MAIN FLOW VELOCITY IN SHORT AND SHARPLY CURVED RIVER BENDS

H. J. de Vriend [×] and H. J. Geldof [†]

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Department of Civil Engineering
Delft University of Technology
The Netherlands

× Delft University of Technology, Department of Civil Engineering, Laboratory of Fluid Mechanics, Delft, The Netherlands; currently, Delft Hydraulics Laboratory De Voorst, Marknesse, The Netherlands.

† State University of Utrecht, Geographical Institute, Department of Physical Geography, Utrecht, The Netherlands, and: Delft University of Technology, Department of Civil Engineering, Delft, The Netherlands.

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SUMMARY

Results of a mathematical model for the depth-averaged main flow velocity in shallow river bends are compared with measurements in two consecutive sharply-curved short bends in the river Dommel, The Netherlands.

The computed main velocity distribution agrees rather well with the measured one in the larger part of each bend. Near the bend exits, however, deviations occur which indicate that secondary flow convection should be included in the mathematical model.

Also, the present model is used to verify some qualitative explanations for the skewing of the main velocity distribution (towards the inner bank in the first part of a bend, outwards further downstream) and to show the effect of flow stage variations on the streamline pattern.

NOTATION

A.O.D.	Agreed Ordnance Datum (N.A.P.)	-
b_o	water surface width of schematized channel	m
C	Chézy factor	$m^{\frac{1}{2}} s^{-1}$
C_o	Chézy factor for $d = d_o$	$m^{\frac{1}{2}} s^{-1}$
d	local water depth	m
d_o	reference water depth	m
g	acceleration due to gravity	$m s^{-2}$
k_{sn}	secondary flow convection factor	-
k_{ss}	correction factor for the vertical non-uniformity of the main flow velocity	-
L_{total}	length along axis of schematized channel section	m
n	horizontal coordinate perpendicular to the channel axis, positive from left to right bank	m
n_c	n-coordinate of channel axis	m
N	number of samples	-
P	total pressure	$kg m^{-1} s^{-2}$
Q	water discharge	$m^3 s^{-1}$
Q_o	reference discharge	$m^3 s^{-1}$
r_s	local radius of curvature of the s-lines	m
R_c	radius of curvature of axis of schematized channel	m
Re	Reynolds number	-
R_s	local radius of curvature of streamlines of depth-averaged flow field	m
s	horizontal coordinate parallel to axis of schematized channel, positive downstream	m
S_t	transverse slope of the water surface	-
u	local flow velocity component in the s-direction (main flow velocity)	$m s^{-1}$
$\bar{u}$	depth-averaged flow velocity component in the s-direction (main flow velocity)	$m s^{-1}$

$\overline{v}$	depth-averaged flow velocity component in the n-direction (main flow velocity)	m s^{-1}
V	reference velocity ($\equiv \frac{Q_o}{b_o d_o}$)	m s^{-1}
X	abscissa of translated national coordinate system	m or km
y	horizontal coordinate between opposite benchmarks, origin at lefthand benchmark	m
Y	ordinate of translated national coordinate system	m or km
z	vertical coordinate, origin at A.O.D.	m
z_b	local bed level	m
z_s	local water surface level	m
Δt	sampling interval	min
κ	Von Karman constant	-
ρ	mass density of water	kg m^{-3}
Φ_{total}	angle of circular arc of schematized channel section, positive for bends turning leftwards	degrees
$_L$	indicates benchmark on left bank	-
$_R$	indicates benchmark on right bank	-

1. Introduction

Curved alluvial streams play an important role in earth science as well as technology. The sedimentological interpretation of meandering river deposits requires a proper understanding of the effects of a bend on the sediment transport and on the pattern of erosion and sedimentation (Collinson, 1978). This pattern leads to a specific geomorphological character of the river channel and the flood plain.

The most important technological impact of this pattern of erosion and deposition is found in river engineering. Bends are often limitative to the navigability of a river and they may require additional bank protection (Jansen, 1979). Moreover, they significantly influence the dispersion of pollutants and heat, whence they cannot be ignored in water quality control (Fischer, 1969).

The most striking feature of the essentially three-dimensional flow field in a bend is the helical streamline pattern, in the simplest case with the flow near the water surface directed outwards and the velocity vector near the bottom directed inwards. This induces transverse shear stresses on the bed, causing a transverse component of the sediment transport and hence the formation of a point bar near the inner bank and a pool near the outer bank.

The flow and the bed formation in curved alluvial rivers are complicated phenomena. They are not easily explained (Callander, 1978) and are still more difficult to model mathematically (Leschziner & Rodi, 1979; De Vriend, 1981b; Flokstra & Koch, 1981; Koch & Flokstra, 1981). In order to avoid too many complications at a time, the present report deals with the velocity field in a curved stream, assuming the bed to be fixed and the discharge to be constant. The main velocity distribution in this type of flow is analyzed using field measurements and a mathematical model of steady flow in shallow rivers.

A comparison of measured and computed velocity fields, likely to yield definite conclusions on the applicability of the mathematical model, is only possible for well-defined and well-documented flow cases in

channels of rather simple configuration. For this purpose field measurements have been made in two consecutive bends of the river Dommel, a small sand-bedded tributary of the Meuse. A similar channel geometry could also have been realized in a hydraulic model, but measurements in a larger stream than usually feasible in a laboratory were preferred.

Once the model has been approved for large parts of the channel under consideration, it is used to verify a number of hypotheses on the mechanism underlying the lateral shift of the main velocity maximum (Bridge & Jarvis, 1976; Hickin, 1978; Dietrich, Smith & Dunne, 1979). In addition, the model is used to investigate the effect of stage variations on the main flow pattern.

The results of these investigation may contribute to a better understanding of the flow phenomena in river bends, indispensable to the development of simplified mathematical models of curved channel flow and to the interpretation of channel deformations and sedimentary structures in meandering rivers.

2. Field measurements

2.1. Location

The bed geometry and flow velocity measurements were performed in May 1980, in a 285 m long section of the river Dommel, approximately 3 km downstream of its crossing with the border between Belgium and The Netherlands (Fig. 1).

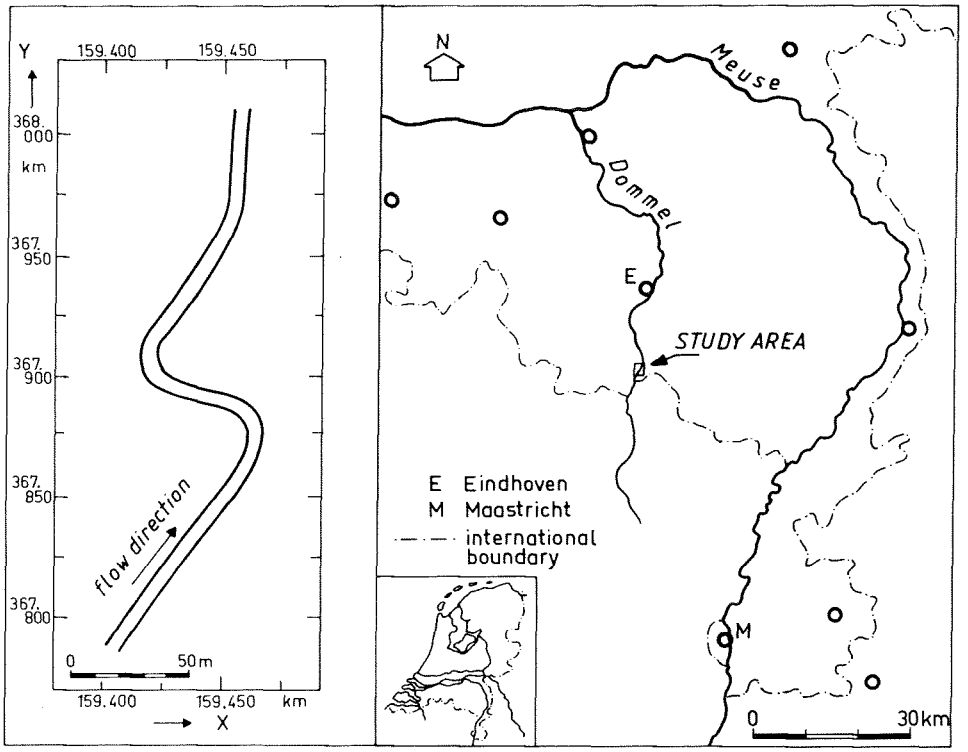


Fig. 1. Location of study area.

The principal reasons for selecting this site are:

(a) The channel section contains two opposite bends of almost 90^{o}, with a short straight reach in between and long straight, or almost straight reaches upstream and downstream. The upstream reach is

long enough to ensure that effects of preceding bends have vanished before the entrance of the first bend.† The two bends provide the possibility to study the effects of curvature on the flow and the interaction, if present, between the first and the second bend. In the downstream straight reach, the curvature effects on the velocity field gradually damp out, again.

(b) The width to depth ratio of about 12 and the radius of curvature to depth ratio of about 20 seem sufficiently large to allow for a successful application of mathematical models based on a shallow-water approximation (*i.e.* the horizontal and vertical distributions of the velocity components are calculated separately; see De Vriend, 1981b).

(c) This part of the river has an almost constant width (approximately 8 m at bankfull stage), a condition necessary for the application of the available mathematical models.

(d) Nowhere in this section, not even in the bends, important regions of flow separation occur: another requirement for the application of the present mathematical models.

(e) A permanent float gauge station of Rijkswaterstaat (*viz.* Borkel - Schaft) is situated about 150 m upstream of the study area. Its continuous water level record allows for estimating the discharge during periods in which velocity measurements are lacking. Besides, it provides a rough check on the measured discharges.

(f) The study area is easily accessible, even by car, which facilitates the transport of equipment.

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† In the area of investigation, the morphology of the Dommel has been modified considerably by human action, in order to facilitate flood discharge and to prevent frequent inundation of the adjoining area. This has led to an almost prefectly straight reach upstream of the first bend.

2.2. Measuring procedure

The geometry of the river channel in the study area was surveyed before and after the velocity measurements (*i.e.* in the periods 1...5 May and 27...28 May) by levelling along 52 traverses (Figs. 3 and 5; Appendices A and B).

In 23 cross-sections, the longitudinal velocity component, or rather the horizontal velocity component perpendicular to the cross-section, was measured (12...30 May) with a propeller-type current meter (Ott C-2, propeller diameter 0.030 m, pitch 0.100 m), mounted on a movable bridge across the river (Fig. 2). The number of measuring points in a section ranged from 61 to 104, depending on cross-sectional geometry. They were arranged along at least 10 equidistant vertical lines. At each point the velocity was measured during 3×30 seconds and averaged. The results are summarized in Appendix C.

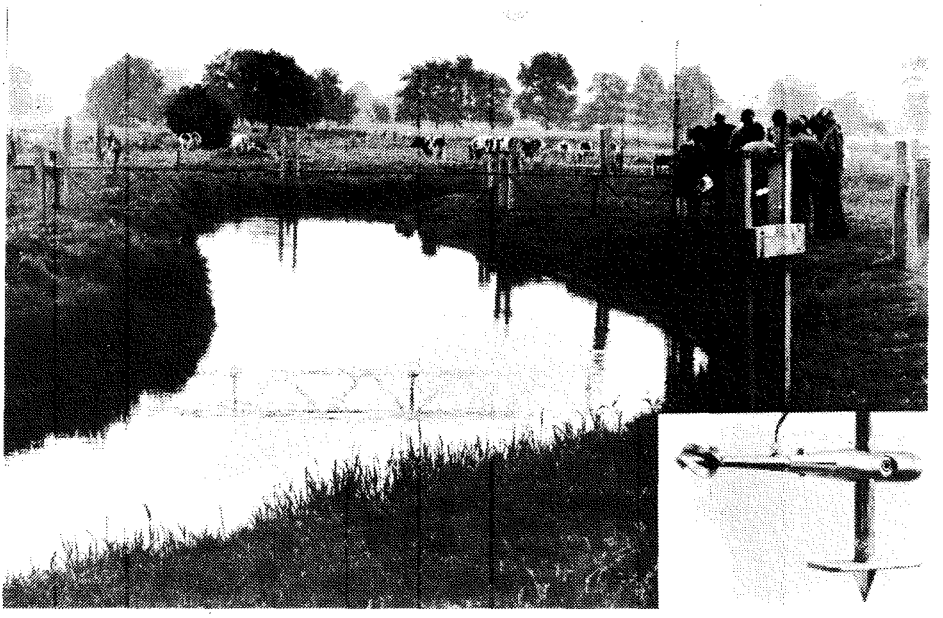


Fig. 2. Upstream view of straight reach between the two bends, with movable bridge and current meter.

The water level was measured twice a day at four point gauge stations in the study area (see Fig. 5 and Appendix D). The stations were situated in such a way, that the longitudinal slope of the water surface could be determined separately for the upstream straight reach, the bend reach and the downstream straight reach.

In the cross-sections where velocity measurements were made, the transverse slope of the water surface was determined using a point gauge mounted on the movable bridge. The results are represented in Fig. 7 and Appendix E.

3. Examination of results

3.1. Channel geometry

When comparing the results of the levellings at the beginning and at the end of the survey period, mostly small and unsystematic differences are found. Therefore, the channel geometry is assumed to have remained unaltered.

In addition to the channel alignment outlined in Fig. 1, the channel geometry in the bend section is depicted in further detail in Fig. 3 (also see Appendix B). This contour map shows that the bends are rather sharp and give rise to pronounced deformations of the channel profile, with high point bars and deep pools. Besides, the banks turn out to be quite steep, sometimes almost vertical.

