Confidential

HYDROLOGICAL / HYDRAULIC STUDY OF NATAL ESTUARIES

DATA REPORT No. 3

MAHLONGWA NS 41

ESTUARINE DYNAMICS (CESD)
NRIO / CSIR
STELLENBOSCH

October 1981

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BRIEF NOTES

MAHLONGWA NS 41

Details of the classification of the lower reaches of the Mahlongwa for 1937, 1959, 1967, 1973 and 1976 may be seen in Tables NS 41/I - V. Details of river widths and lateral stability are given in Tables NS 41/VI and VII. An abstract of results appears in Table NS 41/VIII.

The Mahlongwa estuary has been apparently stable from 1937 - 1976 with an average lateral displacement of 14,4 m and coefficient of variation of 12,0% (Figure NS 41/1). However, regard should be given to two features, namely

(a) the 4ha loss of open water areas (cf photographs NS 41/1 and 2)

(b) the course of the river during major floods such as occurred in May 1959 and March 1976. During these periods the flood plain was inundated and silt was deposited in former left bank wetland areas. Had aerial photographs been available for these times, the lateral displacement and coefficient of variation would have been considerably higher.

Human influence falls broadly into two categories namely

(a) factors associated with sugar cane cultivation and

(b) the national road and railway line along the coast.

The results of these man-made influences are to be seen in the loss of open water areas, increase in bar/swamp areas, increased sinuosity and narrowing of the river channel (see Table NS 41/VIII).

LIST OF TABLES

FIGURE

PHOTOGRAPHS

Abbreviations/Symbols used in the Tables

M.A.R.	Mean Annual Run-off
L.B.	Left Bank
R.B.	Right Bank
P	Perimeter
$\bar{x}$	Arithmetic Mean
s	Standard Deviation
V	Coefficient of Variation $\frac{s}{\bar{x}}$
MSL	Mean Sea Level
R	River
d/s	Downstream
____	Maximum Value
....	Minimum Value

TABLE NS 41 / I

CLASSIFICATION OF THE LOWER REACHES OF NATAL RIVERS

NRIO NS 41

RIVER MAHLONGWA, 56 % ESTUARINE, REACH from Umzinto Rd to Mouth, 2,7* km from mouth. REF. DWAFEC ____

AERIAL PHOTO DATE 30-4-37 SCALE 1:10 000 CATCHMENT AREA 101 km², M.A.R. 14,7 m³x10⁶, No. of DAMS NIL

RIVER VALLEY AND RIVER MOUTH FEATURES

General Description of the Terrain above the Valley

Terrain
- mountainous
- hilly
- ✓ undulating plains

Vegetation
- ✓ almost none
- grass
- sparsely forested (0-25%)
- moderately forested (25-75%)
- heavily forested (75-100%)
- swamp/bog

Land-Use
- none
- scattered cultivation
- partly cultivated
- ✓ mainly cultivated
- scattered settlement
- partly built-up
- urbanised

Valley Sides (~~Not~~ Well-defined)

Slumping
- ✓ none
- occasional
- frequent

Vegetation and Land-Use — *Left* / *Right*

	Left	Right
none		
grass	NIL	10 %
trees	27	10 %
cultivated	73	80 %
built-up	NIL	NIL %

Comments *along 1976 R. course

Valley Characteristics

Measurements
- valley length 1950 m
- bottom width (av.) 375 m
- valley slope ≐ 1:557 (straight-line)
- height at head of reach ~3,5 m to MSL approx

Terraces
- none
- indefinite
- ✓ fragmentary
- continuous

Relation of Channel to Valley Bottom (Vertical)
- not applicable
- not obviously degrading
- partly entrenched
- entrenched
- ✓ aggrading

Relation of Channel to Valley Sides or Resistant Terraces (Lateral)
- ✓ not applicable (no valley or free)
- occasionally confined
- frequently confined
- entrenched

Surface Geology
- bedrock
- lacustrine deposits
- ✓ fluvial deposits
- aeolian
- sand covered ____ % area

Comments ____

River Mouth

Characteristics
- open/~~closed~~
- natural/~~artificial~~
- canalized
- ✓ sandy
- ✓ rocks on right bank
- rocks on left bank
- outer bar
- silt plume (fluvial)
- ✓ suspended sediment (marine)

Measurements
- right bank breakwater length ____ m
- left bank breakwater length ____ m
- ✓ rock sill level ____ m to MSL
- cliffs on right bank: height ____ m to MSL
- cliffs on left bank: height ____ m to MSL
- spit/~~bar~~: direction of growth 195 °
  - length of spit/~~bar~~ 100 m
  - length stabilized NIL m
  - width 70 m

Comments ____

FLOOD PLAIN AND CHANNEL FEATURES

Description of Flood Plain

Presence
- none
- indefinite
- fragmentary
- ✓ continuous

Extent
- none
- average width 375 m
- maximum width 1200 m
- aerial length 1620 m
- area 71 ha

Vegetation
- almost none
- grass
- reed swamp 23 % area
- ✓ sparsely forested
- moderately forested
- heavily forested

Forest Type
- not known/~~applicable~~
- riverine:
  - main channel ____ ha
  - tributaries ____ ha
- ✓ coastal dune/evergreen
- mangroves

