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# MBOZA RIVER BRIDGE No.3513 HYDRAULIC REPORT

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## 1.1 Hydrology

The total catchment of the Pongola River at the Mboza Site is 8903km<sup>2</sup> with a longest collector of 376 km (see Annexure A). However the flow at the site is controlled by flood gates. The flow at this site comprises of water released from the Pongola Dam and the flow from the catchment downstream of the dam. The floods released from the dam were provided by the Department of water affairs (see Annexure B). The releasing is done annually in September / October and released floods are measured accurately.

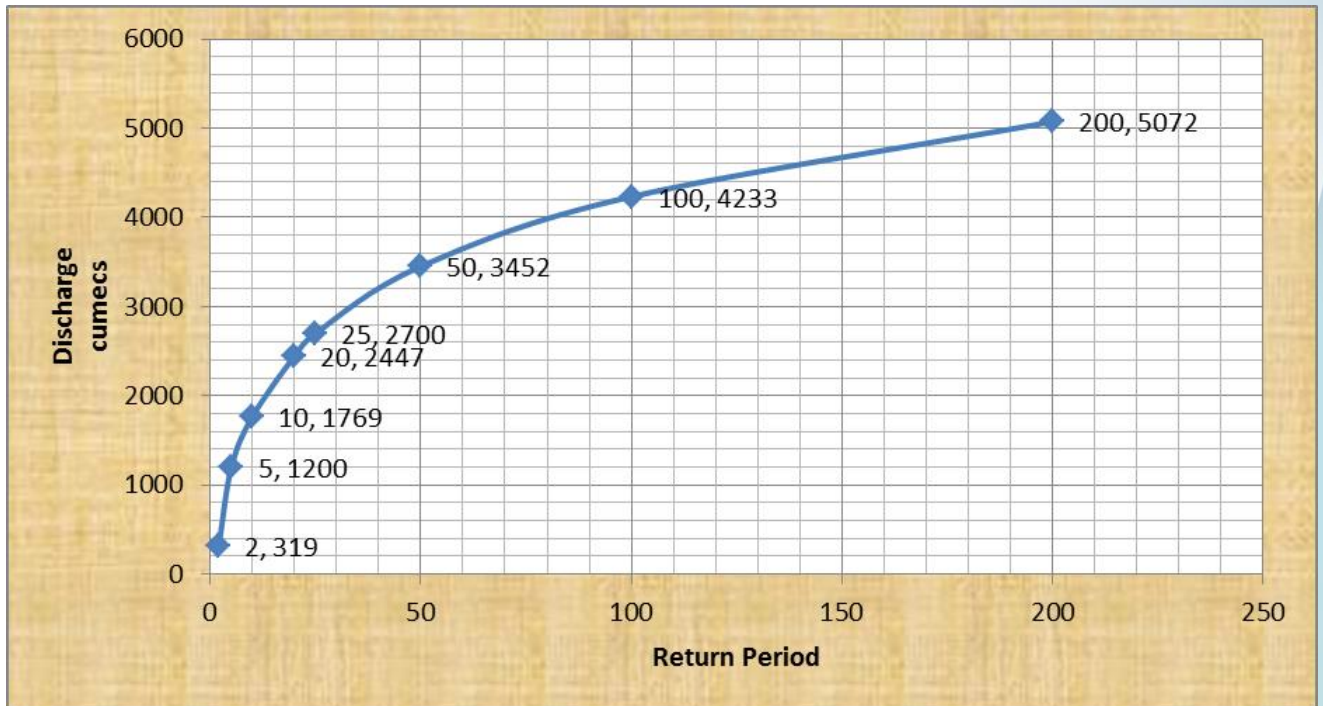
The catchment downstream of the dam is 1114km<sup>2</sup> (see Annexure A) with the longest collector being 53km. Because the catchment is fairly large, the Standard Design Flood Method was used to evaluate the flows downstream of the dam; these flows were added to the flows from the flood gates to provide the floods used for design. The SDF flood figures are provided in Annexure B.

Table 1.1 below shows the flows as released from the dam and the flows from the catchment between the bridge and the dam.