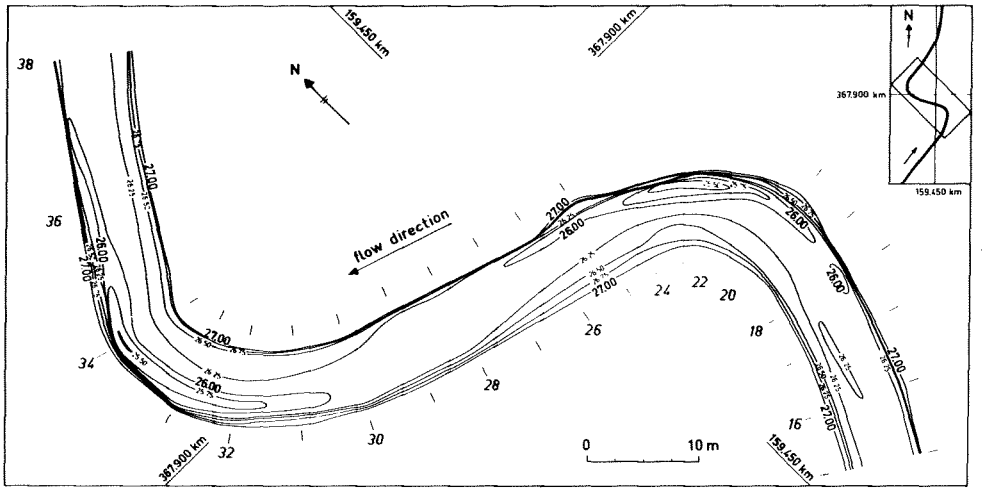


Fig. 3. Contour map of the bed level in the central part of the study area. Bed level indicated in metres above Agreed Ordnance Datum; contour interval 0.25 m. Contours above A.O.D. + 27.00 m are omitted. Surveyed by levelling, 1...5 May 1980.

The upstream and downstream reaches, which are not included in Fig. 3, have steep banks as well, with an almost horizontal bottom in the straight parts and a slightly distorted profile in the mild bend halfway the downstream reach (see Fig. 5 and Appendix B).

3.2. Flow conditions

Throughout the survey period, flow conditions were almost constant. According to the registrations of the Rijkswaterstaat float gauge station (Fig. 4) the variation of the daily mean water level amounted about 0.05 m; using the provisional stage-discharge relation for this station, the daily mean discharge varied between 1.00 and 1.22 $m^3\ s^{-1}$. This corrsponds reasonably well with the variation of the discharge as derived from the velocity measurements (using the velocity-area method; Anon., 1979): from 1.21 to 1.53 $m^3\ s^{-1}$.

The fall of the water surface over the survey section (between point gauge stations 1 and 4, marked in Fig. 5) also showed no important variations: from 0.13 to 0.15 m, with a mean value of 0.145 m (see Appendix D). For a discharge of 1.27 $m^3\ s^{-1}$, a water surface width of 6.10 m and a water depth of 0.50 m, this corresponds with a Chézy factor of about 30 $m^{\frac{1}{2}}\ s^{-1}$ (Darcy Weisbach friction factor 0.087).

During the period of measurements the vegetation in the channel increased, mainly on the banks. The channel bottom remained almost free from vegetation, except for a few places in the upstream reach and a hump (area $0.5 \times 1\ m^2$) near Station 30, just before the entrance of the second bend. This bed irregularity may have influenced the flow pattern in the second bend considerably.

3.3. Main flow velocity

In general, the longitudinal velocity and the main velocity in a curved river will not coincide exactly (Hickin, 1978; Bathurst, Thorne & Hey, 1979; De Vriend, 1981b). As long as the main flow direction does not

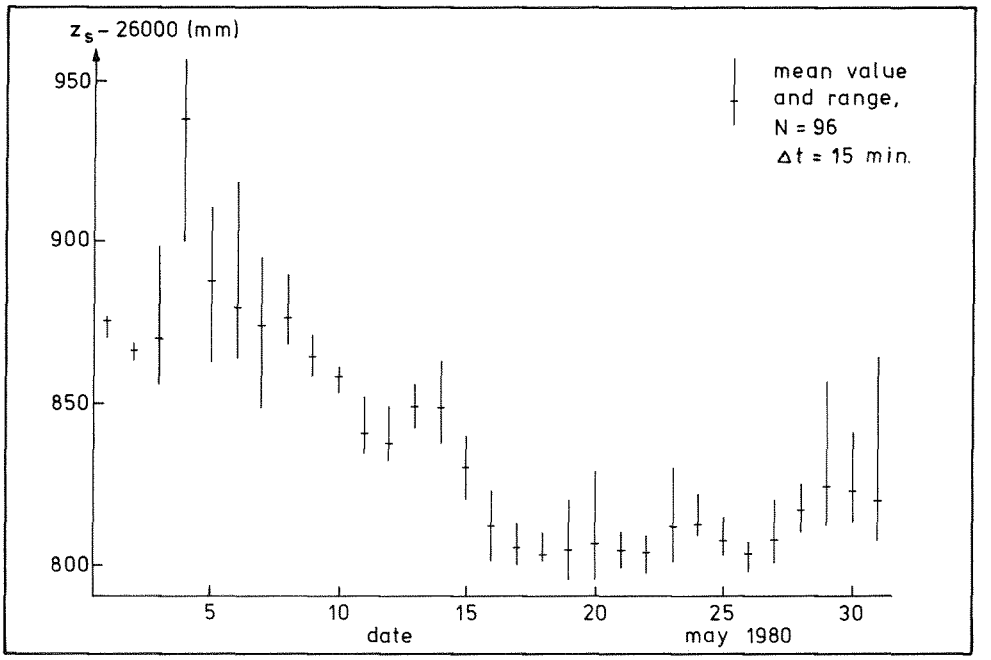


Fig. 4. Water surface level at Rijkswaterstaat float gauge station Borkel-Schaft.

deviate too strongly from the channel axis, however, these velocities have almost the same magnitude. Therefore, it is assumed that the observed longitudinal velocity is equal to the main flow velocity.

The results of the velocity measurements are represented in Fig. 5, showing the depth-averaged main velocity distribution after reduction to the reference discharge Q_o = 1.27 m^3 s^{-1}, and Fig. 6, giving the main flow isovel pattern in the various cross-sections.†

The principal features of the effect of the bends on the velocity distribution are the same as observed in various other field studies (Leopold, Wolman & Miller, 1964; Jackson, 1975; Bridge & Jarvis, 1976,

† The isovel patterns drawn in this figure have been smoothed by eye, so they are more or less subjective.

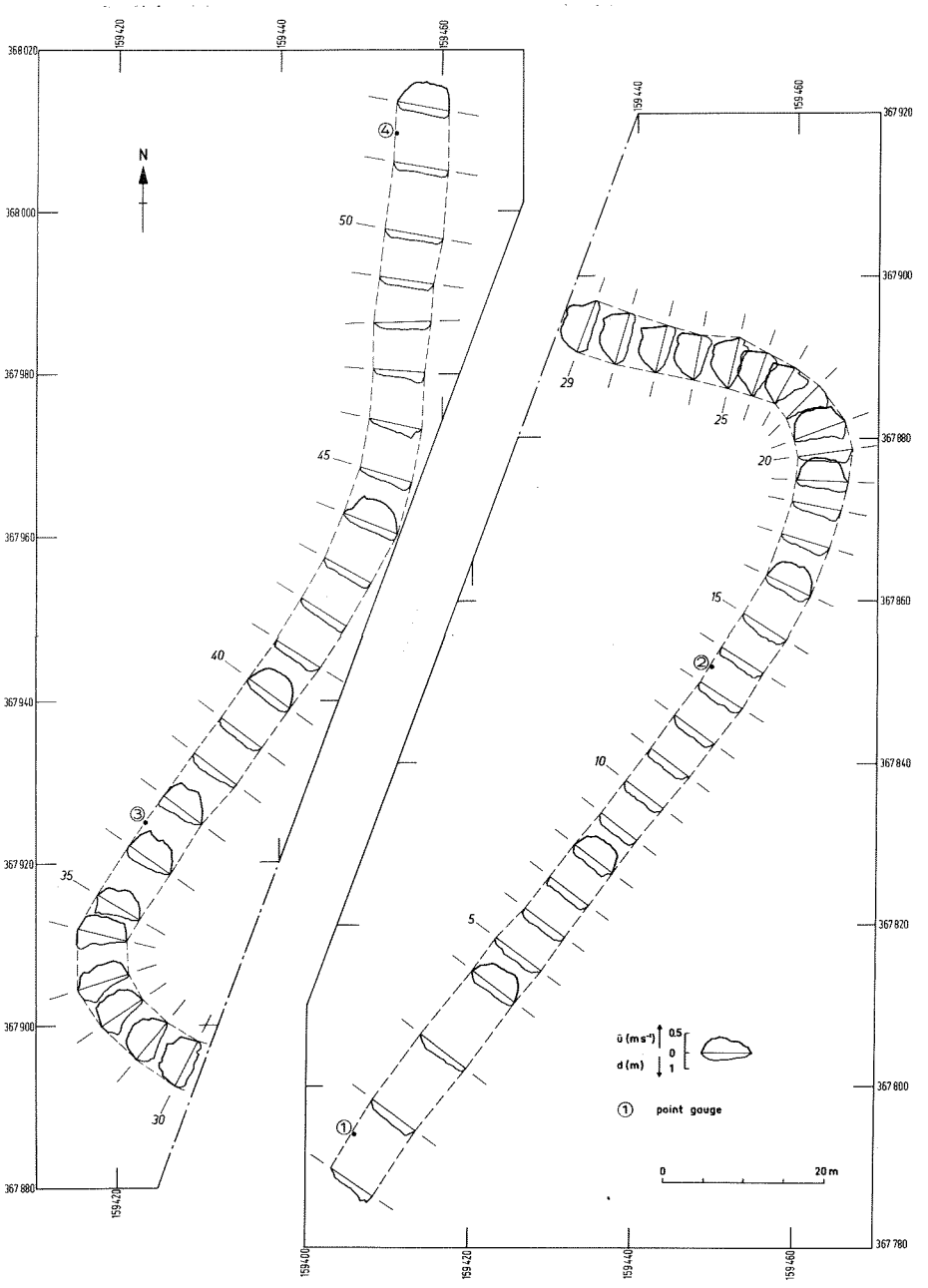


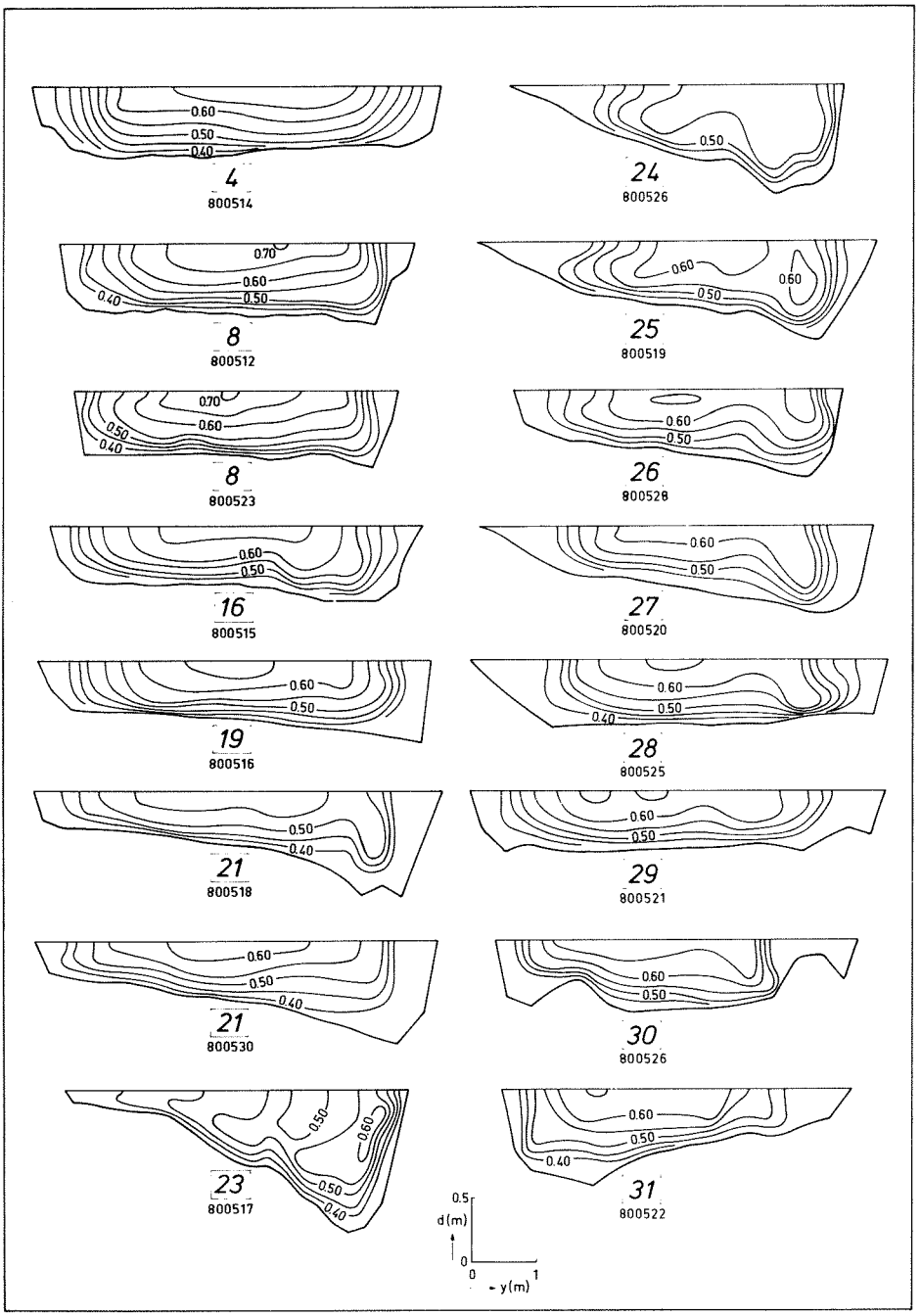
Fig. 5. Water depth and depth-averaged main flow velocity, measured 12...30 May 1980.

1982; Hickin, 1978; Bhowmik, 1979; Dietrich *et al.*, 1979) and in numerous laboratory experiments with curved flumes, either rectangular (*e.g.* Siebert, 1982; De Vriend, 1981b) or non-rectangular (Rozovskii, 1961; Yen, 1967; De Vriend & Koch, 1978). In general, the position of the velocity maximum tends to move towards the inner bank upon entering the bend. Subsequently, it gradually shifts outwards, approaching the outer bank near the bend exit. In addition to this horizontal redistribution, the vertical profile of the main flow velocity is deformed as the velocity maximum gradually shifts away from the water surface through the bend (Fig. 6).

