La Motte Village Extension

Roberts River Assessment

A requirement in terms of Section 21 of the National Water Act

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watsan AFRICA
Dr Dirk van Driel
WATER SCIENTIST
PhD, MBA, PrSciNat, MWISA
www.watsanafrica.co.za - dirk@watsanafrica.co.za
PO Box 681, Melkbosstrand 7437, 079 333 5800 / 022 492 2102

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1 Introduction

The village of La Motte is to be expanded, with several street blocks to be added to the existing development. A Scoping Report was circulated among Interested and Affected Parties, as is required for an Environmental Impact Assessment. One of the comments on the Scoping Report stated that the "wrong river" was evaluated. The stream running past the La Motte village, a tributary of the Franschhoek River, also known as the Roberts River, should have been evaluated and not the Franschhoek River, as was done for the Fresh Water Report scientific input to the Scoping Report.

This then is a short reply to the comment that the La Motte Stream, also known as the Roberts River, should have been evaluated.

The site was re-visited on 22 September 2016.

The report should be read along with the original Fresh Water Report for the Franchhoek River that was submitted in February 2015.

Since the original Fresh Water Report Government Notice 1180 was published in which the Risk Matrix was introduced. This was subsequently applied to the Roberts River.

Lately the Department of Environmental Affairs and Economic Development (DEA&DP) pressed on an impact assessment according to a prescribed methodology. This impact assessment for the Roberts River reach has been included as well.

The Resource Economics evaluation became a recent requirement as well, but this is not applicable to the La Motte situation, as has been explained in the report.

2 The Sampling Point

The sampling point (Figure 1 & 2) was chosen downstream of the bridge on the access road to the La Motte village.

Upstream of the bridge the river is heavily overgrown and cannot be reached for the purpose of sampling.

Figure 1 Location of the sampling point

Figure 2 Sampling Point

3 Present Ecological State (PES)

The habitat for aquatic organisms is adequate with riffles, rapids, pools, stones in and out of current, bedrock, sandy bottom and emerging vegetation. The river varied from 1 meter to 5 meters wide and from a few centimetres to 1.5 meter deep.

During sampling the water was clear and fast running.

Reportedly the river at the sampling point stops flowing during summer. Evidently the period during which the river flowed was substantially shortened because of upstream water abstraction.

3.1 Sampling Point Vegetation

A single palmiet *Prionium serratum* (Figure 3) was still present, high above the river bed, which indicated that the river must have been overgrown prior to human impact, as dense stands of palmiet was the hallmark of Western Cape streams before human impact. The riverside *Restio paniculatus* (Figure 3), a wetland indicator, grows in abundance right next to the water's edge along the river bed, but was absent higher up the banks.