Land-Use
- ~~not cultivated~~, not built-up
- cultivated 76 % area
- crop/s sugar
- partly built-up
- mainly built-up

Comments ____

Channel Description N.B. Estimate of flow stage: ~~BANK~~/NEAR LONG-TERM MEAN/~~BANK~~

Pattern
- straight
- sinuous
- irregular
- regular meanders
- ✓ irregular meanders
- tortuous meanders
- bifurcated
- lake/s
- lagoon

Measurements
- thalweg 2540 m
- *sinuosity 1,57
- * *open water area 9,5 ha
- *(whole reach) P 7960 m
- lake/lagoon area ____ ha
- inundated
- channel slope ____
- channel width x̄ ____ m s = ____ m
- river slope ____
- river width x̄ 21,4 m s = 24,2 m

Islands/Shoals
- ✓ none
- occasional
- frequent
- split
- braided

Type of Flow
- stagnant/still
- ✓ uniform water surface
- uniform with rapid in reach
- irregular
- pool & riffle sequence

Bar Type
- none
- ✓ channel side bars
- ✓ point bars
- channel junction bars
- mid-channel bars
- diamond bars
- diagonal bars
- sand waves/large dunes

Comments ** including 3 tributaries

Obstructions/Constructions

Natural — *Degree*
- ✓ none — ✓ none
- logs — minor
- boulders — major
- vegetation

Comments *along 1976 R. course

Man-made — *Degree of Obstruction/Constriction for Each* — *Position (from head of reach)*

road bridge/s	2	
rail bridge/s		
causeway	R. confined	100 m & 2540 m
weir/dam		
fish traps		
embankment/s		
groynes		
canals		
✓ drainage furrows		over most of flood plain
others		

Lateral Channel Activity

Lateral Activity
- not detectable
- downstream progression
- ✓ progression & cut-offs
- mainly cut-offs
- entrenched loop development
- irregular lateral activity
- avulsion

Nature of Banks
- ✓ alluvium (silt/sand)
- natural levées
- rock/boulders
- protected/stabilized
- ✓ cultivation to channel edge

Bank Vegetation
- ✓ none
- weak
- good
- very strong
- left bank ____ %
- right bank ____ %

Lateral Stability
- ✓ stable
- slightly unstable
- moderately unstable
- highly unstable

Comments ____

TABLE NS 41./II

CLASSIFICATION OF THE LOWER REACHES OF NATAL RIVERS

NRIO NS 41

RIVER MAHLONGWA, 56 % ESTUARINE, REACH from Umzinto Rd to Mouth, 2,7* km from mouth. REF. DWAFEC _____

AERIAL PHOTO DATE 6-6-59 SCALE 1:10 000 CATCHMENT AREA 101 km², M.A.R. 14,7 m³x10⁶, No. of DAMS NIL

RIVER VALLEY AND RIVER MOUTH FEATURES

General Description of the Terrain above the Valley

Terrain	*Vegetation*	*Land-Use*
mountainous	✓ almost none	none
hilly	grass	scattered cultivation
✓ undulating	sparsely forested (0-25%)	partly cultivated
plains	moderately forested (25-75%)	✓ mainly cultivated
	heavily forested (75-100%)	scattered settlement
	swamp/bog	partly built-up
		urbanised

Valley Sides (~~Not~~ Well-defined)

Slumping	*Vegetation and Land-Use*	*Left*	*Right*
✓ none	none		
occasional	grass	NIL	10. %
frequent	trees	27	10 %
	cultivated	73	80 %
	built-up	NIL	NIL %

Comments *along 1976 R. course

Valley Characteristics

Measurements	*Terraces*
valley length 1950 m	none
bottom width (av.) 375 m	indefinite
valley slope ≃ 1:557 (straight-line)	✓ fragmentary
height at head of reach +3,5 m to MSL approx	continuous

Relation of Channel to Valley Bottom (Vertical)
- not applicable
- not obviously degrading
- partly entrenched
- entrenched
- ✓ aggrading

Relation of Channel to Valley Sides or Resistant Terraces (Lateral)
- ✓ not applicable (no valley or free)
- occasionally confined
- frequently confined
- entrenched

Surface Geology
- bedrock
- lacustrine deposits
- ✓ fluvial deposits
- aeolian
- sand covered _____ % area

Comments _____

River Mouth

Characteristics
- open/~~closed~~
- natural/~~artificial~~
- canalized
- ✓ sandy
- ✓ rocks on right bank
- rocks on left bank
- outer bar
- silt plume (fluvial)
- ✓ suspended sediment (marine)

Measurements
- right bank breakwater length _____ m
- left bank breakwater length _____ m
- ✓ rock sill level _____ m to MSL
- cliffs on right bank: height _____ m to MSL
- cliffs on left bank: height _____ m to MSL
- spit/~~bar~~: direction of growth 195 °
- length of spit/~~bar~~ 110 m
- length stabilized NIL m
- width 40 m

Comments _____

FLOOD PLAIN AND CHANNEL FEATURES

Description of Flood Plain

Presence	*Extent*
none	none
indefinite	average width 375 m
fragmentary	maximum width 1200 m
✓ continuous	aerial length 1620 m
	area 71 ha

Vegetation
- almost none
- grass
- ✓ reed swamp 20 % area
- ✓ sparsely forested
- moderately forested
- heavily forested

Forest Type
- not known/applicable
- riverine:
  - main channel _____ ha
  - tributaries _____ ha
- ✓ coastal dune/evergreen
- mangroves

Land-Use
- ~~not cultivated~~, not built-up
- ✓ cultivated 75 % area
- crop/s sugar
- partly built-up
- mainly built-up

Comments recent silt deposits from May '59 major flood along old R. course on L.B.