If the bend is followed by a long straight reach, the deformations of the main velocity distribution gradually vanish. If another bend follows at a short distance, however, its flow pattern will be influenced. In case of opposite bends, this implies that the inward skewing of the main velocity distribution is enhanced, whence it takes longer for the velocity maximum to reach the outer bend (Callander, 1978). This may also have consequences for the channel configuration: the point bar near the inner bank of the second bend will not be as high as in a bend preceded by a long straight reach.

The results of the velocity measurements in the Dommel suggest that the influence of the first bend vanishes before the flow enters the second bend. It should be noted, however, that this picture may have been influenced by the vegetation-covered bed irregularity near Station 30 (also see Fig. 9 and Appendix B), the more so since the point bar in the second bend is much lower than the one in the first bend, even though the two bends have almost the same radius of curvature.

The horizontal redistribution of the main flow velocity has been explained in various ways. Bridge & Jarvis (1976) state that the higher velocity in the inner bend must be a remnant of a preceding opposite bend. The results of the present survey, however, make clear that this cannot be the only explanation, since even in a bend following a long straight reach the velocity maximum tends to shift towards the inner bank (Fig. 6, Station 21; also see Hickin, 1978, and the results of many laboratory experiments in curved rectangular flumes). Hickin (1978)


0.60
0.50
0.40
4
800514
0.50
24
800526
0.70
0.60
0.50
0.40
8
800512
0.60
0.50
0.60
25
800519
0.70
0.60
0.50
0.40
8
800523
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0.60
0.50
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23
800517
0.60
0.50
0.40
31
800522
0.5
d(m)
0
0
1
y(m)

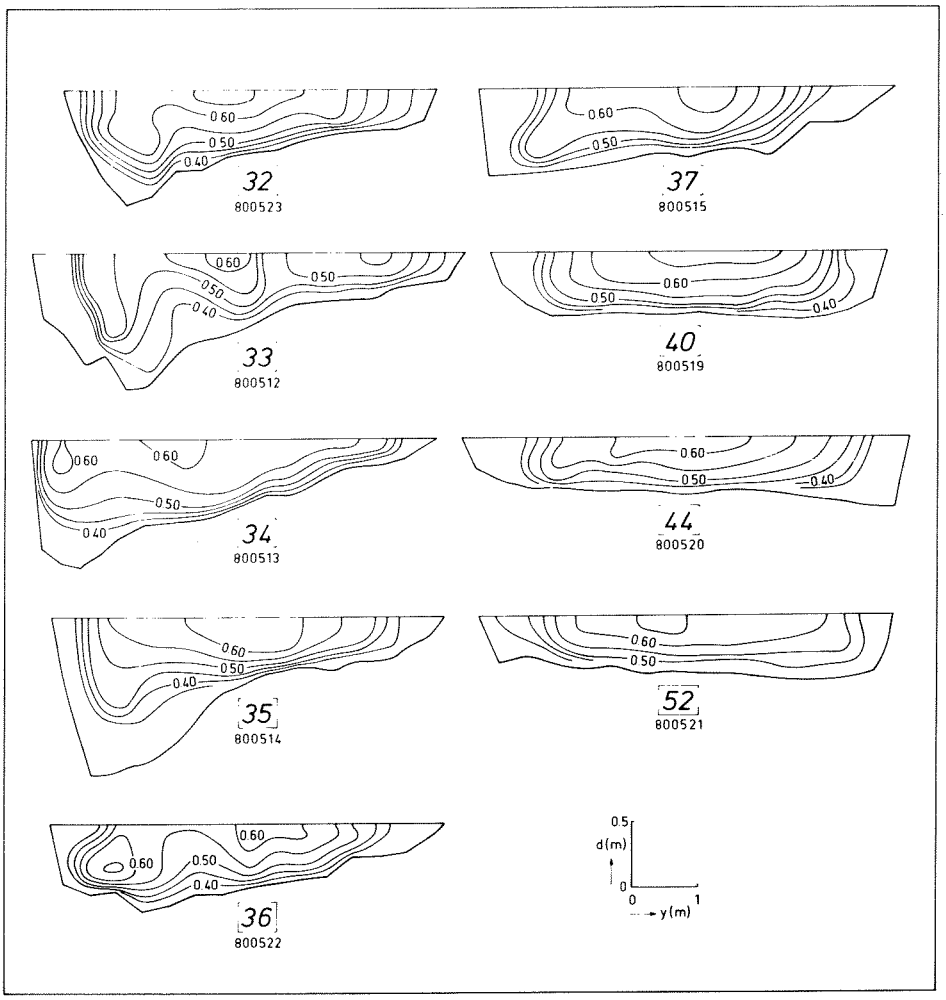


Fig. 6. Downstream view of main flow isovel pattern. Isovel interval 0.05 m s^{-1}. In each diagram the station number and the date of measurement are indicated.

argues that the redistribution of the main flow in a bend is rather a matter of continuity and main flow inertia interacting with the non-uniformity of the channel. Dietrich *et al.* (1979), however, emphasize the role of two other factors, *viz.* the longitudinal pressure gradients

attending the formation of the transverse surface slope and the transverse redistribution of main flow momentum by the secondary circulation. Only quantitative computations can make clear which explanation applies here (see par. 6.2).

The vertical deformation of the main velocity near the ends of the surveyed bends must be attributed to the transverse redistribution of momentum by the secondary flow (Rozovskii, 1961; Bathurst *et al.*, 1979; De Vriend, 1981a, 1981b).

3.4. Transverse slope of the water surface

As stated in par. 2.2, the transverse fall of the water level was measured using a point gauge mounted on a movable bridge. This method turns out to be rather sensitive to small fluctuations of the water level: the measured data are widely scattered (see Fig. 7). Consequently, they do not yield reliable information on the longitudinal distribution of the transverse slope. The maxima of the transverse water surface slope in the bends, however, can still be estimated: 1.6×10^{-3} for the first bend and 1.9×10^{-3} for the second one (Appendix E).

4. Mathematical simulation

4.1. Mathematical model

In order to gain a better insight into the physical process causing the observed redistribution of the depth-averaged main flow velocity, the flow has been simulated mathematically using two computational models, *viz.* a rather extensive one developed for curved shallow channels of arbitrary cross-sectional shape, called 'model A' (see De Vriend, 1981b), and a strongly simplified one, called 'model B', holding good under the following conditions (Kalkwijk & De Vriend, 1980):

- the flow is shallow and gently curved,
- the bed (including the banks) is mildly sloping,
- the flow is mainly controlled by friction,
- the longitudinal component of the velocity is predominant,
- the Froude number is so small, that a 'rigid-lid' approximation can be applied to the water surface (*i.e.* the surface is left free in the pressure gradient terms, but not in the water depth).

Either model solves the depth-averaged balance equations for mass and momentum, with the vertical distributions of the main and the secondary velocity components assumed invariant throughout the flow.

Formulated in the 'channel-fitted' coordinate system (s, n), with s parallel to the channel axis and n perpendicular to it, the system of depth-averaged equations in model B reads

- continuity

$$\frac{\partial}{\partial s}(\overline{u}\, d) + \frac{\partial}{\partial n}(\overline{v}\, d) + \frac{\overline{v}\, d}{r_s} = 0 \qquad (1)$$

- s - momentum

$$k_{ss}\left(\frac{1}{d}\frac{\partial}{\partial s}(\overline{u}^2 d) + \frac{1}{d}\frac{\partial}{\partial n}(\overline{u}\,\overline{v}\, d) + 2\frac{\overline{u}\,\overline{v}}{r_s} \right) +$$

convective main flow inertia

$$+ k_{sn}\left(\frac{1}{d} \frac{\partial}{\partial n} \left(\frac{\overline{u}^2 d^2}{R_s} \right) + 2 \frac{\overline{u}^2 d}{R_s^2} \right) = - \frac{1}{\rho} \frac{\partial P}{\partial s} - \frac{g}{C^2} \frac{\overline{u}^2}{d} \qquad (2)$$

secondary flow convection | longit. pressure gradient | bed friction

- n - momentum

$$- k_{ss} \frac{\overline{u}^2}{R_s} = - \frac{1}{\rho} \frac{\partial P}{\partial n} \qquad (3)$$

centripetal acceleration | transverse pressure gradient

with: $\overline{u}$, $\overline{v}$ = depth-averaged velocity components in the s- and n-direction, respectively,

P = total pressure,

d = local water depth,

r_s = local radius of curvature of the s-lines,

R_s = local radius of curvature of the streamlines of the depth-averaged flow field,

k_{ss} = correction factor for the vertical non-uniformity of the main flow velocity ($k_{ss} \simeq 1$),

k_{sn} = secondary flow convection factor ($k_{sn} \simeq 0.8$),

g = acceleration due to gravity,

C = Chézy factor,

ρ = mass density of the fluid.

If all aforementioned limiting conditions are met, this model gives a proper description of the redistribution of the depth-averaged main flow in a curved channel (Kalkwijk & De Vriend, 1980).

In addition to the phenomena included in the strongly simplified model, the more extensive model takes account of lateral diffusion as well as inertial growth and decay of the secondary flow (De Vriend, 1981b).

4.2. Further simplification of model B for the present flow case

The channel geometry in the study area does not meet all requirements for the strongly simplified mathematical model to be applicable. The channel can be considered as shallow (having a width to depth ratio of about 12), but it is not quite mildly curved (radius of curvature to width ratio ≈ 1.7) and the banks are far from mildly sloping (locally almost vertical). Consequently, applying the models, without any modification, to the present flow case leads to erroneous results, with the velocity near the steep concave banks in the bends tending to infinity (Kalkwijk & De Vriend, 1980; see Fig.9b).

This problem could be circumvented by disregarding the redistribution of the main flow due to the secondary circulation ($k_{sn} = 0$). This may seem a rather crude simplification, but there are some arguments in favour (De Vriend, 1981a, 1981b).

Firstly, the secondary flow intensity in the model is proportional to the local properties of the main flow (velocity, depth, streamline curvature), whereas the actual intensity has its own inertia, causing a retarded adaptation to longitudinal variations of the main flow. The characteristic length scale of this adaptation is about $1.3\ C\ g^{-\frac{1}{2}}\ d$ (Rozovskii, 1961), irrespective of the channel curvature. So in sharp bends the growth of the secondary flow to its full strength will take a rather large part of the bend. This is readily illustrated by the deformation of the main flow isovel pattern depicted in Fig. 6: only in the last part of each bend these deformations, which are due to the secondary flow (Bathurst *et al.*, 1979), become appreciable.

Secondly, in sharp bends like the present ones the secondary flow will interact with the main flow as soon as it becomes strong enough. This interaction leads to a considerable decrease of the maximum secondary flow intensity and, in case of a steep concave bank, it can give rise to the formation of an additional, counter-rotating cell of secondary circulation near the surface in the outer bend (*cf.* Bathurst *et al.*, 1979; Thorne, Bathurst & Hey, 1981). The deformation of the isovel pattern at the end of either bend (Fig. 6) suggests this

additional cell to occur, indeed. If so, the transverse redistribution of main flow momentum by the secondary flow is distinctly different: the main flow velocity maximum will not shift further outwards than the boundary between the two cells (*cf.* Fig. 10). The strongly simplified model, however, takes no account of any interaction of the secondary flow with the main flow whatsoever and, especially for the double-cell pattern, the inclusion of this effect would complicate the model disproportionately (De Vriend & Koch, 1981). Therefore, arguing that the complete Eq. 2 would yield erroneous results and that it is hardly possible to improve the model at this point, it seems reasonable to leave the convective effect of the secondary flow out of consideration, keeping in mind that the predictions may become rather poor in regions where this effect is strong.

The effects of omitting secondary flow convection will be considered for the strongly simplified model as well as for the more extensive one, by comparing the results of either model with and without convection terms.

4.3. Channel schematization

Although, in principle, the mathematical models apply to a much wider range of channel configurations, the presently available versions of the computer codes are restricted to channels of constant width, with a longitudinal axis consisting of a limited number of straight lines and circular arcs. Therefore, the channel planform has been schematized, fixing the width at 6.10 m and dividing the longitudinal axis into 10 sections, according to Table 1.

Channel bed undulations (mostly ripples, locally dunes), with an estimated maximum height of about 0.1 m, caused significant deviations from the mean bed topography. The bed forms were not observed systematically, nor was their effect eliminated by taking the average of a large number of levellings at each point. Hence the irregularities have to be considered as random scatter of the data without any physical meaning. Therefore it would not be realistic to introduce the raw bed

section no.	centre of curvature		arc properties of the channel axis			computational grid	
	X (m)	Y (m)	R_c (m)	Φ_{total} (degr.)	L_{total} (m)	number of steps	Δs (m)
1	-	-	∞	0	40.60	12	3.38
2	159 410.6	367 884.1	53.50	27.2	25.40	8	3.18
3	159 453.3	367 877.2	10.20	70.2	12.50	4	3.13
4	159 446.7	367 866.4	22.90	16.2	6.50	2	3.25
5	-	-	∞	0	20.10	6	3.35
6	159 439.9	367 917.9	25.30	- 34.9	15.40	5	3.08
7	159 428.6	367 908.4	10.50	- 75.3	13.80	4	3.45
8	-	-	∞	0	47.10	14	3.36
9	159 408.5	367 978.9	46.00	30.3	24.30	7	3.47
10	-	-	∞	0	37.50	12	3.13

Table 1. Schematization of the channel planform.

level data into the computation.

Another reason for schematizing the bed configuration is the obvious necessity to reconcile the transverse channel profile with the planform schematization discussed before. Therefore the wet perimeter of the channel has been schematized by eye before being used in the computation (see Figs. 5 and 8, keeping in mind that the cross-sections of the measuring grid and the computational grid are not exactly coincident).

In accordance with the 'rigid-lid' approximation in the mathematical model, the water surface is taken horizontal in each cross-section. Its longitudinal slope in the channel axis is assumed to correspond with the overall mean energy slope (5.2×10^{-4}), with z_s = A.O.D. + 26.620 m at point gauge station 3.

The influence of the bed forms is incorporated in the Chézy roughness factor C, estimated from the energy losses measured in the straight reaches. Spatial variations of C due to variations in the water depth are taken into account through the White-Colebrook formula for a rough bed, keeping the roughness height constant. Hence

$$C = C_o + \frac{\sqrt{g}}{\kappa} \ln (d/d_o) \qquad (4)$$

in which C_o = Chézy factor for the reference depth d_o ($C_o \simeq 30$ m$^{\frac{1}{2}}$ s^{-1}),

κ = Von Karman constant ($\simeq 0.4$).