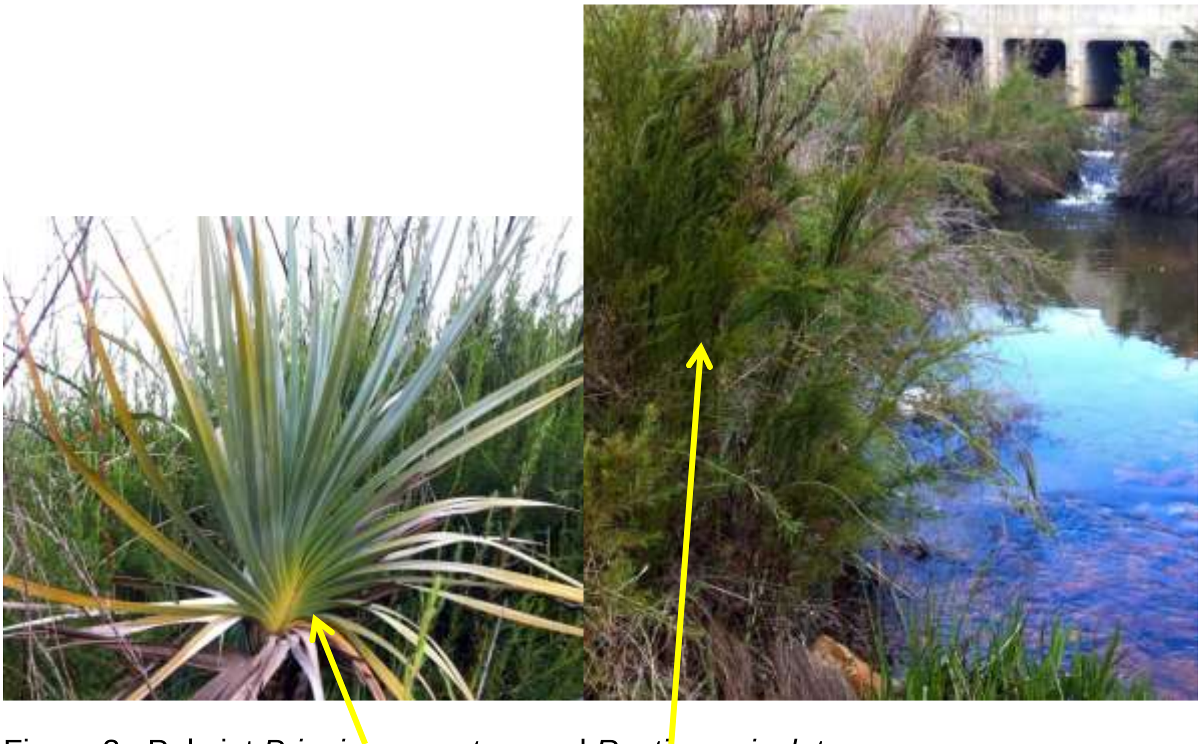

Figure 3 Palmiet *Prionium serratum* and *Restio paniculatus*

3.2 Flood Plain

The river at the sampling point is deeply incised because of long-term erosion, with the river bed some 2.5 meter below the surrounding land. The riparian zone is narrow and restricted to the river banks, from where the landscape rises to what previously was a flood plain.

Gleying of the upper 50 cm of hydromorphic soils was observed on the exposed river banks, which indicates the presence of wetland conditions during historic times. During the time of sampling the banks were dry.

The flood plain was dry, with no hydraulic connectivity to the river. This could be classified as a dried out riparian wetland of which the "plug has been pulled" because of shallow ground water previously replenishing the wetland is now decanting into a deeply incised river.

The area around the river was recently burned down and the evidence of a hot veldt fire was obvious.

3.3 Upstream Wetland

Further upstream is an extensive wetland abundant with wetland vegetation (Figure 4). This wetland comes to an abrupt stop where the vineyards start.