Channel Description N.B. Estimate of flow stage: ~~low~~/NEAR LONG-TERM MEAN/~~high~~

Pattern
- straight
- sinuous
- irregular
- regular meanders
- irregular meanders
- tortuous meanders
- bifurcated
- lake/s
- lagoon

Measurements

thalweg	2550 m	
*sinuosity	1,57	
* *open water area	6,1 ha	
*(whole reach) P	5950 m	
lake/lagoon area inundated	_____ ha	
channel slope	_____	
channel width x̄	_____ m	s = _____ m
river slope	_____	
river width x̄	19,2 m	s = 23,0 m

Islands/Shoals
- ✓ none
- occasional
- frequent
- split
- braided

Type of Flow
- stagnant/still
- ✓ uniform water surface
- uniform with rapid in reach
- irregular
- pool & riffle sequence

Bar Type
- none
- ✓ channel side bars
- ✓ point bars
- channel junction bars
- mid-channel bars
- diamond bars
- diagonal bars
- sand waves/large dunes

Comments **including 1 tributary

Obstructions/Constructions

Natural	*Degree*
✓ none	✓ none
logs	minor
boulders	major
vegetation	

Comments *along 1976 R. course

Man-made	*Degree of Obstruction/Constriction for Each* *	*Position (from head of reach)*
road bridge/s 2	R. confined	100 m & 2540 m
rail bridge/s 1	R. confined	2590 m
causeway		
weir/dam		
fish traps		
embankment/s		
groynes		
canals		
✓ drainage furrows		over most of flood plain
others		

Lateral Channel Activity

Lateral Activity
- not detectable
- downstream progression
- ✓ progression & cut-offs
- mainly cut-offs
- entrenched loop development
- irregular lateral activity
- avulsion

Nature of Banks
- ✓ alluvium (silt/sand)
- natural levées
- rock/boulders
- protected/stabilized
- ✓ cultivation to channel edge

Bank Vegetation
- ✓ none
- weak
- good
- very strong
- left bank _____ %
- right bank _____ %

Lateral Stability
- stable
- ✓ slightly unstable*
- moderately unstable
- highly unstable

Comments * recently reverted to old R. course during flood.

TABLE NS 41/III

CLASSIFICATION OF THE LOWER REACHES OF NATAL RIVERS

NRIO NS 41

RIVER MAHLONGWA, 56 % ESTUARINE, REACH from Umzinto Rd to Mouth, 2,7* km from mouth. REF. DWAFEC ____

AERIAL PHOTO DATE 18-6-67 SCALE 1:10 000 CATCHMENT AREA 101 km², M.A.R. 14,7 $m^3 \times 10^6$, No. of DAMS NIL

RIVER VALLEY AND RIVER MOUTH FEATURES

General Description of the Terrain above the Valley

Terrain
- mountainous
- hilly
- ✓ undulating plains

Vegetation
- ✓ almost none
- grass
- sparsely forested (0-25%)
- moderately forested (25-75%)
- heavily forested (75-100%)
- swamp/bog

Land-Use
- none
- scattered cultivation
- partly cultivated
- ✓ mainly cultivated
- scattered settlement
- partly built-up
- urbanised

Valley Sides (~~Not~~ Well-defined)

Slumping
- ✓ none
- occasional
- frequent

Vegetation and Land-Use

	Left	Right
none		
grass	NIL	10 %
trees	27	10 %
cultivated	73	80 %
built-up	NIL	NIL %

Comments * along 1976 R. course

Valley Characteristics

Measurements
- valley length 1950 m
- bottom width (av.) 375 m
- valley slope ≈ 1:557 (straight-line)
- height at head of reach 13,5 m to MSL approx

Terraces
- none
- indefinite
- ✓ fragmentary
- continuous

Relation of Channel to Valley Bottom (Vertical)
- not applicable
- not obviously degrading
- partly entrenched
- entrenched
- ✓ aggrading

Relation of Channel to Valley Sides or Resistant Terraces (Lateral)
- ✓ not applicable (no valley or free)
- occasionally confined
- frequently confined
- entrenched

Surface Geology
- bedrock
- lacustrine deposits
- ✓ fluvial deposits
- aeolian
- sand covered ____ % area

Comments ____

River Mouth

Characteristics
- ~~open~~/closed
- natural/~~artificial~~
- canalized
- ✓ sandy
- ✓ rocks on right bank
- rocks on left bank
- outer bar
- silt plume (fluvial)
- ✓ suspended sediment (marine)

Measurements
- right bank breakwater length ____ m
- left bank breakwater length ____ m
- ✓ rock sill level ____ m to MSL
- cliffs on right bank: height ____ m to MSL
- cliffs on left bank: height ____ m to MSL
- ~~spit~~/bar: direction of growth 195 °
- length of ~~spit~~/bar 130 m
- length stabilized NIL m
- width 70 m