**Table 1.1: Flow data at bridge site**

Hydrological parameters for the catchments												
Pongola-Mboza												
Description	Catchment properties				Flood return period (years)							
	Area (km <sup>2</sup> )	Length of longest water-course km	1085 height m	Basin No.	2	5	10	20	25	50	100	200
Pongola-Mboza Measured DWAF Flows from dam			740	28	192	834	1200	1652	1800	2300	2757	3229
Pongola-Mboza flows from catch D/S of Dam	1 114	53	740	28	127	366	569	795	900	1152	1476	1843
Pongola-Mboza Total (1+2) cumecs	8 903	376		28	<b>319</b>	<b>1200</b>	<b>1769</b>	<b>2447</b>	<b>2700</b>	<b>3452</b>	<b>4233</b>	<b>5072</b>
Flow Level					37.4	38.2	38.6	38.9	39.0	39.2	39.5	39.7

The sum totals of the flows at the bridge site were extracted from the table above and are summarised in Figure 1.1 below.



**Figure 1.1 Summary of water flows at bridge site**

The road is a minor rural road connector class 5 (Fig 8.2) hence designed for Q10 (10 year flood return period). The minimum freeboard required is 0.3m from fig. 8.3 of SANRAL Drainage Manual. The Q2T level for the 20 year flood return period is satisfied for all the options presented in this report.

## 1.2 Hydraulics

### 1.2.1 Hydraulic behaviour in the vicinity of the bridge site

The Pongola river downstream of the dam comprises a main channel and very wide flood plains ranging from 0.5km to about 5km wide. At this particular site the main channel is 55m wide by 4m deep and the flood plain to the east is about 1.5km and that to the west is about 1.0km.

- 200m to the south of this site there is a 2m deep (by 50m wide) channel in the flood plain on the east making it impossible to position the bridge on the south.
- Further south (1.2km) the main channel meets a tributary from the east and this makes moving the bridge south require several bridges.
- 200m to the north of this site there is a 2m deep by (50-100m) wide channel in the flood plain on the east making it impossible to position the bridge on the north of this site.
- Further north (1.2km) the main channel meanders to the west and also meets a tributary coming from the west and this makes moving the bridge north impossible.

The behaviour of the flow on site is as follows

- The selected site has the shortest flood plains and has the most well defined main channel, there is an existing track leading to this site, a clear indication of the usability of this site. This is the site the community want.
- The behaviour of the flow in the vicinity of the site is unique. On the north (downstream) The water flows and then recedes towards the site but not getting to the site, on the south (upstream) the water narrows when getting to the site. This was related to the design team by the local farmers and corroborated by the flood lines attached in Annexure C of this report.

### 1.2.2 Flood line:

The 1:100 year flood is at level 39.45 and has been shown graphically in Annexure C as a flood line level at level 40.0m The highest observed flood level is 39.52. It is evident that all settlements are above level 45m level. As can be seen in Annexure C the nature of the flood plain shows itself in the flood line.

### 1.2.3 Bridge hydraulics:

The road is a minor rural road connector class 5 (Fig 8.2) hence designed for Q10 (10 year flood return period). The minimum freeboard required is 0.3m from fig. 8.3 of SANRAL Drainage Manual. The Q2T level for the 20 year flood return period is satisfied for all the options presented in this report. Table 1.2 below shows the flood levels at the bridge for different return periods.

T (years)	Q (m <sup>3</sup> /s)	RMF (%)	HW (m)	FLOOD ELEVATION (m)	MAXIMUM VELOCITY (m/s)	EXIT CONDITIONS
2	319	2,7	2,22	37,40	1,16	CLAY, SAND AND SILT. EROSION PROTECTION REQUIRED
5	1200	10,5	3,06	38,23	1,50	
10	1769	11,5	3,40	38,57	1,58	
20	2447	21,5	3,69	38,86	1,67	
25	2700	23,7	3,79	38,96	1,71	
50	3452	30,3	4,04	39,21	1,84	
100	4233	37,1	4,28	39,45	1,93	
200	5072	44,5	4,50	39,67	2,00	
RMF = 11396 cumecs FROM THE DAM OUTFLOWS + DOWNSTREAM OF DAM RMF						K = 5,0

Table 1.2.3: Bridge flood flows and flood levels

## ANNEXURE A

A: Catchment Properties

## ANNEXURE B

B: Flow Data

## ANNEXURE C

C: DWARF Report