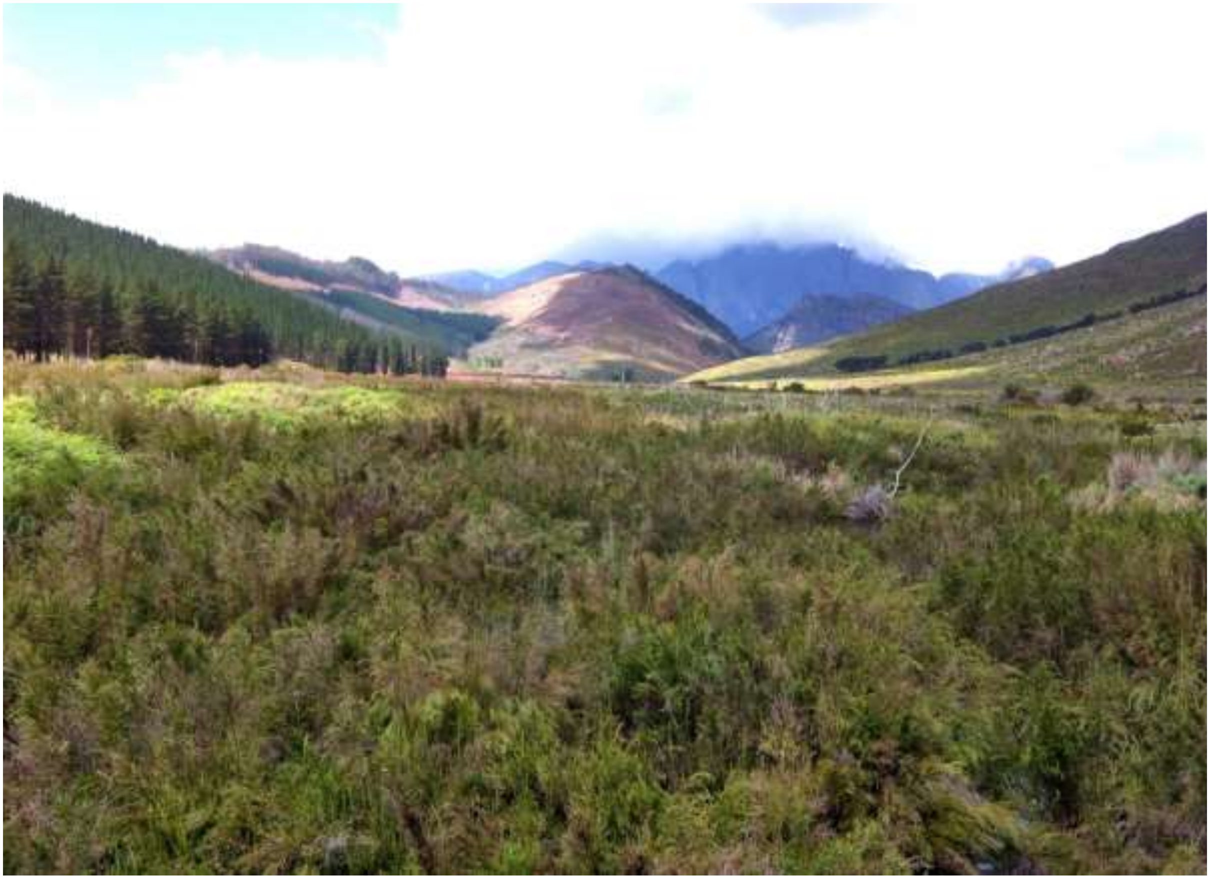

Figure 4 Vegetation upstream of sampling point

The La Motte MTO forest is being harvested at the moment (Figure 5). This process will continue in the years to come. The pines are being cut down. As a result the evapotranspiration of ground water diminishes and the cleared mountains sides become hydrologically active again. Subsequently emerging ground water lower down the mountain slopes is likely to sustain the existing wetland and perhaps add some more wetland area.

It was noted that blue gum saplings have been eradicated with herbicide during follow-up operations.

Figure 5 Forest harvesting

3.4 Downstream of the Sampling Point

The river here becomes more natural with meanders and much more vegetation. It is not as deeply incised, which suggest that the building of the road, the bridge and the settlement, with the hardening of surfaces, had much to do with a higher peak flow during rainfall events and resulting erosion just downstream of the bridge.

Further downstream, before the confluence with the Franschhoek River, as it runs through vineyards, the river has been canalised and entirely denaturised, with little ecological functioning.

There is a drainage line coming out of the mountain to the west of the La Motte Village. It runs through the village towards the river where it supports a more vegetated area.

3.5 Habitat Assessment

Table 1 Habitat Assessment La Motte Access Road Bridge

Instream	score	weight	Product	Maximum Score	Remark
Water Abstraction	20	14	280	350	
Flow modification	20	13	260	325	
Bed modification	20	13	260	325	
Channel modification	20	13	260	325	
Water quality	15	14	210	350	
Inundation	20	10	200	250	
Exotic macrophytes	5	9	45	225	
Exotic fauna	0	8	0	200	
Solid waste disposal	5	6	30	150	
max score		100	1545	2500	
% of total			61.8		
Inverse			38.2		
Class			E		Extensively modified
Riperian Zone					
Water abstraction	20	13	260	325	
Inundation	24	11	264	275	
Flow modification	20	12	240	300	
Water quality	15	13	195	325	
Indigenous vegetation removal	22	13	286	325	
Exotic vegetation encroachment	22	12	264	300	
Bank erosion	24	14	336	350	
Channel modification	22	12	264	300	
		100	2109	2500	
% of total			84.4		
Inverse			15.6		
Class			F		Critically modified

The habitat assessment (Table 1) was carried out according to the methodology of Kleynhans (1999).