Comments ____

FLOOD PLAIN AND CHANNEL FEATURES

Description of Flood Plain

Presence
- none
- indefinite
- fragmentary
- ✓ continuous

Extent
- none
- average width 375 m
- maximum width 1200 m
- aerial length 1610 m
- area 71 ha

Vegetation
- almost none
- grass
- ✓ reed swamp 19 % area
- ✓ sparsely forested
- moderately forested
- heavily forested

Forest Type
- not known/applicable
- riverine: main channel ____ ha
- riverine: tributaries ____ ha
- ✓ coastal dune/evergreen
- mangroves

Land-Use
- ~~not cultivated~~, not built-up
- ✓ cultivated 76 % area
- crop/s sugar
- partly built-up
- mainly built-up

Comments ____

Channel Description N.B. Estimate of flow stage: ~~BANK~~/NEAR LONG-TERM MEAN/~~FLOOD~~

Pattern
- straight
- sinuous
- irregular
- regular meanders
- ✓ irregular meanders
- tortuous meanders
- bifurcated
- lake/s
- lagoon

Measurements

thalweg	2670 m	
*sinuosity	1,66	
**open water area	6,0 ha	
*(whole reach) P	5900 m	
lake/lagoon area	____ ha	
inundated		
channel slope	____	
channel width $\bar{x}$	____ m	s = ____ m
river slope	____	
river width $\bar{x}$	18,3 m	s = 19,7 m

Islands/Shoals
- ✓ none
- occasional
- frequent
- split
- braided

Type of Flow
- stagnant/still
- ✓ uniform water surface
- uniform with rapid in reach
- irregular
- pool & riffle sequence

Bar Type
- none
- ✓ channel side bars
- ✓ point bars
- channel junction bars
- mid-channel bars
- diamond bars
- diagonal bars
- sand waves/large dunes

Comments ____

** including 1 tributary

Obstructions/Constructions

Natural	*Degree*
✓ none	✓ none
logs	minor
boulders	major
vegetation	

Comments * along 1976 R. course

Man-made	*Degree of Obstruction/Constriction for Each*	* *Position (from head of reach)*
road bridge/s 2	R. confined	100m & 2540m
rail bridge/s 1	R. confined	2590m
causeway		
weir/dam		
fish traps		
embankment/s		
groynes		
canals		
✓ drainage furrows		
others	over most of flood plain	

Lateral Channel Activity

Lateral Activity
- not detectable
- downstream progression
- ✓ progression & cut-offs
- mainly cut-offs
- entrenched loop development
- irregular lateral activity
- avulsion

Nature of Banks
- ✓ alluvium (silt/sand)
- natural levées
- rock/boulders
- protected/stabilized
- ✓ cultivation to channel edge

Bank Vegetation
- ✓ none
- weak
- good
- very strong
- left bank ____ %
- right bank ____ %

Lateral Stability
- ✓ stable
- slightly unstable
- moderately unstable
- highly unstable

Comments ____

TABLE NS 41/IV

CLASSIFICATION OF THE LOWER REACHES OF NATAL RIVERS

NRIO NS 41

RIVER MAHLONGWA, 56 % ESTUARINE, REACH from Umzinto Rd to Mouth, 2,7 * km from mouth. REF. DWAFEC _____

AERIAL PHOTO DATE 12-8-73 SCALE 1:10 000 CATCHMENT AREA 101 km², M.A.R. 14,7 m³x10⁶, No. of DAMS NIL

RIVER VALLEY AND RIVER MOUTH FEATURES

General Description of the Terrain above the Valley

Terrain
- mountainous
- hilly
- ✓ undulating plains

Vegetation
- ✓ almost none
- grass
- sparsely forested (0-25%)
- moderately forested (25-75%)
- heavily forested (75-100%)
- swamp/bog

Land-Use
- none
- scattered cultivation
- partly cultivated
- ✓ mainly cultivated
- scattered settlement
- partly built-up
- urbanised

Valley Sides (~~Not~~ Well-defined)

Slumping
- ✓ none
- occasional
- frequent

Vegetation and Land-Use	*Left*	*Right*
none		
grass	NIL	8 %
trees	27	10 %
cultivated	73	80 %
built-up	NIL	2 %

Comments* along 1976 R. course

Valley Characteristics

Measurements
- valley length 1950 m
- bottom width (av.) 375 m
- valley slope ≈ 1:557 (straight-line)
- height at head of reach +3,5 m to MSL approx.

Terraces
- none
- indefinite
- ✓ fragmentary
- continuous

Relation of Channel to Valley Bottom (Vertical)
- not applicable
- not obviously degrading
- partly entrenched
- entrenched
- ✓ aggrading

Relation of Channel to Valley Sides or Resistant Terraces (Lateral)
- ✓ not applicable (no valley or free)
- occasionally confined
- frequently confined
- entrenched

Surface Geology
- bedrock
- lacustrine deposits
- ✓ fluvial deposits
- aeolian
- sand covered ____ % area

Comments _____

River Mouth

Characteristics
- open/~~closed~~
- natural/artificial
- canalized
- ✓ sandy
- ✓ rocks on right bank
- rocks on left bank
- outer bar
- silt plume (fluvial)
- ✓ suspended sediment (marine)