Finally, it is pointed out that, as long as only the distribution of the main velocity is concerned and not its absolute magnitude, the mathematical models can be formulated in terms of dimensionless variables, such that the magnitude of the discharge is not relevant (neither the Froude number nor the Reynolds number figure in these models).

5. Computational results

Both the extensive model (A) and the strongly simplified model (B), with $k_{sn} = 0$ as well as $k_{sn} \neq 0$, have been applied to the schematized channel, with the velocity distribution at the upstream boundary (traverse 6) as in fully-developed straight channel flow with the same cross-section. The transverse pressure gradient and depth-averaged main velocity distribution resulting from these computations are shown in Fig. 7 and Figs. 8 & 9, respectively.

The longitudinal distribution of the transverse pressure gradient is almost the same for all four model versions applied here. A typical example is given in Fig. 7, together with the measured data. Apart from some oscillations caused by local disturbances in the streamline curvature (due to the rather coarse computational grid), the measured and the calculated maxima are about the same. In addition, both the measured and the calculated distribution show that there is hardly a region of constant transverse pressure gradient: in either bend the growth and decay regions are connected. Further conclusions, however, cannot be drawn from this figure, because of the large scatter of the measured data.

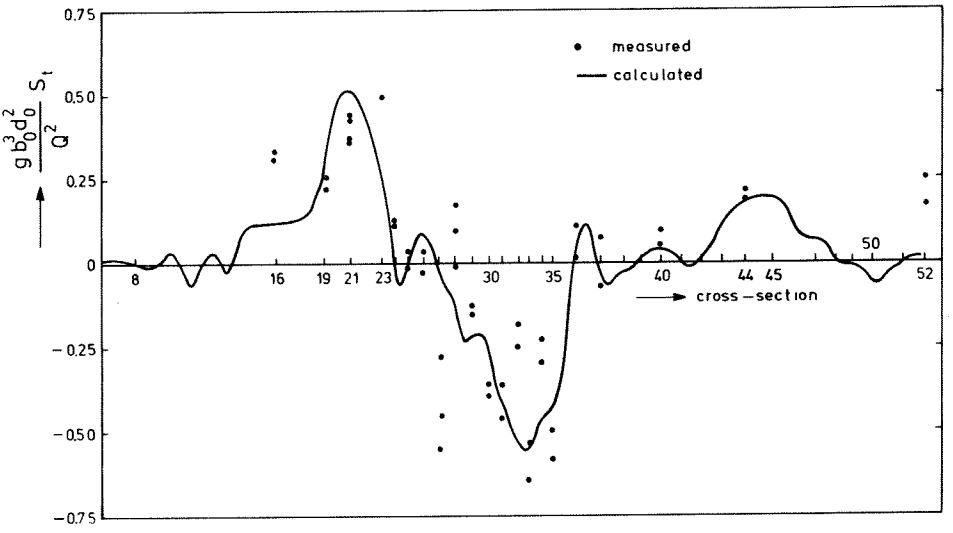


Fig. 7. Transverse slope of the water surface.

Figure 8 gives an overall impression of the velocity predictions by the strongly simplified model with $k_{sn} = 0$, for the cross-sections that are nearest to the ones of the velocity measuring grid. At the first glance, the calculated depth-averaged main velocity field presents the same features as the measured one (Fig. 5).† In the first part of each bend the flow tends to shift towards the convex bank. Subsequently, it gradually moves outwards, to yield an outward skewed distribution of $\overline{u}$ near the bend exit and in the straight reach downstream of each bend.

On closer inspection, however, significant differences become apparent (Fig. 9a). Firstly, as could be expected from a model in which lateral diffusion of momentum is disregarded, the predicted influence of the banks on $\overline{u}$ does not extend far enough into the central part of the cross-section. The results of the extensive model represented in the same figure, however, make clear that the absence of lateral diffusion only partly explains the underestimation of the bank influence. There must be other causes, such as the schematization of the bed roughness, which takes no account of the vegetation on the banks.

Secondly, even when limiting consideration to the regions where the influence of the banks seems negligible, the skewness of the $\overline{u}$-distribution in the last part of the first bend is overestimated by the models. When comparing the central part of Cross-sections 23 and 24 (Fig. 9a), the skewness of the computed velocity distributions remains almost unaltered, whereas the slope of the regression line through the measured data decreases by a factor 2.3. As the channel geometry hardly changes between these two cross-sections (Fig. 3), this decrease seems rather surprising. Still it is not accidental, since it also occurs, to an even more marked degree, at the end of the second bend (Fig. 9: Section 35 *vs* Section 33).

This loss of skewness cannot be explained by arguing that at Station

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† The anomalous peak in $\overline{u}$ near the convex bank at the end of the first bend (Station 25) is probably caused by the application of a computational grid that is too coarse for the very shallow flow there.

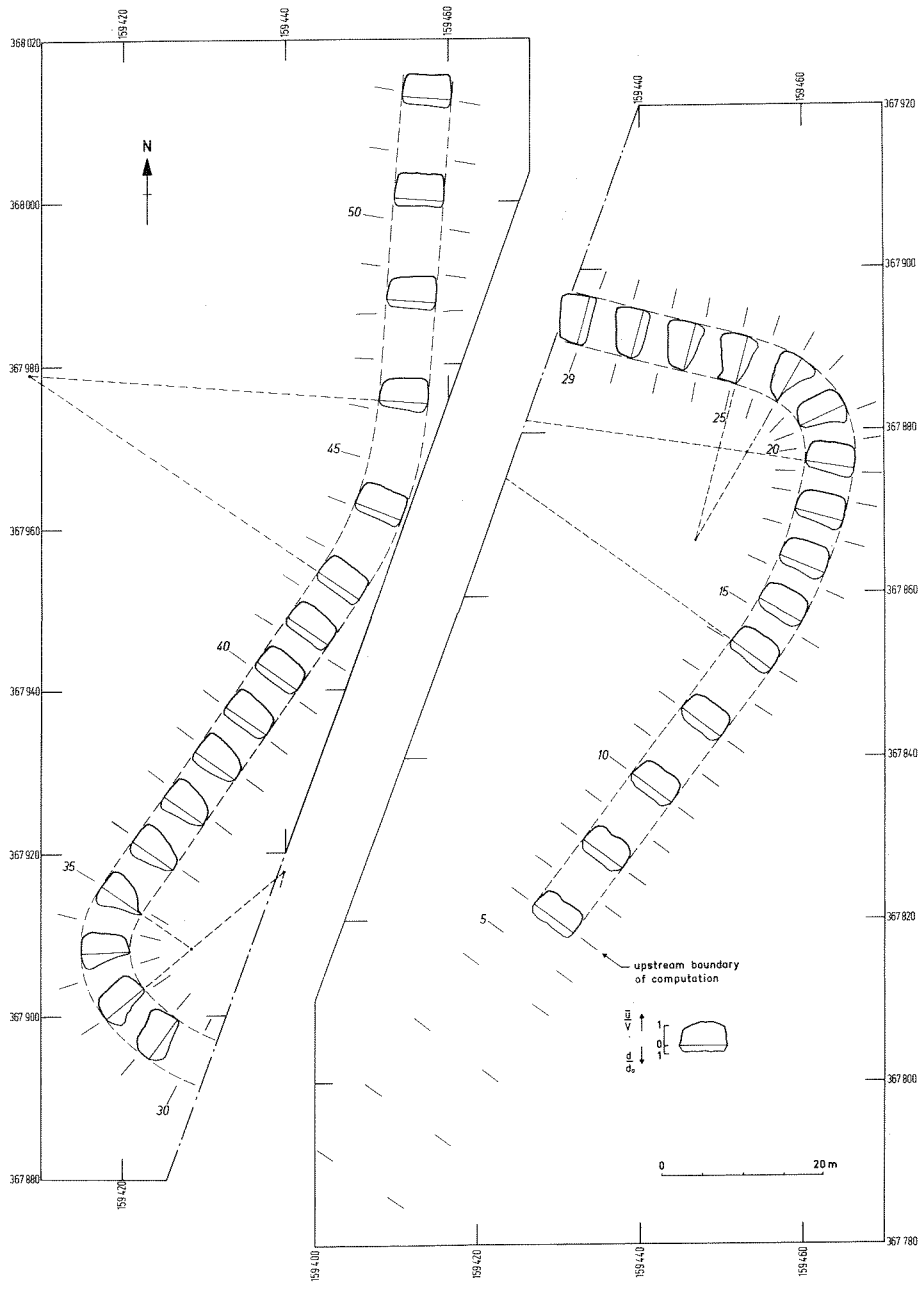
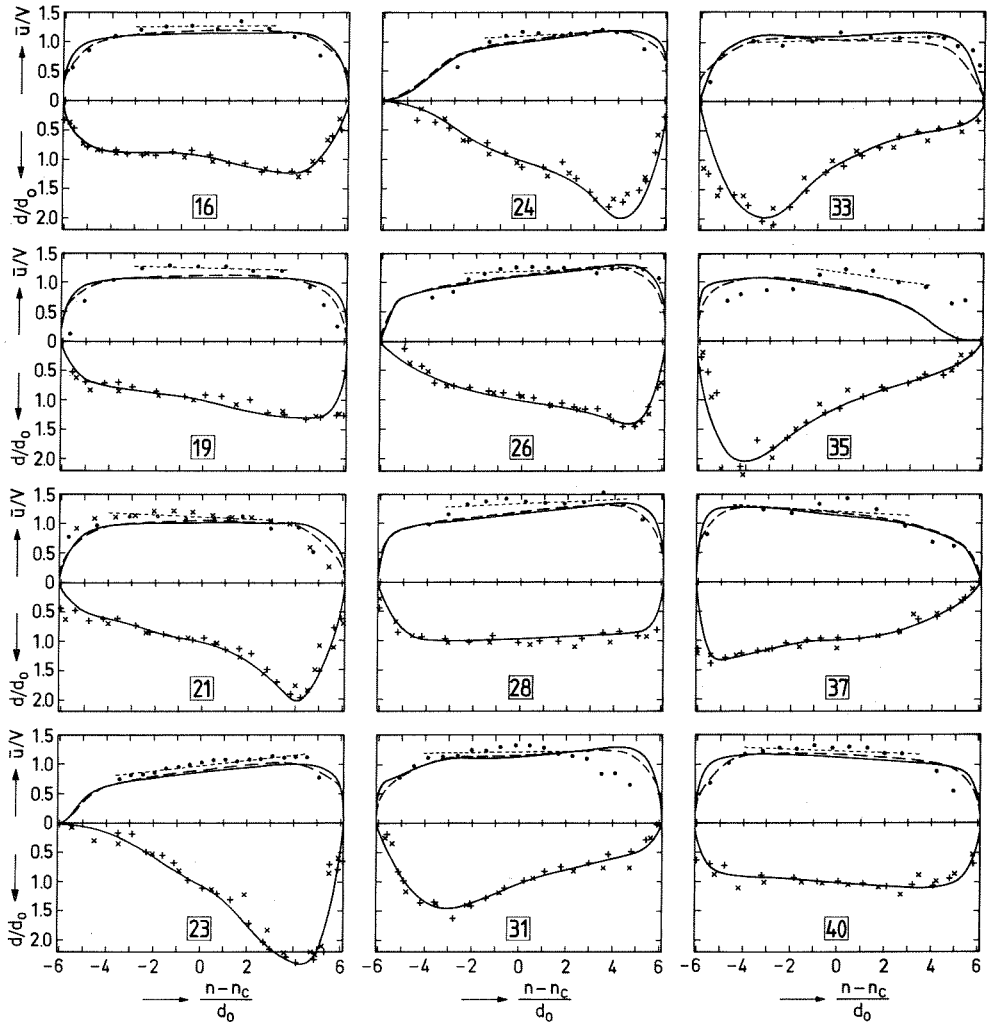


Fig. 8. Schematized water depth and computed depth-averaged main flow velocity (using model B without secondary flow convection (k_{sn} = 0)).



(a) $k_{sn} = 0$

$\bar{u}/V$ - plots:

measured { • × measured data; ----- linear regression line (for central region only)

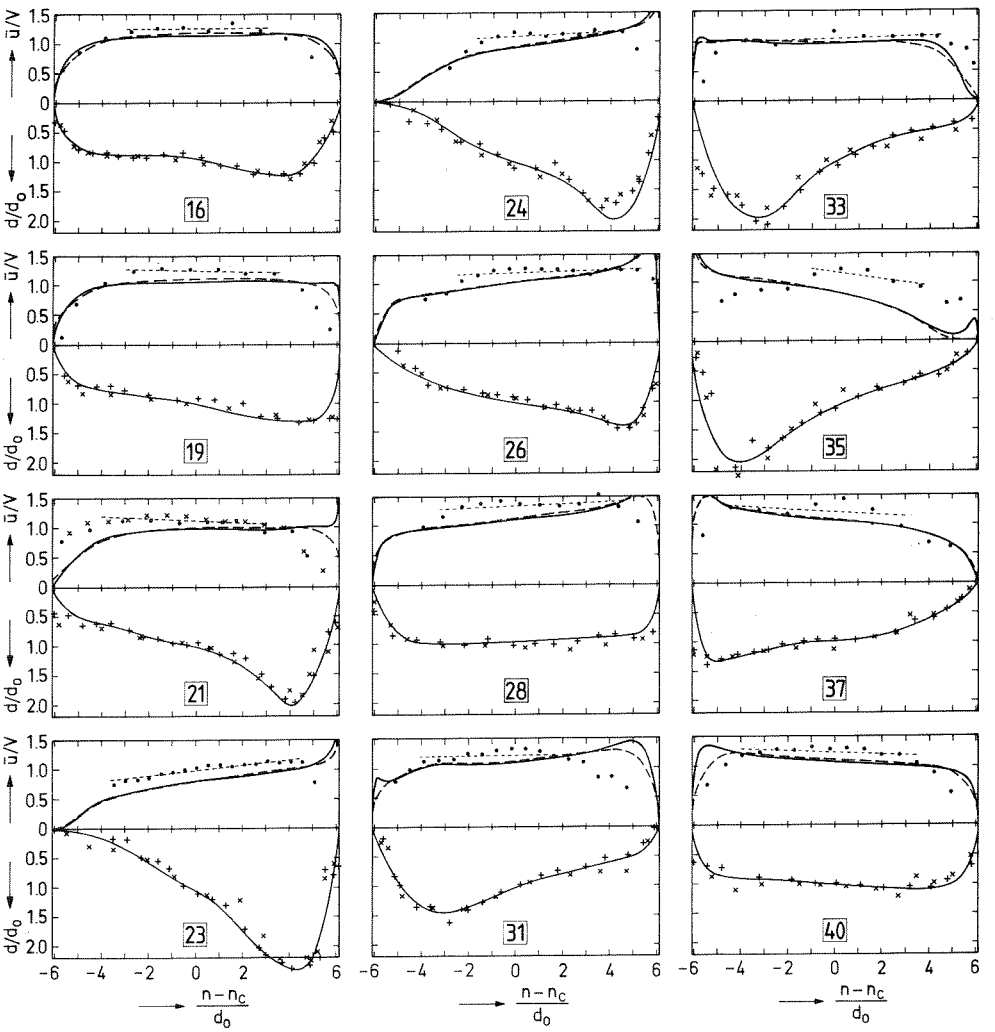
computed { ——— model B; — — — model A

d/d_o - plots:

+ × measured data

——— channel schematization

99 cross-section



(b) $k_{sn} \neq 0$

Fig. 9. Comparison between measured and computed depth-averaged main flow velocity.