The results amplify that the river downstream of the access road bridge has been extensively modified with loss of ecological function and that the riparian zone and flood plain has been critically modified.

The riparian zone is even more modified, with the original vegetation removed and no connectivity with the river. This is apart from the banks directly next to the river inside the trench.

The situation upstream of the bridge is much better, with the banks less steep and a broad strip of riverine vegetation. This is probably the result of secondary erosion that smoothed over the river side and allowed for a more vegetated area. There is however no sign of the original palmiet habitat. Further upstream the area widens into an extensive wetland.

The area that is earmarked for development upstream of the bridge is elevated above the river. If in the past there was a hydraulic connection to the river and the riparian zone, this does no longer exist. This area does not bear any resemblance any more with riparian or wetland conditions.

In order to bring back wetland conditions the river would have to be filled in and allowed to seasonally overflow its banks, a situation that is unlikely to ever be considered.

3.6 Biomonitoring

The biomonitoring results are given in Table 4 of the Appendix.

For a mountain valley stream so close to the headwater and with such a relatively large habitat availability a high score can be expected. The score, however, was a poor 49. The ASPT of 4.9 puts the sampling site in the “fair” category. The water quality is clearly impacted, probably because of the large-scale vineyards higher up in the valley.

According to the biomonitoring results the river downstream of the bridge is extensively modified with the loss of ecological function.

4 Ecological Importance and Sensitivity (EIS)

This is the same as for the rest of the Berg River Catchment, as is described in the Fresh Water Report. The now critically endangered Berg River minnow probably was present at the sampling site prior to human impact. Hence the EIS category should be 3 or even 4.

5 Impact Assessment

Table 2 Summary of possible impacts

Possible Impact		Extent	Duration	Intensity	Significance	Probability	Confidence
Construction of houses, roads & storm water infrastructure	Without mitigation	Regional	Short term	Medium	Medium	Probable	High
	With mitigation	Local	Short term	Low	Low	Low	High
Wastewater management	Without mitigation	Regional	Long term	High	High	Probable	High
	With mitigation	Regional	Short term	Medium	Medium	Medium	High
Storm water Management.	Without mitigation	Regional	Long term	High	High	Definite	High
	With mitigation	Local	Long term	Low	Low	Medium	Medium
Litter & solid waste management	Without mitigation	Regional	Long term	Medium	Medium	Probable	High
	With mitigation	Regional	Short term	Low	Low	Medium	Medium
Leisure on banks, trampling of vegetation	Without mitigation	Regional	Long term	High	Low	Probable	High
	With mitigation	Local	Short term	Low	Low	Medium	Medium

With “local” is meant the river reach from the road bridge down to the confluence with the Franchhoek River. “Regional” means downstream past the confluence down the Franchhoek River.

The measures that can be put in place for storm water and solid waste management is hopefully going to work, but there is always a possibility in the breakdown of vigilance. Therefore the certainty at which future measures are going to be successful can as most be rated as “medium”.

The hardening of urban surfaces increased peak storm water flows and will predictably erode the banks of the river. This can be effectively countered, but preferably not with the traditional hard structures such as concrete canals. A literature reference at the end of this report is provided that offers wise and viable alternatives.

The impact of a sewage spill is always present, even though quality materials are to be used to construct the infrastructure and the required levels of management are maintained. The effects are ecologically devastating. Likewise, the effects for public health are serious. This is the most serious consideration for any new and existing urban development of which the sewerage conduits are close or adjacent to water ways.