Measurements
- right bank breakwater length ____ m
- left bank breakwater length ____ m
- ✓ rock sill level ____ m to MSL
- cliffs on right bank: height ____ m to MSL
- cliffs on left bank: height ____ m to MSL
- spit/~~bar~~: direction of growth 195 °
- length of spit/~~bar~~ 90 m
- length stabilized NIL m
- width 50 m

Comments _____

FLOOD PLAIN AND CHANNEL FEATURES

Description of Flood Plain

Presence
- none
- indefinite
- fragmentary
- ✓ continuous

Extent
- none
- average width 375 m
- maximum width 1200 m
- aerial length 1620 m
- area 71 ha

Vegetation
- almost none
- grass
- ✓ reed swamp 19 % area
- ✓ sparsely forested
- moderately forested
- heavily forested

Forest Type
- not known/applicable
- riverine: main channel ____ ha
- riverine: tributaries ____ ha
- ✓ coastal dune/evergreen
- mangroves

Land-Use
- ~~not cultivated~~, not built-up
- ✓ cultivated 76 % area
- crop/s sugar
- partly built-up
- mainly built-up

Comments _____

Channel Description N.B. Estimate of flow stage: ~~LOW~~/NEAR LONG-TERM MEAN/~~HIGH~~

Pattern
- straight
- sinuous
- irregular
- regular meanders
- ✓ irregular meanders
- tortuous meanders
- bifurcated
- lake/s
- lagoon

Measurements

thalweg	2688 m	
*sinuosity	1,66	
*open water area (whole reach)	5,5 ha	
lake/lagoon area inundated	____ ha	
channel slope $\bar{x}$	____	
channel width $\bar{x}$	____ m	s = ____ m
river slope $\bar{x}$	____	
river width $\bar{x}$	19,7 m	s = 20,4 m

Islands/Shoals
- ✓ none
- occasional
- frequent
- split
- braided

Type of Flow
- stagnant/still
- ✓ uniform water surface
- uniform with rapid in reach
- irregular
- pool & riffle sequence

Bar Type
- none
- ✓ channel side bars
- ✓ point bars
- channel junction bars
- mid-channel bars
- diamond bars
- diagonal bars
- sand waves/large dunes

Comments _____

Obstructions/Constructions

Natural	*Degree*
✓ none	✓ none
logs	minor
boulders	major
vegetation	

Comments _____

Man-made	*Degree of Obstruction/Constriction for Each*	*Position (from head of reach)*
road bridge/s	1 R. confined	2540 m
rail bridge/s	1 R. confined	2590 m
causeway		
weir/dam		
fish traps		
embankment/s		
groynes		
canals		
✓ drainage furrows		
others		over most of flood plain

Lateral Channel Activity

Lateral Activity
- not detectable
- downstream progression
- ✓ progression & cut-offs
- mainly cut-offs
- entrenched loop development
- irregular lateral activity
- avulsion

Nature of Banks
- ✓ alluvium (silt/sand)
- natural levées
- rock/boulders
- protected/stabilized
- ✓ cultivation to channel edge

Bank Vegetation
- ✓ none
- weak
- good
- very strong
- left bank ____ %
- right bank ____ %

Lateral Stability
- ✓ stable
- slightly unstable
- moderately unstable
- highly unstable

Comments _____

TABLE NS41/V

CLASSIFICATION OF THE LOWER REACHES OF NATAL RIVERS

NRIO NS 41

RIVER MAHLONGWA, 56 % ESTUARINE, REACH from Umzinto Rd to Mouth, 2,7* km from mouth. REF. DWAFEC _____

AERIAL ~~PHOTO~~ DATE 23-6-76 SCALE 1:10 000 CATCHMENT AREA 101 km², M.A.R. 14,7 m³x10⁶, No. of DAMS NIL
orthophoto

RIVER VALLEY AND RIVER MOUTH FEATURES

General Description of the Terrain above the Valley

Terrain	*Vegetation*	*Land-Use*
mountainous	✓almost none	none
hilly	grass	scattered cultivation
✓undulating plains	sparsely forested (0-25%)	partly cultivated
	moderately forested (25-75%)	✓mainly cultivated
	heavily forested (75-100%)	scattered settlement
	swamp/bog	partly built-up
		urbanised

Valley Sides (~~Not~~ Well-defined)

Slumping	*Vegetation and Land-Use*	*Left*	*Right*
✓none	none		
occasional	grass	NIL	7 %
frequent	trees	27	10 %
	cultivated	73	80 %
	built-up	NIL	3 %

Comments *along 1976 R course

Valley Characteristics

Measurements	*Terraces*	*Relation of Channel to Valley Bottom (Vertical)*	*Relation of Channel to Valley Sides or Resistant Terraces (Lateral)*	*Surface Geology*
valley length 1950 m	none	not applicable	✓not applicable (no valley or free)	bedrock
bottom width(av.) 375m	indefinite	not obviously degrading	occasionally confined	lacustrine deposits
valley slope ≈ 1:55	✓fragmentary	partly entrenched	frequently confined	✓fluvial deposits
(straight-line)	continuous	entrenched	entrenched	aeolian
height at head		✓aggrading		sand covered ____ % area
of reach +3,5 m to MSL approx				

