg/l)	6800	4400	↓
Turbidity (NTU)	19.2	1.8	↓
Total Suspended Solids (mg/l)	18	5	↓
Ortho Phosphate (mg/l as P)	<.20	<.20	-
Ammonia Nitrogen (mg/l N)	<.10	<.10	-
Nitrate Nitrogen (mg/l N)	<.20	<.20	-
Nitrite Nitrogen (mg/l N)	<.20	<.20	-
Total Inorganic Nitrogen (mg/l N) Calculated	<.50	<.50	-

EWR 11 RW-G30D KROM GOERG

Water Quality Variable	Dry Season	Wet Season	Change
pH (at 25°C)	7.65	7.78	↑
Electrical Conductivity (mS/m)	157	28.8	↓
Total Dissolved Solids (mg/l)	1044	202	↓
Turbidity (NTU)	18.2	1.4	↓
Total Suspended Solids (mg/l)	16	<4	↓
Ortho Phosphate (mg/l as P)	<.20	<.20	-
Ammonia Nitrogen (mg/l N)	<.10	<.10	-
Nitrate Nitrogen (mg/l N)	<.20	<.20	-
Nitrite Nitrogen (mg/l N)	<.20	<.20	-
Total Inorganic Nitrogen (mg/l N) Calculated	<.50	<.50	-