24, situated at the exit of the bend, the velocity distribution is changing already to its straight-channel shape. In this kind of unidirectional subcritical flow, upstream influencing occurs almost exclusively through longitudinal pressure gradients (Pratap & Spalding, 1976) and near the bend exit these gradients, arising mainly from the decrease of the transverse slope of the water surface there, will rather cause an additional skewing of $\bar{u}$.

A qualitatively plausible explanation can be based on the transverse variation of the bed forms that can be expected in the last part of the bend (Jackson, 1975; also see Zimmermann, 1974). This variation implies that the bed roughness will be larger in the outer bend, so that the flow will be forced somewhat further inwards. By lack of sufficient information on the bed forms in the Dommel, this cannot be verified quantitatively. The results of an additional run of the strongly simplified model with $C \equiv C_o$, however, closely agree with the ones represented in Figs. 8 and 9a. Hence it must be doubted whether the hypothesis is quantitatively correct.

Another phenomenon that may play a part in the observed velocity redistribution near the bend exit is the convective transport of main flow momentum in the transverse plane by the secondary circulation. When attempting to take account of this effect by including secondary flow convection in the present models, the predictions are not better in the central region and they are even worse near the banks, especially in the outer bends (Fig. 9b). As was shown by Kalkwijk & De Vriend (1980), the main velocity distribution resulting from the strongly simplified model with $k_{sn} \neq 0$ contains a high peak tending to infinity if the outer bank is too steep. Even the more extensive model, however, in which lateral diffusion keeps the velocity from going to infinity, yields pronounced and obviously spurious peaks in $\bar{u}$ near the outer bank. Also near the inner bank, the local effect of secondary flow convection, a reduction of $\bar{u}$ (Kalkwijk & De Vriend, 1980; De Vriend, 1981a), is too strong and there is too little lateral interaction. This is a basic shortcoming of models based on strict similarity hypotheses for the main and the secondary velocity profiles (De Vriend, 1981b).

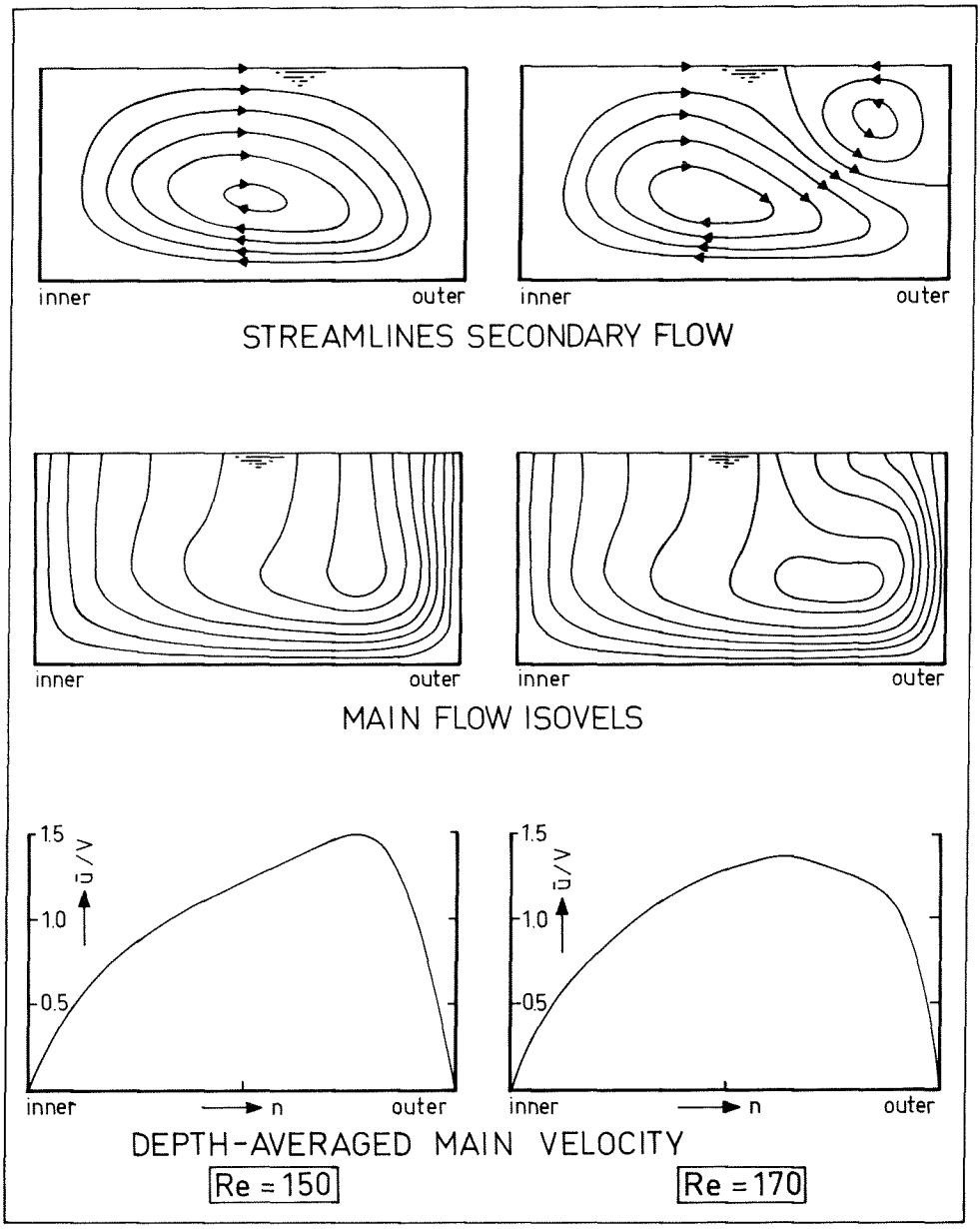


Fig. 10. Transition to the double-cell pattern of secondary flow and its effect on the main velocity distribution (for fully-developed laminar flow in a coiled square pipe, with $\frac{d}{b_o} = 0.5$ and $\frac{d}{R_c} = 0.1$; De Vriend, 1981b).

A secondary circulation consisting of a single cell, with the velocity directed towards the outer bank near the water surface and towards the inner bank near the bottom would enhance the outward skewing of $\overline{u}$ (Kalkwijk & De Vriend, 1980; De Vriend, 1981a; De Vriend & Koch, 1981). If a second cell with an opposite circulation is formed near the surface in the outer bend, however, the velocity maximum will tend to shift back inwards to the boundary between the two cells (see Fig. 10). Though not investigated systematically, the existence of this second cell was confirmed by occasional observations of floating material during the survey. Moreover, the deformations of the main flow isovels near the outer bank (Fig. 6) suggest that a double-cell configuration of the secondary flow does occur in the last parts of the bends (*cf.* Bathurst *et al.*, 1979; Thorne *et al.*, 1981). This could account, at least qualitatively, for the observed changes of $\frac{\partial \overline{u}}{\partial n}$ between Stations 23 and 24 and between Stations 33 and 35.

This implies that, for the present type of bends, the incorporation of secondary flow convection requires the mathematical model to describe the formation of the double-cell pattern. Such a model, however, is extremely complicated and necessarily three-dimensional (De Vriend & Koch, 1981). Hence a quantitative verification of the above hypothesis is beyond reach, let alone that the effect be incorporated in the present two-dimensional model.

A third explanation, also qualitative, hypothetical, and hard to be verified quantitatively, can be found in the effect of secondary flow convection on the longitudinal bed shear stress. This convective influence causes the maximum in the main velocity profile to shift from the surface towards the lower half of the vertical (Fig. 6). Consequently, if $\overline{u}$ remains unaltered, the velocity gradient at the bottom, and hence the bed shear stress, will increase. This increase will vary along with the intensity of the secondary flow as compared with the depth-averaged main flow velocity. Hence it is likely to be largest in the deeper parts of the cross-section at the end of the bend, where it will hamper the outward skewing of $\overline{u}$.

It may be noted in passing that, if it would have been possible to

quantify the increase of the shear velocity as compared with $\bar{u}$, this effect could have been reckoned with by the introduction of a fictitious additional bed roughness.

In summary, the comparison of the model results with the measured data leads to the conclusion that, for this steep-banked channel with its sharply curved, but rather short bends, the models without secondary flow convection work reasonably well in the straight reaches and in the larger part of each bend. As soon as the influence of this convection becomes important, *i.e.* in the downstream parts of the bends, these models overestimate the outward skewing of the main flow velocity distribution. The influence of this shortcoming still lingers in the straight reaches following the bends. Consequently, the description of the interaction between the velocity distribution in the two consecutive bends is not entirely correct.

6. Application of the model

6.1. Preliminary remarks

The foregoing makes clear, that the mathematical models without secondary flow convection used here will not be quite suitable as a component of a predictive mathematical model of river bend morphology. To that end, the convective interaction of the main and the secondary flow has to be incorporated and, in case of steep banks, this requires essentially more sophisticated models.

On the other hand, it has been shown that, in the specific type of bends considered here, the role of the secondary flow is not as important as suggested elsewhere (Dietrich *et al.*, 1979; De Vriend, 1981a). This provides the possibility of using model B, with $k_{sn} = 0$, as a tool for the physical analysis of the main velocity redistribution in this kind of river bends, at least in large parts of them.

6.2. Analysis of the depth-averaged main velocity field

The tendency of the velocity maximum to shift towards the inner bank in the first part of the bend is represented reasonably well by the model. So far, various explanations of this phenomenon have been given in the literature (also see par. 3.3). The argument that it must be a remnant of the preceding opposite bend (Bridge & Jarvis, 1976) is contradicted by the observations in the bend following the upstream straight reach. Without a quantitative model, however, it is difficult to find out whether the longitudinal pressure gradients are of minor importance here (Hickin, 1978), or, on the contrary, predominate (Dietrich *et al.*, 1979). Near the bend entrance these longitudinal pressure gradients are mainly caused by the growth of the transverse water surface slope. When omitting the transverse pressure gradients from the model, these longitudinal pressure gradients appear to be definitely important to the inward shift of the main velocity maximum (see Fig. 11, Station 21). So, in

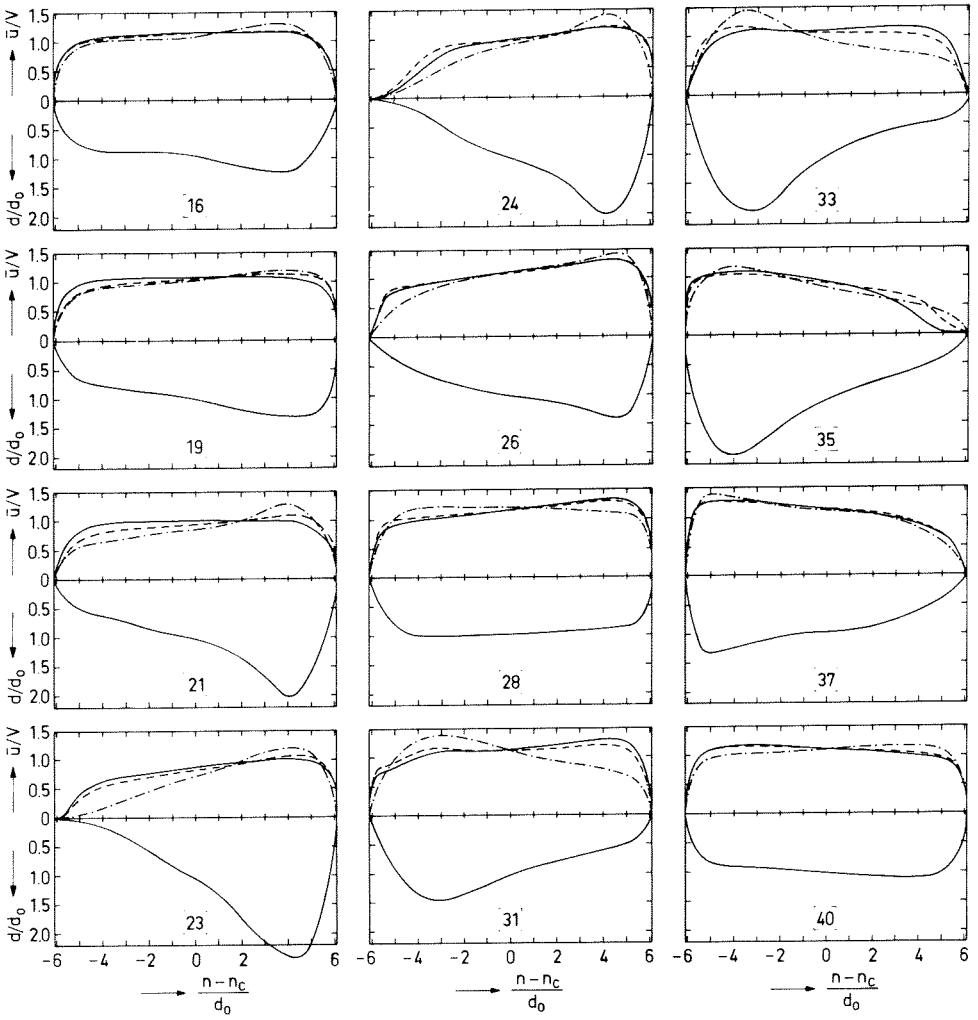


Fig. 11. Analysis of main velocity redistribution, using model B without secondary flow convection ($k_{sn} = 0$).

contrast with Hickin's proposition, the interaction of channel geometry, flow continuity and convective acceleration is not sufficient to explain this phenomenon.