Comments _____

River Mouth

Characteristics	*Measurements*		
open/~~closed~~	right bank breakwater length	____	m
natural/~~artificial~~	left bank breakwater length	____	m
canalized	rock sill level	____	m to MSL
✓sandy	cliffs on right bank: height	____	m to MSL
rocks on right bank	cliffs on left bank: height	____	m to MSL
rocks on left bank	spit/~~bar~~: direction of growth	195	°
outer bar	length of spit/~~bar~~	95	m
silt plume (fluvial)	length stabilized	NIL	m
✓suspended sediment (marine)	width	45	m

Comments _____

FLOOD PLAIN AND CHANNEL FEATURES

Description of Flood Plain

Presence	*Extent*	*Vegetation*	*Forest Type*	*Land-Use*
none	none	almost none	not known/applicable	~~not cultivated~~, not built-up
indefinite	average width 375 m	grass	riverine:	✓cultivated 77 % area
fragmentary	maximum width 1200 m	✓reed swamp 21 % area	main channel ____ ha	crop/s sugar
continuous	aerial length 1620 m	✓sparsely forested	tributaries ____ ha	partly built-up
	area 71 ha	moderately forested	coastal dune/evergreen	mainly built-up
		heavily forested	mangroves	

Comments _____

Channel Description N.B. Estimate of flow stage: ~~LOW~~/NEAR LONG-TERM MEAN/~~HIGH~~

Pattern	*Measurements*		*Islands/Shoals*	*Type of Flow*	*Bar Type*
straight	thalweg	2700 m	✓none	stagnant/still	none
sinuous	*sinuosity	1,67	occasional	✓uniform water surface	✓channel side bars
irregular	*open water area	5,8 ha	frequent	uniform with rapid in reach	✓point bars
regular meanders	*(whole reach)		split	irregular	channel junction bars
irregular meanders	lake/lagoon area ____ ha		braided	pool & riffle sequence	mid-channel bars
tortuous meanders	inundated				diamond bars
bifurcated	channel slope _	____			diagonal bars
lake/s	channel width x̄	____ m	s = ____ m		sand waves/large dunes
lagoon	river slope _	____			
	river width x̄	18,1 m	s = 18,9 m		

Comments _____

Obstructions/Constructions

Natural	*Degree*	*Man-made*	*Degree of Obstruction/Constriction for Each*	*Position (from head of reach)*
✓none	✓none	road bridge/s 1	R. confined	2540 m
logs	minor	rail bridge/s 1	R. confined	2590 m
boulders	major	causeway		
vegetation		weir/dam		
		fish traps		
		embankment/s		
		groynes		
		canals		
		✓drainage furrows	over most of flood plain	
		others		

Comments _____

Lateral Channel Activity

Lateral Activity	*Nature of Banks*	*Bank Vegetation*	*Lateral Stability*
not detectable	✓alluvium (silt/sand)	✓none	✓stable
downstream progression	natural levées	weak	slightly unstable
✓progression & cut-offs	rock/boulders	good	moderately unstable
mainly cut-offs	protected/stabilized	very strong	highly unstable
entrenched loop development	✓cultivation to	left bank ____ %	
irregular lateral activity	channel edge	right bank ____ %	
avulsion			

Comments _____

TABLE NS 41/VI

RIVER WIDTHS

MAHLONGWA NS 41

Station	Approx. distance along mid-channel from Umzinto Rd. (m)	River Widths (m) Date					$\bar{x}$	s	V%
		30.4.37	6.6.59	18.6.67	12.8.73	23.6.76			
1	0	5	5	5	5	5	5	0	0
2	295	10	5	5	5	5	6	2,2	37,3
3	590	5	5	5	5	5	5	0	0
4	885	10	8	8	5	5	7,2	2,2	30,1
5	1180	15	12	10	6	6	9,8	3,9	39,8
6	1475	22	22	15	15	15	17,8	3,8	21,5
7	1770	25	25	25	28	28	26,2	1,6	6,2
8	2065	32	25	25	25	22	25,8	3,7	14,3
9	2360	85	80	70	68	65	73,6	8,5	11,6
10	2655 *	5	5	15	35	25	17,0	13,0	76,6
$\bar{x}$		21,4	19,2	18,3	19,7	18,1	19,3		
s		24,2	23,0	19,7	20,4	18,9			
V%		113,2	119,7	107,6	103,5	104,2			

* Near the River Mouth

TABLE NS 41/VII LATERAL STABILITY MAHLONGWA NS 41

Station	Approx. distance along mid-channel from Umzinto Rd. (m)	Distance from maximum observed L.B. position to mid-channel (m) Date					Max - Min	$\bar{x}$	s	VZ
		30.4.37	6.6.59	18.6.67	12.8.73	23.6.76				
1	0	2,5	2,5	2,5	2,5	2,5	0	2,5	0	0
2	295	5,0	7,5	7,5	7,5	7,5	2,5	7,0	1,1	16,0
3	590	5,0	5,0	5,0	5,0	5,0	0	5,0	0	0
4	885	5,0	4,0	4,0	5,5	5,5	1,5	4,8	0,8	15,8
5	1180	7,5	7,5	10,0	12,0	12,0	4,5	9,8	2,3	23,0
6	1475	11,0	11,0	14,5	14,5	14,5	3,5	13,1	1,9	14,6
7	1770	15,5	15,5	15,5	14,0	14,0	1,5	14,9	0,8	5,5
8	2065	16,0	20,0	20,0	20,0	18,0	4,0	18,8	1,8	9,5
9	2360	42,5	45,0	50,0	51,0	52,5	10,0	48,2	4,3	8,8
10	2655 *	25,0	25,0	15,0	17,5	15,0	10,0	19,5	5,1	26,3
$\bar{x}$		13,5	14,3	14,4	15,0	14,7	3,8	14,4		12,0
s		12,3	13,0	13,8	13,9	14,2	3,6			
VZ		91,2	91,1	95,5	93,0	97,2	96,8			

Average Lateral Displacement 1937 - 76 = 14 m.