6 Risk Assessment

Table 3 Risk Assessment

No.	Activity	Aspect	Impact	Significance	Risk Rating
1	Construction of roads, houses & storm water infrastructure	Silt in river	Habitat loss	42	Low
2	Wastewater Management	Sewage ending up in river	Public health hazard	64	Medium
3	Storm water management	Urban runoff ending up in river	Further erosion Habitat loss	37.5	Low
4	Litter & solid waste management	Littering	Litter in estuary and riparian zone	50	Low
5	Leisure on the river banks	Treading on vegetation	Destruction of vegetation	50	Low

Table 3 (Continued) Risk Rating

No	Flow	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Conse-quence
1	1	2	1	1	1.25	1	1	3.25
2	1	4	3	4	3	3	2	8
3	2	2	1	1	2.5	1	1	3.5
4	1	1	1	1	1	2	3	6
5	1	1	1	1	1	1	2	4

No	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significan-ce	Risk Rating
1	1	1	5	1	8	26	Low
2	1	1	5	1	8	64	Medium
3	2	2	1	1	6	21	Low
4	3	3	1	1	8	48	Low
5	3	3	1	1	8	32	Low

The risk assessment is prescribed by GN1180 as applicable to Section 21(c) and (i) of the National Water Act. This requirement was added after the initial Fresh Water Report was submitted. Table 3 is a replica of the Risk Matrix Excel spreadsheet on the DWS webpage. This is in PDF format and cannot be copied and pasted. Hence Table 3 has been drafted to suit the format of the current report.

The construction of the roads, storm water, sewerage and houses pose a low risk because of the possibility of silt ending up in the river. Likewise, litter and storm water entering the river once the houses are occupied pose a slight risk. The same can be said about people trampling the vegetation on the banks of the river. These risks are small and can be managed.

However, the risk of untreated sewage entering the river because of a blockage in the conduits or a pump station braking down is higher. The risk increases as the sewerage system ages and gets more prone to break downs and leakages. This risk cannot be regarded as low and is at least medium. This is true for all sewerage systems alongside waterways even though the risk is less with modern materials and technology.

7 Resource Economics

The goods and services delivered by the wetland is a Resource Economics concept as adapted by Kotze *et al* (2005). No valid wetland was found on the sites of the proposed La Motte development. Hence this technique cannot be applied in this instance.

8 Recommendations

Storm water from the new development upstream from the access road bridge should be channelled to a point adjacent or downstream from the road bridge. Because of the hardening of urban surfaces it can be expected that the amplitude of storm water pulses would significantly increase with the resulting increased erosion potential. The river and its banks upstream of the bridge should not be allowed to erode and any further erosion from the stretch immediately downstream of the bridge should be prevented.

Further downstream, where the river meanders and still resembles a natural river, before it enters the vineyards, further degradation should be prevented. The increased flow should not be allowed to carry away the river banks.

Hence decision-makers should not even think about stabilising the river banks with hard structures, or of straightening and deepening the river to aid flow. Instead a system should be designed to buffer the flow, to slow it down, in order to reduce erosion potential. This is in line with current thinking and a modern approach to storm water management, as so aptly described by Armitage (2013) and his co-workers.

After such engineered solutions have been implemented, the river should still maintain a variety of habitats such as pools, riffles, rapids and emerging vegetation. For this reason a fresh water specialist (limnologist) should be consulted for such a project.

The stretch of river upstream of the bridge to where the vineyards start in the upper catchment, as well as it's associated riparian zone and wetlands should be conserved at all costs. Storm water and pollution by accidental sewage spills should be channelled to a point downstream of the bridge.

The proposed urban developments at La Motte does not pose a threat of such a nature and magnitude that it cannot go ahead. It would be hard to find a valid reason to stop the proposed development on the grounds of aquatic environmental conservation.

No wetland indicator plants were encountered when walking the grounds during the site visit where the new developments are proposed.