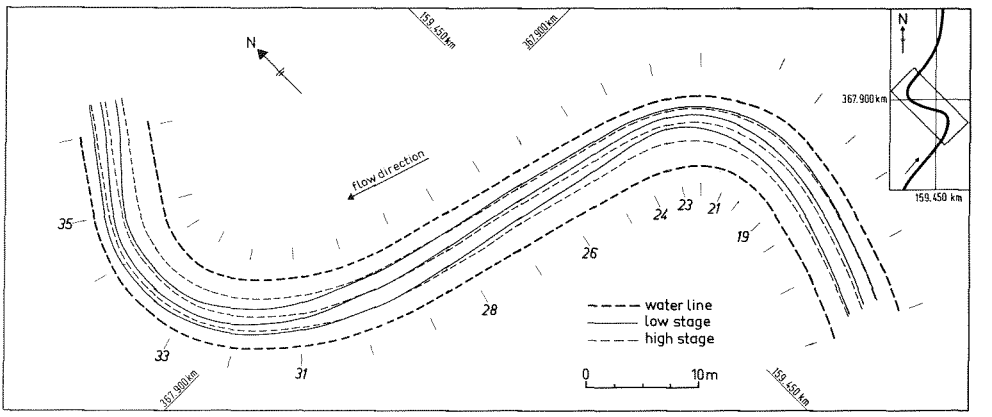
Another model run, in which not only the transverse pressure gradient is omitted, but also the convective acceleration terms (Fig. 11, dash-dotted lines), shows that it is rather the combination of longitudinal pressure gradients and main flow inertia that causes the inward skewing tendency. The retardative effect of convective acceleration keeps the almost symmetric velocity distribution from adapting immediately to the asymmetric bed profile in the bend, while the longitudinal pressure gradients give rise to additional accelerations and decelerations in the inner and the outer parts of the bend, respectively.

The additional runs also make clear, that the gradual outward skewing of the main velocity further downstream in a bend is a matter of retarded adaptation to the channel geometry rather than of secondary flow convection (*cf.* Dietrich *et al.*, 1979). Only close to the bend exit, the latter effect becomes appreciable, but there it seems to hamper the outward skewing instead of enhancing it (as has been discussed in chapter 5). It should be stressed, however, that these conclusions only hold good for channels with steep banks and short, sharply curved bends. If the banks are shelving and the bends are mild and long, the explanation given by Dietrich *et al.* (1979) will hold much better.

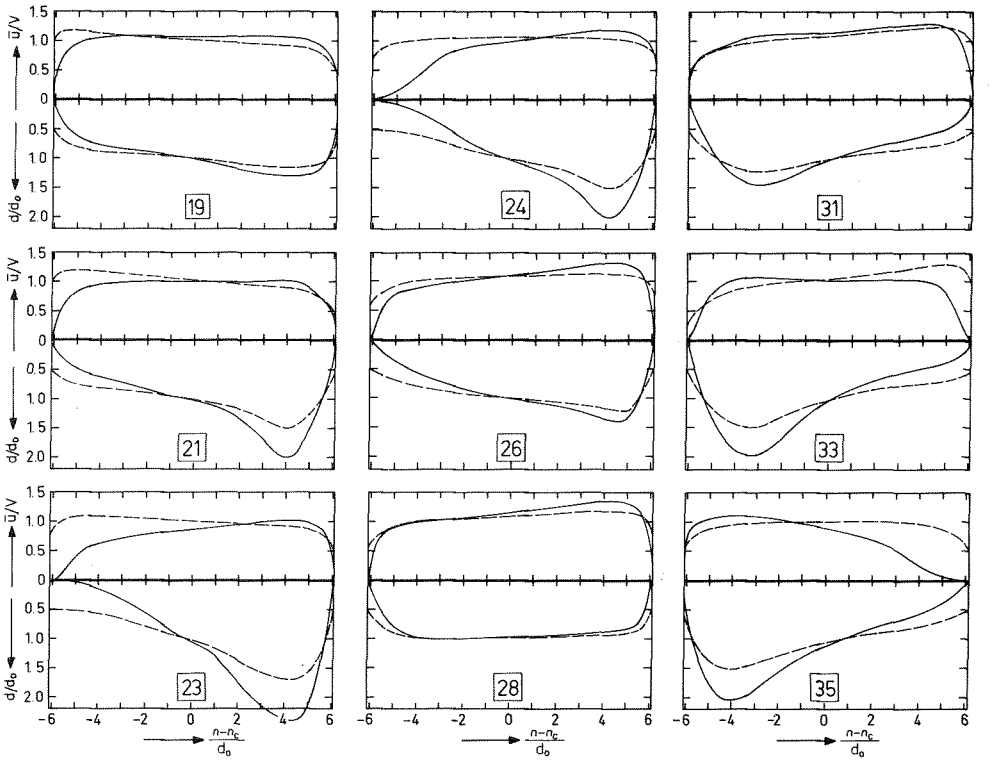
6.3. Variation of the flow pattern with the stage

Bridge & Jarvis (1976, 1982) and Bhowmik (1979) have pointed out that the main velocity distribution in a curved channel varies with the flow stage. At high stages the line of maximum velocity lies further inwards than at low stages. This is attributed to the slower growth of the secondary flow, which is seen as the principal cause of the outward skewing of the main velocity distribution.

In the present channel, however, the secondary flow has appeared not so important to the outward skewing process and it would be interesting to see what happens here if the flow stage becomes higher.



(a)



(b)

Fig. 12. Effect of flow stage on streamline pattern (a) and main velocity distribution (b). High stage (- - - -) differs from low stage (———) by 0.50 m.

Unfortunately, measured data for higher stages are not available, so only the mathematical model can be used here. The model predictions for the larger part of the bends are likely to be at least as good as for the lower stage, since the secondary flow as well as its convective interaction with the main flow will develop more slowly now (for either phenomenon the characteristic length of longitudinal variation is almost proportional to the water depth).

In order to avoid too many complications, a higher flow stage is simulated in the model by increasing the water depth and keeping the channel width constant. Figure 12 shows that increasing the depth by 0.50 m gives rise to a distinct inward shift of the flow.

The underlying mechanism is rather simple, as is illustrated by the same figure. The increase of the water depth reduces the asymmetry of the cross-section and hence the difference in flow resistance between the deeper and the shallower parts. As a consequence, the computed flow pattern tends towards the one for a rectangular channel, with the velocity maximum near the inner bank (De Vriend, 1976, 1977).

Hence it is concluded that the reduced asymmetry of the channel cross-section at higher flow stages can give rise to an inward shift of the main velocity maximum, so that it is not necessarily the slower growth of the secondary flow that causes this phenomenon.

7. Practical implications and further research

In addition to field measurements and laboratory experiments, mathematical models become increasingly important in hydraulic design and in the interpretation of geomorphological phenomena. This is certainly true for the flow, the channel formation and the sedimentary structure in alluvial rivers. The present work may be of use to the mathematical modelling of meandering rivers by contributing to the necessary understanding of the main flow in river bends.

Although it has proved a useful tool in the interpretation of the main velocity redistribution in sharp and short bends, the strongly simplified mathematical model used here is not quite suitable as a component of a predictive mathematical model of river bend morphology, since its description of the flow fails in some parts of the channel. On the other hand, a morphological computation requires multiple flow calculations (Koch & Flokstra, 1981) and hence a cheap and simple flow model like this is quite attractive. Therefore it seems appropriate to retain the basic principle of the present model (assumed or separately calculated vertical distributions of the main and the secondary velocity components; solution of depth-averaged main flow equations) and to focus further research on a proper simplified description of lateral diffusion and secondary flow convection (Kalkwijk & De Vriend, 1980; De Vriend, 1981b).

8. Conclusions

The principal conclusions to be drawn from the investigations described herein can be summarized as follows.

- The velocity distribution measured in the Dommel shows essentially the same features as observed in other channels of similar geometry.
- Both a mathematical model derived from the 'Kalkwijk/De Vriend' - model and a more extensive one including lateral diffusion work rather well in the greater part of the two bends if secondary flow convection is ignored.
- Including secondary flow convection in these models leads to erroneous results for this steep-banked channel because of the assumed strict similarity for the main and the secondary flow.
- The inward skewing tendency of the velocity distribution near the entrance of a bend is due to main flow inertia combined with the longitudinal pressure gradients arising from the growth of the transverse surface slope.
- In the river section under consideration, the gradual outward shift of the main velocity maximum further downstream in the bend is a matter of retarded adaptation of the flow to the bed configuration, rather than of secondary flow convection.
- Secondary flow convection is only important in the last part of each of the surveyed bends; there it seems to hamper the outward skewing of the flow instead of enhancing it.
- As the flow stage becomes higher, the main velocity maximum tends to shift towards the inner bank; this must be attributed to the reduced asymmetry of the channel, rather than to the slower development of the secondary flow.

It has to be stressed that these conclusions hold good for sharply curved, but rather short bends in steep-banked channels with a pronounced cross-sectional asymmetry. Without due consideration, they should not be extended to other configurations.

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APPENDIX A

Channel geometry: data of levelling

Explanatory note:
The ⊙ sign indicates the y-coordinate of the benchmark on the right bank. This y-coordinate has been measured directly; therefore it is the most accurate available estimate of the distance between opposite benchmarks. The X_R- and Y_R-coordinates of the benchmark on the right bank (see column headings) should be used only to determine the direction of the traverse.

TRAVERSE 1		TRAVERSE 2		TRAVERSE 3	
benchmark coordinates:		benchmark coordinates:		benchmark coordinates:	
X_L = 159 400.30 m		X_L = 159 406.30 m		X_L = 159 412.29 m	
Y_L = 367 791.78 m		Y_L = 367 799.74 m		Y_L = 367 807.80 m	
X_R = 159 409.78 m		X_R = 159 415.10 m		X_R = 159 420.68 m	
Y_R = 367 785.40 m		Y_R = 367 793.35 m		Y_R = 367 801.38 m	
date: 80 05 01		date: 80 05 01		date: 80 05 01	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.884	0.00	27.695	0.00	27.764
1.00	27.785	1.00	27.553	1.00	27.734
1.80	27.603	1.30	27.438	1.50	27.607
2.20	27.426	1.60	27.244	1.75	27.542
2.70	27.338	2.00	27.185	1.90	27.441
3.00	27.154	2.40	27.044	2.10	27.379
3.15	26.824	2.55	26.508	2.20	27.326
3.50	26.730	2.80	26.446	2.30	26.639
4.00	26.631	3.20	26.266	2.50	26.577
4.35	26.495	3.75	26.219	2.80	26.448
4.60	26.350	4.25	26.207	3.10	26.349
5.00	26.367	4.70	26.197	3.50	26.306
5.50	26.346	5.20	26.185	3.75	26.188
6.10	26.358	6.00	26.157	4.00	26.163
6.50	26.336	6.50	26.128	4.25	26.163
7.00	26.380	7.00	26.136	4.50	26.177
7.50	26.350	7.50	26.139	5.00	26.221
8.00	26.284	8.00	26.128	5.40	26.241
8.40	26.217	8.50	26.096	5.80	26.246
8.90	26.055	8.75	26.395	6.25	26.266
9.30	26.253	9.00	26.594	6.70	26.316
9.65	26.166	9.30	27.235	7.10	26.219
9.75	26.764	9.50	27.425	7.40	26.254
9.95	26.817	9.80	27.508	7.75	26.293
10.00	27.654	10.20	27.629	8.00	26.316
10.70	27.759	10.80 ⊙	27.744	8.25	26.309
11.00	27.903			8.50	26.309
11.48 ⊙	27.933			8.75	26.348
				9.00	26.356
				9.30	26.464
				9.45	27.036
				9.70	27.186
				9.90	27.358
				10.10	27.493
				10.45	27.661
				10.83 ⊙	27.761

TRAVERSE 4		TRAVERSE 5		TRAVERSE 6	
benchmark coordinates:		benchmark coordinates:		benchmark coordinates:	
X_L = 159 418.57 m		X_L = 159 421.62 m		X_L = 159 424.65 m	
Y_L = 367 815.60 m		Y_L = 367 819.52 m		Y_L = 367 823.53 m	
X_R = 159 426.82 m		X_R = 159 430.00 m		X_R = 159 433.08 m	
Y_R = 367 809.47 m		Y_R = 367 813.31 m		Y_R = 367 817.34 m	
date: 80 05 01		date: 80 05 01		date: 80 05 02	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.716	0.00	27.707	0.00	27.662
1.00	27.610	1.00	27.535	1.00	27.534
1.50	27.481	1.80	27.303	1.30	27.468
1.80	27.440	2.00	27.146	1.60	27.289
1.95	26.989	2.10	26.626	1.90	27.188
2.10	26.819	2.50	26.383	2.20	27.053
2.40	26.612	3.00	26.323	2.50	26.908
2.70	26.444	3.50	26.351	2.75	26.680
3.00	26.323	4.00	26.163	2.90	26.322
3.40	26.173	4.50	26.188	3.30	26.194
3.90	26.199	5.00	26.192	3.60	26.153
4.40	26.213	5.50	26.221	4.00	26.144
4.90	26.238	5.90	26.254	4.25	26.108
5.35	26.260	6.30	26.252	4.50	26.152
5.90	26.256	6.80	26.186	5.00	26.189
6.45	26.210	7.30	26.153	5.50	26.232
6.90	26.216	7.80	26.198	5.90	26.182
7.40	26.211	8.30	26.274	6.20	26.174
7.90	26.255	8.70	26.498	6.70	26.160
8.40	26.273	9.00	26.566	7.00	26.156
8.85	26.410	9.30	27.408	7.40	26.176
9.00	27.231	9.70	27.561	7.70	26.178
9.50	27.544	10.00	27.713	8.00	26.158
10.25 ⊙	27.751	10.45 ⊙	27.737	8.20	26.253
				8.40	26.253
				8.60	26.292
				8.80	26.361
				8.85	26.965
				8.95	27.020
				9.05	27.116
				9.30	27.400
				9.60	27.472
				10.00	27.635
				10.45 ⊙	27.681