Average Coefficient of Variation 1937 - 76 = 12%

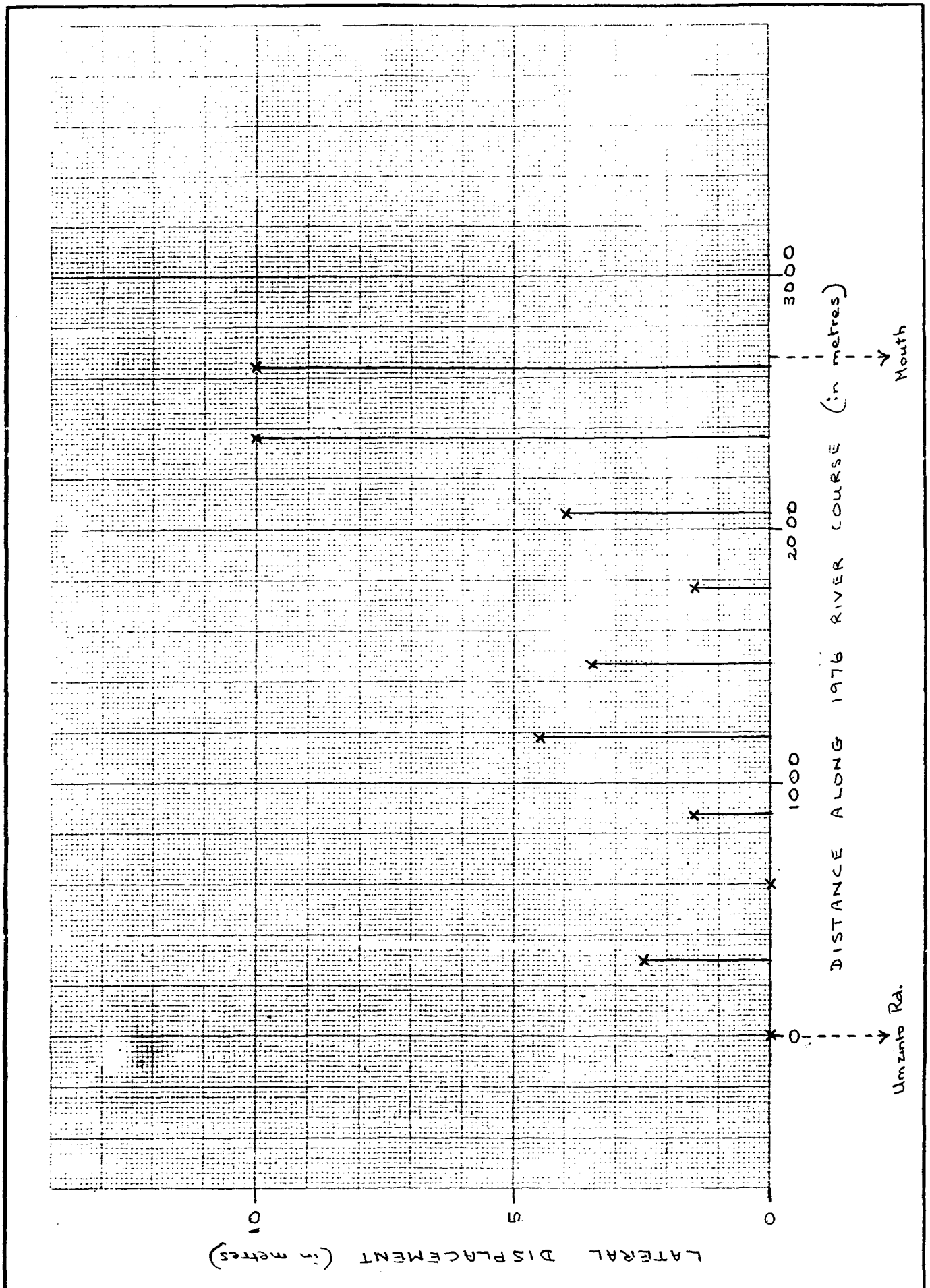
* Near the River Mouth

TABLE NS 41/VIII

A B S T R A C T

MAHLONGWA 1937 - 1976

1. Sinuosity Range 1,57 → 1,67
2. River width " 21,4m → 18,1m
3. Lateral displacement $\bar{x}$ 14,4m
   $\bar{V}$ 12,0%
4. Thalweg Range 2540m → 2700m
5. Open water area Range 9,5ha → 5,5ha → 5,8ha
(including tributaries)
6. Increase in bar area (main channel) 1,1ha
7. Reed swamp area Range 23% → 19% → 21%
8. Cultivation (sugar cane) valley sides L.B. 73%
   " " R.B. 80%
   flood plain Range 75% - 77%
9. Human influence
   (a) High percentage area of sugar cane cultivation both on flood plain and along valley sides
   (b) Cultivation to the river's edge
   (c) Drainage furrows
   (d) Bridge contstruction at head of reach
   (e) Loss of wetland areas (4ha) and increase of bar areas due to (b), (c) and (d)
   (f) Road and railway bridge near the river mouth
   (g) Main road and railway line leading to (f) from the north on "old" stabilised sand-spit blocking natural river flood course to the sea : national road now being undercut by river 650m north of the bridge
   (h) Sandbar at the mouth is occasionally opened manually to flush the lagoon because of organic enrichment (Begg).