9 Literature

Armitage, N., M. Vice, L. Fisher-Jeffes, K. Winter, A. Spiegel & Jessica Dunstan. 2013. *Alternative Technology for Storm Water Management.* Water Research Commission. Pretoria.

Kotze, G., G. Marneweck, A. Batchelor, D. Lindley & Nacelle Collins. 2009. *A technique for rapidly assessing ecosystem services supplied by wetlands.* Water Research Commission, Pretoria.

10 Appendix

Table 4 SASS5 Score Sheet

SASS5 Score Sheet										
Date	22-Sep-16	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**	**Taxon**	**Weight**	**Score**
Locality	La Motte River	Porifera	5		**Hemiptera**			**Diptera**		
	La Motte Township	Coelenterata	1		Belostomatidae	3		Athericidae	10	
		Turbellaria	3		Corixidae	3	3	Blepharoceridae	15	
		Oligochaeta	1	1	Gerridae	5		Ceratopogonidae	5	
Coordinates	33°53' 48.04"	Huridinea	3		Hydrometridae	6		Chironomidae	2	2
	19°04'41.85"	**Crustacea**			Naucoridae	7		Culicidae	1	
		Amphipodae	13		Nepidae	3		Dixidae	10	
DO mg/l	9	Potamonautidae	3		Notonectidae	3		Empididae	6	
Temperature °C	14.9	Atyidae	8		Pleidae	4		Ephydridae	3	
pH		Palaemonidae	10		Veliidae	5	5	Muscidae	1	
EC mS/m		Hydracarina	8	8	**Megaloptera**			Psychodidae	1	
		Plecoptera			Corydalidae	10		Simuliidae	5	5
SASS5 Score	49	Notonemouridae	14		Sialidae	8		Syrphidae	1	
Number of Taxa	10	Perlidae	12		**Trichoptera**			Tabanidae	5	
ASPT	4.9	**Ephemeroptera**			Dipseudopsidae	10		Tipulidae	5	
		Baetidae 1 sp	4		Ecnomidae	8		**Gastropoda**		
Other Biota	Galaxias	Baetidae 2 sp	6	6	Hydropsychidae 1 sp	4	4	Ancylidae	6	
	Tadpoles	Baetidae >3 sp	12		Hydropsychidae 2 sp	6		Bulinidae	3	
	Adult stoneflies	Caenidae	6		Hydropsychidae <2 sp	12		Hydrobiidae	3	
		Ephemeridae	15		Phylopotamidae	10		Lymnaeidae	3	
		Heptageniidae	13		Polycentropodidae	12		Physidae	3	
		Leptophlebiidae	9		Psychomyidae	8		Planorbidae	3	
		Oligoneuridae	15		**Cased Caddis**			Thiaridae	3	
Comments		Polymitarcyidae	10		Barbarochthonidae	13		Viviparidae	5	
		Prosopistomatidae	15		Calamoceratidae	11		**Pelecipoda**		
		Teloganodiadae	12		Glossostomatidae	11		Corbiculidae	5	
		Trichorythidae	9		Hydroptilidae	6		Sphariidae	3	
		Odonata			Hydrosalpingidae	15		Unionidae	6	
		Calopterygidae	10		Leptostomatidae	10				
		Clorocyphidae	10		Leptoceridae	6	6			
		Chorolestidae	8		Petrothrincidae	11				
		Coenagrionidae	4		Pisulidae	10				
		Lestidae	8		Sericostomatidae	13				
		Platycnemidae	10		**Coleoptera**					
		Protoneuridae	8		Dyticidae	5				
		Aesthnidae	8		Elmidae Dryopidae	8				
		Corduliidae	8		Gyrinidae	5				
		Gomphidae	6		Haliplidae	5				
		Libellulidae	4	4	Helodidae	12				
		Lepidoptera			Hydraenidae	8				
		Pyralidae	12		Hydrophilidae	5	5			
					Limnichidae	10				
					Psephenidae	10				
Score				19			23			7