TRAVERSE 7		TRAVERSE 8		TRAVERSE 9	
benchmark coordinates: X_L = 159 427.73 m Y_L = 367 827.38 m X_R = 159 435.92 m Y_R = 367 821.30 m		benchmark coordinates: X_L = 159 430.83 m Y_L = 367 831.32 m X_R = 159 439.00 m Y_R = 367 825.21 m		benchmark coordinates: X_L = 159 433.94 m Y_L = 367 835.30 m X_R = 159 441.78 m Y_R = 367 829.35 m	
date: 80 05 02		date: 80 05 02		date: 80 05 02	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.663	0.00	27.654	0.00	27.655
1.00	27.613	1.20	27.616	0.90	27.643
1.30	27.521	1.70	27.400	1.10	27.539
1.50	27.321	2.00	27.223	1.35	27.472
1.80	27.216	2.30	27.034	1.60	27.378
1.90	27.169	2.50	26.703	1.70	27.229
2.10	27.165	2.70	26.508	1.90	27.197
2.25	26.970	2.90	26.310	2.10	27.074
2.40	26.888	3.20	26.210	2.30	26.962
2.60	26.732	3.50	26.161	2.60	26.809
2.75	26.502	3.90	26.181	2.70	26.510
2.90	26.203	4.10	26.197	2.85	26.412
3.25	26.144	4.50	26.237	3.00	26.296
3.50	26.193	4.80	26.222	3.20	26.212
3.80	26.212	5.10	26.188	3.50	26.144
4.00	26.210	5.50	26.140	3.85	26.139
4.30	26.193	5.60	26.153	4.15	26.133
4.60	26.244	6.00	26.151	4.50	26.134
4.90	26.222	6.25	26.173	4.85	26.138
5.20	26.203	6.60	26.152	5.20	26.111
5.50	26.201	6.90	26.127	5.60	26.113
5.90	26.158	7.30	26.090	6.00	26.151
6.30	27.171	7.65	26.081	6.40	26.159
6.75	26.159	7.90	26.376	6.70	26.129
7.10	26.159	8.10	26.502	7.00	26.109
7.50	26.150	8.40	26.557	7.25	26.110
7.90	26.147	8.50	26.809	7.50	26.131
8.15	26.198	8.80	26.904	7.80	26.118
8.30	26.351	9.00	27.195	8.00	26.229
8.45	26.383	9.18	27.455	8.15	26.402
8.55	26.477	9.20	27.573	8.30	26.836
8.65	27.043	9.50	27.607	8.55	27.282
8.75	27.182	9.60	27.679	8.75	27.459
9.00	27.414	10.23 ⊙	27.706	9.00	27.461
9.30	27.489			9.40	27.603
9.50	27.627			9.88 ⊙	27.712
10.20 ⊙	27.723				

TRAVERSE 10		TRAVERSE 11		TRAVERSE 12	
benchmark coordinates: X_L = 159 437.11 m Y_L = 367 839.20 m X_R = 159 445.18 m Y_R = 367 833.20 m		benchmark coordinates: X_L = 159 439.91 m Y_L = 367 843.37 m X_R = 159 448.30 m Y_R = 367 837.10 m		benchmark coordinates: X_L = 159 443.00 m Y_L = 367 847.34 m X_R = 159 451.54 m Y_R = 367 841.07 m	
date: 80 05 02		date: 80 05 03		date: 80 05 03	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.657	0.00	27.861	0.00	27.712
1.30	27.539	1.00	27.606	1.40	27.550
1.40	27.431	1.30	27.582	1.60	27.497
1.70	27.331	1.50	27.490	1.80	27.413
2.00	27.144	1.65	27.357	1.95	27.323
2.25	27.025	1.75	27.221	2.05	27.013
2.45	26.945	2.00	27.197	2.20	27.007
2.55	26.507	2.25	27.136	2.40	26.962
2.80	26.351	2.50	27.015	2.55	26.808
3.00	26.244	2.70	26.842	2.70	26.603
3.25	26.179	2.80	26.743	2.90	26.467
3.50	26.143	3.00	26.248	3.10	26.397
3.70	26.162	3.25	26.151	3.40	26.245
4.00	26.144	3.50	26.171	3.80	26.160
4.30	26.141	3.90	26.185	4.10	26.172
4.60	26.198	4.30	26.148	4.40	26.177
4.90	26.141	4.70	26.205	4.70	26.151
5.20	26.147	5.00	26.205	4.95	26.160
5.50	26.183	5.30	26.198	5.20	26.153
6.00	26.199	5.75	26.121	5.50	26.140
6.30	26.175	6.20	26.140	5.90	26.180
6.60	26.145	6.65	26.153	6.15	26.207
6.90	26.094	7.00	26.140	6.40	26.210
7.20	26.101	7.35	26.123	6.70	26.163
7.50	26.144	7.65	26.148	7.00	26.168
7.75	26.162	7.95	26.220	7.35	26.167
7.85	26.299	8.10	26.267	7.60	26.117
8.00	26.362	8.30	26.328	7.95	26.168
8.30	26.357	8.50	26.623	8.15	26.200
8.40	27.204	8.56	26.595	8.30	26.303
8.70	27.324	8.75	26.653	8.45	26.385
8.80	27.519	8.85	26.643	8.60	26.557
9.05	27.570	8.95	27.318	8.70	26.608
9.50	27.680	9.10	27.510	8.80	27.169
10.10 ⊙	27.694	9.30	27.541	9.00	27.313
		9.80	27.668	9.90	27.863
		10.53 ⊙	27.681	10.60 ⊙	27.675

TRAVERSE 13		TRAVERSE 14		TRAVERSE 15	
benchmark coordinates: X_L = 159 446.10 m Y_L = 367 851.20 m X_R = 159 454.71 m Y_R = 367 845.73 m		benchmark coordinates: X_L = 159 448.76 m Y_L = 367 855.49 m X_R = 159 457.58 m Y_R = 367 849.91 m		benchmark coordinates: X_L = 159 451.21 m Y_L = 367 859.84 m X_R = 159 460.20 m Y_R = 367 854.09 m	
date: 80 05 04		date: 80 05 04		date: 80 05 04	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.664	0.00	27.693	0.00	27.724
1.05	27.521	1.00	27.572	0.80	27.663
1.40	27.466	1.50	27.360	1.20	27.520
1.50	27.162	1.70	27.311	1.50	27.401
1.90	27.145	1.80	27.181	1.80	27.293
2.10	26.982	2.20	27.054	2.00	27.135
2.30	26.786	2.40	26.891	2.30	27.090
2.45	26.711	2.50	26.653	2.60	26.919
2.50	26.489	2.60	26.516	2.85	26.673
2.80	26.277	2.80	26.235	3.00	26.473
3.20	26.193	3.10	26.197	3.30	26.324
3.60	26.229	3.30	26.221	3.60	26.263
4.00	26.238	3.70	26.229	3.90	26.248
4.40	26.190	4.00	26.251	4.20	26.227
4.80	26.152	4.40	26.251	4.50	26.226
5.30	26.142	4.70	26.230	4.90	26.178
5.80	26.103	5.00	26.220	5.40	26.131
6.10	26.172	5.45	26.142	5.80	26.062
6.50	26.233	6.00	26.141	6.10	26.049
6.80	26.219	6.40	26.157	6.50	26.086
7.10	26.190	6.70	26.082	6.85	26.148
7.50	26.140	7.00	26.087	7.20	26.061
7.90	26.148	7.40	26.121	7.50	26.121
8.15	26.213	7.75	26.087	7.80	26.166
8.40	26.305	8.10	26.162	8.30	26.131
8.60	26.460	8.15	26.183	8.70	26.304
8.70	27.057	8.20	26.340	9.00	26.511
8.85	27.254	8.50	26.424	9.10	26.991
9.00	27.366	8.60	27.001	9.25	27.148
9.10	27.449	8.80	27.144	9.50	27.271
9.60	27.546	9.00	27.288	9.80	27.493
9.70	27.619	9.30	27.358	10.20	27.596
10.00	27.672	9.50	27.411	10.70 ⊙	27.670
10.30 ⊙	27.668	9.70	27.531		
		10.00	27.671		
		10.48 ⊙	27.716		

TRAVERSE 16		TRAVERSE 17		TRAVERSE 18	
benchmark coordinates: X_L = 159 453.73 m Y_L = 367 864.23 m X_R = 159 463.34 m Y_R = 367 859.77 m		benchmark coordinates: X_L = 159 455.46 m Y_L = 367 868.91 m X_R = 159 466.52 m Y_R = 367 865.63 m		benchmark coordinates: X_L = 159 456.98 Y_L = 367 872.63 X_R = 159 469.93 Y_R = 367 870.06	
date: 80 05 04		date: 80 05 04		date: 80 05 04	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.692	0.00	27.737	0.00	27.632
0.70	27.620	0.80	27.681	0.60	27.587
1.20	27.464	1.20	27.498	1.30	27.355
1.55	27.243	1.75	27.327	1.40	27.159
1.80	27.098	2.20	27.175	1.90	27.111
2.20	26.978	2.45	27.039	2.20	26.961
2.60	26.902	2.70	26.831	2.45	26.678
2.80	26.792	2.85	26.676	2.70	26.568
2.90	26.513	3.00	26.533	2.90	26.404
3.10	26.444	3.25	26.374	3.20	26.318
3.40	26.278	3.50	26.327	3.50	26.291
3.70	26.247	3.75	26.299	3.90	26.239
4.00	26.245	4.05	26.254	4.40	26.218
4.25	26.215	4.40	26.237	4.80	26.234
4.55	26.210	4.70	26.284	5.25	26.191
4.85	26.208	5.10	26.266	5.85	26.155
5.20	26.230	5.60	26.195	6.20	26.118
5.60	26.245	5.90	26.213	6.60	26.118
6.00	26.213	6.20	26.191	6.90	26.077
6.40	26.140	6.50	26.173	7.20	26.054
6.75	26.140	6.80	26.147	7.60	25.951
7.10	26.072	7.10	26.097	7.90	25.961
7.45	26.070	7.50	26.054	8.20	25.969
7.75	26.070	7.80	26.036	8.35	26.007
8.10	26.072	8.20	26.063	8.55	26.254
8.40	26.162	8.50	26.202	8.75	26.910
8.60	26.372	8.80	26.360	8.90	27.003
8.80	26.427	9.00	26.489	9.10	27.051
9.00	26.785	9.10	26.954	9.35	27.095
9.20	26.870	9.40	27.167	9.45	27.274
9.30	26.963	9.70	27.341	10.10	27.361
9.50	27.217	10.00	27.425	10.30	27.412
9.65	27.412	10.50	27.442	10.90	27.341
10.00	27.439	11.00	27.505	11.70	27.518
10.20	27.523	11.50 ⊙	27.525	13.15 ⊙	27.588
10.60 ⊙	27.640				

TRAVERSE 19		TRAVERSE 20		TRAVERSE 20	
benchmark coordinates: X_L = 159 457.59 m Y_L = 367 874.87 m X_R = 159 469.74 m Y_R = 367 874.38 m		benchmark coordinates: X_L = 159 457.50 m Y_L = 367 877.27 m X_R = 159 470.36 m Y_R = 367 879.05 m		(continued)	
date: 80 05 04		date: 80 05 04			
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.619	0.00	27.701	9.10	26.352
0.50	27.624	0.50	27.666	9.30	26.531
1.20	27.370	0.75	27.553	9.50	26.978
1.45	27.238	1.00	27.473	9.85	27.187
1.70	27.123	1.20	27.395	10.45	27.278
2.20	27.018	1.50	27.232	11.20	27.270
2.30	26.970	1.70	27.159	12.25	27.358
2.40	26.589	1.95	27.090	12.65	27.453
2.70	26.403	2.15	26.980	13.05 ⊙	27.535
3.00	26.319	2.35	26.888		
3.40	26.310	2.50	26.785		
3.70	26.314	2.65	26.628		
4.00	26.276	2.90	26.471		
4.50	26.241	3.20	26.398		
5.10	26.194	3.55	26.371		
5.55	26.207	3.90	26.328		
5.90	26.194	4.25	26.298		
6.50	26.166	4.60	26.248		
6.90	26.062	4.85	26.233		
7.25	26.047	5.05	26.238		
7.70	26.009	5.35	26.198		
8.00	26.024	5.70	26.178		
8.35	26.040	6.05	26.138		
8.50	26.036	6.50	26.053		
8.70	26.171	6.85	26.027		
8.95	27.004	7.20	26.021		
9.40	27.213	7.55	25.993		
10.20	27.287	7.80	25.961		
10.95	27.340	8.05	25.913		
11.20	27.386	8.35	25.898		
12.19 ⊙	27.468	8.50	25.953		
		8.75	26.023		
		8.90	26.111		

TRAVERSE 21		TRAVERSE 21		TRAVERSE 22	
benchmark coordinates: X_L = 159 457.12 m Y_L = 367 878.76 m X_R = 159 470.13 m Y_R = 367 883.59 m		(continued)		benchmark coordinates: X_L = 159 456.43 m Y_L = 367 880.02 m X_R = 159 465.22 m Y_R = 367 889.00 m	
date: 80 05 04				date: 80 05 04	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.753	8.20	25.708	0.00	27.751
0.40	27.749	8.40	25.678	0.70	27.639
0.50	27.635	8.80	25.908	1.30	27.357
0.70	27.600	9.10	26.283	1.75	27.200
0.80	27.528	9.25	26.253	2.20	27.053
1.10	27.468	9.40	26.533	2.70	26.861
1.30	27.399	9.55	26.911	3.10	26.680
1.60	27.273	9.70	27.097	3.50	26.549
1.75	27.215	10.00	27.157	3.90	26.520
1.90	27.118	10.30	27.281	4.20	26.442
2.00	27.051	11.00	27.428	4.50	26.432
2.20	26.886	11.90	27.389	4.60	26.427
2.35	26.816	12.80	27.448	4.90	26.347
2.55	26.726	13.30	27.528	5.25	26.243
2.70	26.631	13.80 ⊙	27.570	5.60	26.199
2.85	26.478			5.90	26.115
3.10	26.471			6.25	25.990
3.30	26.448			6.60	25.920
3.60	26.428			6.90	25.670
3.90	26.342			7.30	25.504
4.20	26.355			7.35	25.411
4.50	26.358			7.70	25.360
4.90	26.298			8.10	25.501
5.20	26.238			8.40	25.600
5.50	26.228			8.65	25.920
5.80	26.190			8.85	26.025
6.10	26.173			9.00	26.955
6.35	26.188			9.30	27.094
6.55	26.139			9.90	27.229
6.80	26.089			10.40	27.355
7.10	26.093			11.00	27.490
7.35	26.058			11.60	27.506
7.70	25.921			12.50 ⊙	27.519
7.90	25.815				