TRACED DS CHECKED DATE REF	NATAL ESTUARIES: MAHLONGWA THALWEG DISPLACEMENT 1937-76	FIGURE NS 41/1

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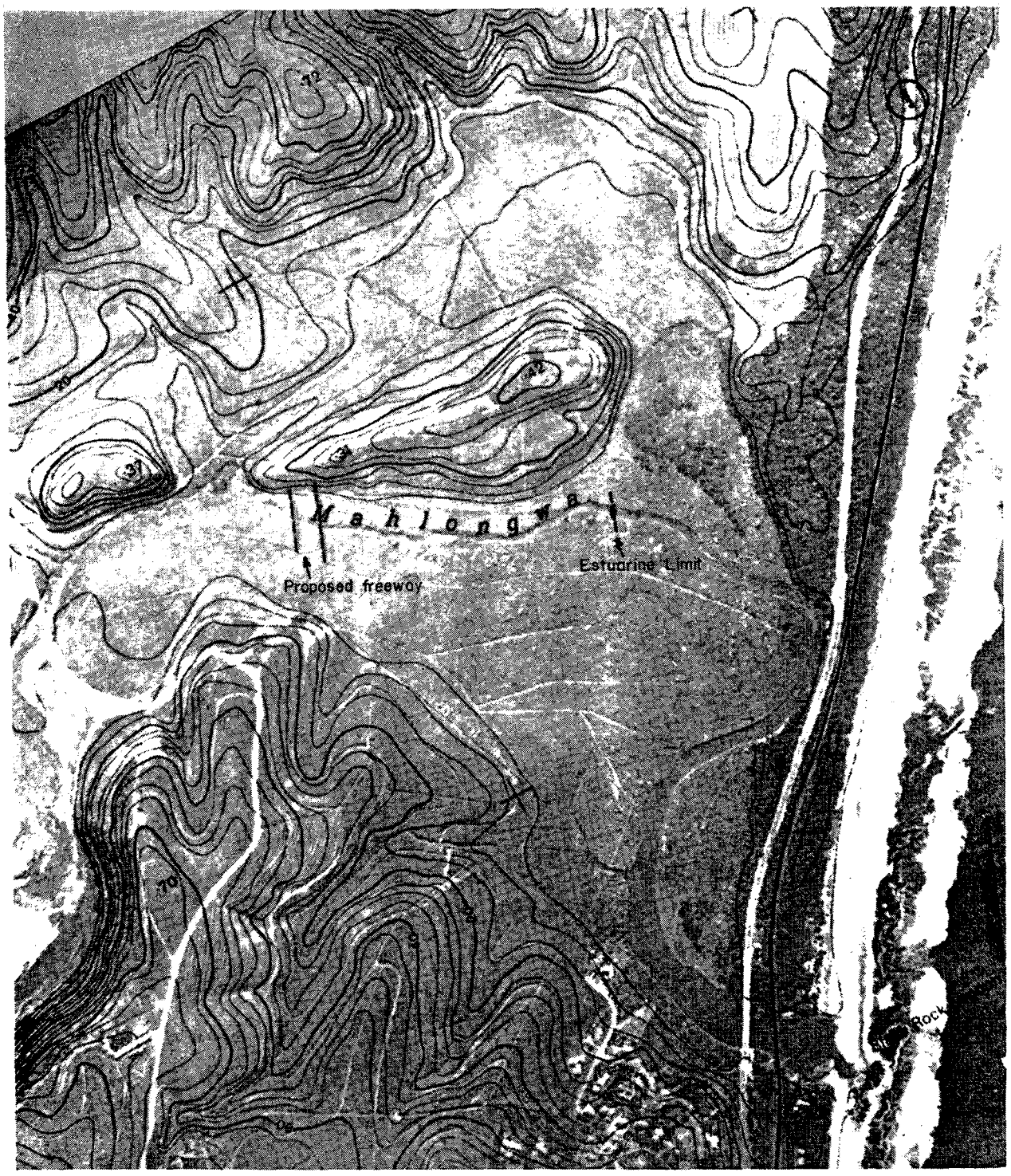

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SCALE: 1 : 10 000 ap

TRACED DS CHECKED DATE. REF	NATAL ESTUARIES : MAHLONGWA ORTHOPHOTO : 23·6·76	PHOTOGRAI NS 41/1

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N

SCALE: 1 : 10 000 appro

TRACED DS CHECKED DATE REF	NATAL ESTUARIES : MAHLONGWA 30 - 4 - 37	PHOTOGRAPH NS 42/2

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