TRAVERSE 23		TRAVERSE 24		TRAVERSE 25	
benchmark coordinates: X_L = 159 455.35 m Y_L = 367 881.00 m X_R = 159 461.41 m Y_R = 367 891.67 m		benchmark coordinates: X_L = 159 453.25 m Y_L = 367 882.07 m X_R = 159 457.27 m Y_R = 367 893.41 m		benchmark coordinates: X_L = 159 450.54 m Y_L = 367 882.74 m X_R = 159 453.35 m Y_R = 367 894.47 m	
date: 80 05 04		date: 80 05 04		date: 80 05 04	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.686	0.00	27.662	0.00	27.630
0.75	27.610	0.40	27.653	0.40	27.587
1.20	27.433	0.55	27.535	1.00	27.463
1.70	27.338	0.60	27.486	1.15	27.426
2.00	27.177	0.75	27.435	1.40	27.405
2.30	27.093	1.30	27.505	1.85	27.237
2.60	26.774	1.50	27.497	2.20	27.080
3.20	26.721	1.75	27.354	2.60	26.867
3.60	26.653	2.00	27.170	2.90	26.797
3.90	26.572	2.20	27.013	3.30	26.684
4.20	26.562	2.40	26.932	3.50	26.557
4.50	26.410	2.75	26.909	3.80	26.480
4.85	26.281	3.05	26.800	4.10	26.413
5.10	26.219	3.20	26.639	4.40	26.369
5.40	26.173	3.60	26.488	4.80	26.337
5.70	26.102	4.00	26.475	5.10	26.282
6.00	26.059	4.30	26.424	5.40	26.218
6.30	26.006	4.70	26.316	6.10	26.142
6.70	25.803	5.10	26.302	6.50	26.105
7.00	25.641	5.50	26.208	7.00	26.185
7.15	25.581	5.85	26.091	7.40	26.101
7.50	25.514	6.30	26.094	7.65	26.120
7.70	25.466	6.70	26.137	8.00	26.027
8.10	25.490	7.00	25.994	8.30	25.952
8.30	25.554	7.30	25.878	8.70	25.913
8.40	26.326	7.70	25.752	8.95	26.026
8.60	26.261	8.00	25.790	9.10	26.334
8.70	26.328	8.35	25.891	9.60	26.318
8.80	27.120	8.50	25.973	9.75	26.398
9.00	27.234	8.70	26.221	9.95	26.730
9.50	27.356	8.90	26.416	10.10	27.023
10.00	27.461	8.95	27.056	10.30	27.130
11.00	27.568	9.20	27.201	10.40	27.357
12.00 ⊙	27.701	9.85	27.336	10.65	27.464
		10.70	27.637	10.90	27.607
		11.20	27.704	11.95 ⊙	27.671
		12.00 ⊙	27.693		

TRAVERSE 26		TRAVERSE 27		TRAVERSE 28	
benchmark coordinates: X_L = 159 446.50 m Y_L = 367 883.88 m X_R = 159 448.64 m Y_R = 367 895.38 m		benchmark coordinates: X_L = 159 441.71 m Y_L = 367 885.09 m X_R = 159 444.44 m Y_R = 367 896.41 m		benchmark coordinates: X_L = 159 436.71 m Y_L = 367 886.75 m X_R = 159 439.79 m Y_R = 367 897.51 m	
date: 80 05 04		date: 80 05 04		date: 80 05 04	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.630	0.00	27.658	0.00	27.641
1.00	27.535	1.00	27.551	1.00	27.488
1.50	27.338	1.25	27.369	1.50	27.375
1.75	27.233	2.00	27.091	1.60	27.138
2.00	27.116	2.50	26.978	2.00	27.009
2.75	26.804	2.80	26.722	2.30	26.684
3.40	26.587	3.30	26.503	2.60	26.427
3.75	26.438	3.70	26.374	3.00	26.217
4.10	26.296	4.10	26.253	3.50	26.180
4.45	26.270	4.50	26.212	4.00	26.159
4.80	26.261	4.85	26.215	4.50	26.133
5.20	26.229	5.10	26.176	5.00	26.188
5.50	26.215	5.50	26.138	5.55	26.127
5.85	26.194	5.85	26.118	6.00	26.144
6.15	26.172	6.10	26.111	6.40	26.141
6.50	26.110	6.45	26.147	6.90	26.163
6.75	26.126	6.80	26.076	7.35	26.209
7.00	26.094	7.10	26.070	7.70	26.222
7.25	26.078	7.40	26.047	8.10	26.187
7.50	26.079	7.60	26.081	8.50	26.238
7.85	25.973	7.80	26.067	8.85	26.313
8.05	25.926	8.10	26.016	9.10	27.015
8.30	25.930	8.45	26.009	9.60	27.136
8.45	25.970	8.80	26.059	9.80	27.023
8.60	26.099	9.00	26.121	10.00	27.662
8.80	26.263	9.10	27.370	10.50	27.684
8.90	27.119	9.50	27.548	11.10 ⊙	27.631
9.10	27.223	10.00	27.664		
9.40	27.413	11.00	27.678		
9.70	27.490	11.50 ⊙	27.654		
10.00	27.649				
11.00	27.670				
11.35 ⊙	27.666				

TRAVERSE 29		TRAVERSE 30		TRAVERSE 31	
benchmark coordinates: X_L = 159 431.88 m Y_L = 367 888.35 m X_R = 159 435.79 m Y_R = 367 898.93 m		benchmark coordinates: X_L = 159 426.33 m Y_L = 367 890.48 m X_R = 159 431.25 m Y_R = 367 900.08 m		benchmark coordinates: X_L = 159 421.19 m Y_L = 367 894.15 m X_R = 159 427.80 m Y_R = 367 902.08 m	
date: 80 05 04		date: 80 05 04		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.600	0.00	27.576	0.00	27.572
0.70	27.559	0.90	27.528	0.80	27.433
1.30	27.291	1.30	27.351	1.10	27.338
1.50	27.294	1.95	27.072	1.40	27.155
1.60	27.084	2.20	26.798	1.50	26.967
2.00	26.954	2.35	26.506	2.00	26.809
2.30	26.664	2.50	26.297	2.10	26.647
2.60	26.372	2.95	26.085	2.30	26.540
3.00	26.084	3.30	26.076	2.55	26.224
3.50	26.164	3.65	26.163	2.65	26.146
3.90	26.164	3.95	26.160	3.00	25.957
4.40	26.139	4.30	26.123	3.30	25.962
4.80	26.165	4.65	26.103	3.70	25.824
5.25	26.199	5.00	26.083	4.10	25.932
5.80	26.234	5.40	26.133	4.40	25.996
6.25	26.201	5.75	26.230	4.80	26.082
6.70	26.215	6.15	26.200	5.20	26.139
7.10	26.213	6.45	26.194	5.65	26.221
7.45	26.209	6.80	26.246	6.00	26.265
7.90	26.223	7.10	26.196	6.60	26.289
8.20	26.245	7.25	26.397	7.00	26.370
8.50	26.229	7.60	26.336	7.50	26.392
8.80	26.376	8.00	26.298	7.80	26.492
9.00	26.409	8.40	26.440	8.05	26.622
9.20	27.207	8.65	27.071	8.20	27.089
9.70	27.386	9.10	27.376	8.40	27.177
10.35	27.645	9.20	27.602	8.60	27.385
11.15 ⊙	27.567	9.80	27.691	9.00	27.519
		10.65 ⊙	27.666	9.20	27.590
				9.35	27.646
				9.45	27.776
				10.10 ⊙	27.698

TRAVERSE 32		TRAVERSE 33		TRAVERSE 34	
benchmark coordinates:		benchmark coordinates:		benchmark coordinates:	
X_L = 159 416.48 m		X_L = 159 413.79 m		X_L = 159 413.59 m	
Y_L = 367 898.67 m		Y_L = 367 903.78 m		Y_L = 367 912.26 m	
X_R = 159 425.31 m		X_R = 159 424.68 m		X_R = 159 423.77 m	
Y_R = 367 904.63 m		Y_R = 367 907.38 m		Y_R = 367 909.75 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.463	0.00	27.489	0.00	27.487
1.00	27.390	1.00	27.373	0.40	27.251
1.15	27.343	1.40	27.186	1.00	27.270
1.60	27.166	1.60	27.033	1.35	27.118
1.75	26.836	1.75	26.493	1.50	26.919
1.95	26.688	1.90	26.241	1.70	26.763
2.10	26.698	2.15	26.017	1.85	26.363
2.30	26.324	2.40	25.888	2.05	25.756
2.50	26.047	2.70	25.837	2.40	25.526
2.75	26.048	3.00	25.747	2.70	25.491
2.95	25.930	3.30	25.610	2.95	25.538
3.30	25.624	3.55	25.581	3.10	25.579
3.60	25.633	3.90	25.734	3.40	25.728
4.00	25.793	4.25	25.868	3.65	25.898
4.40	26.030	4.65	26.024	4.00	26.009
5.00	26.163	5.05	26.081	4.40	26.008
5.70	26.243	5.40	26.169	4.90	26.018
6.20	26.313	5.80	26.234	5.30	26.087
6.60	26.303	6.20	26.330	5.75	26.200
7.10	26.348	6.60	26.370	6.20	26.306
7.60	26.389	7.05	26.399	6.55	26.374
8.00	26.460	7.50	26.435	7.00	26.460
8.25	26.630	7.90	26.460	7.45	26.521
8.50	27.020	8.20	26.528	7.85	26.547
8.70	27.135	8.35	26.585	8.00	26.626
9.00	27.368	8.45	27.030	8.15	27.096
9.30	27.450	8.70	27.210	8.30	27.248
9.70	27.642	8.95	27.310	8.60	27.298
9.80	27.794	9.05	27.368	9.00	27.414
10.15	27.872	9.60	27.421	9.60	27.543
10.60 ⊙	27.808	9.90	27.569	9.90	27.630
		10.50	27.733	10.42 ⊙	27.623
		11.50 ⊙	27.778		

TRAVERSE 35		TRAVERSE 36		TRAVERSE 37	
benchmark coordinates: X_L = 159 416.64 m Y_L = 367 916.77 m X_R = 159 425.00 m Y_R = 367 911.74 m		benchmark coordinates: X_L = 159 420.67 m Y_L = 367 922.80 m X_R = 159 428.20 m Y_R = 367 917.60 m		benchmark coordinates: X_L = 159 424.40 m Y_L = 367 929.34 m X_R = 159 432.30 m Y_R = 367 923.39 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.367	0.00	27.345	0.00	27.449
0.20	27.270	0.50	27.211	0.20	27.501
0.60	27.054	0.90	27.011	0.80	27.448
1.00	26.880	1.10	26.445	1.10	27.388
1.20	26.660	1.35	26.243	1.40	27.255
1.35	26.484	1.55	26.142	1.60	27.100
1.50	26.459	1.75	26.034	1.70	26.050
1.80	26.184	2.00	26.029	2.00	25.925
2.20	25.560	2.40	25.991	2.30	25.977
2.55	25.780	2.75	25.985	2.65	26.012
2.90	25.721	3.15	26.039	3.00	26.030
3.20	25.801	3.55	26.065	3.30	26.053
3.60	25.929	4.00	26.089	3.60	26.095
4.00	26.013	4.30	26.085	3.95	26.117
4.30	26.054	4.65	26.120	4.35	26.139
4.80	26.153	5.00	26.147	4.70	26.141
5.20	26.226	5.30	26.191	5.15	26.130
5.75	26.258	5.65	26.199	5.50	26.150
6.10	26.339	6.00	26.310	6.00	26.188
6.50	26.333	6.25	26.367	6.40	26.300
6.80	26.432	6.50	26.335	6.80	26.315
7.10	26.522	6.80	26.407	7.10	26.392
7.35	26.600	7.20	26.571	7.40	26.489
7.50	26.744	7.35	26.635	7.65	26.642
7.80	27.012	7.45	27.032	7.90	26.930
8.35	27.330	7.70	27.230	8.20	27.062
8.75	27.377	8.20	27.331	8.80	27.220
9.20	27.540	8.70	27.478	8.90	27.447
9.77 ⊙	27.631	8.90	27.551	9.40	27.698
		9.25 ⊙	27.571	9.70 ⊙	27.670

TRAVERSE 38		TRAVERSE 39		TRAVERSE 40	
benchmark coordinates: X_L = 159 428.06 m Y_L = 367 934.62 m X_R = 159 436.61 m Y_R = 367 928.22 m		benchmark coordinates: X_L = 159 431.17 m Y_L = 367 939.19 m X_R = 159 439.50 m Y_R = 367 932.87 m		benchmark coordinates: X_L = 159 434.29 m Y_L = 367 944.11 m X_R = 159 443.09 m Y_R = 367 937.69 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.488	0.00	27.519	0.00	27.542
1.00	27.431	0.60	27.585	1.10	27.554
1.60	27.344	1.10	27.512	1.40	27.480
1.85	26.425	1.30	27.367	1.60	27.397
2.10	26.336	1.60	27.193	1.70	27.252
2.30	26.206	1.80	27.026	1.95	27.198
2.60	26.141	2.05	26.331	2.10	27.022
2.90	26.115	2.30	26.295	2.30	26.429
3.30	26.079	2.60	26.162	2.60	26.295
3.80	26.068	3.00	26.140	2.90	26.262
4.20	26.097	3.50	26.149	3.20	26.149
4.60	26.079	4.00	26.158	3.60	26.158
5.05	26.115	4.40	26.135	4.00	26.160
5.50	26.144	4.85	26.133	4.30	26.140
6.00	26.162	5.20	26.102	4.70	26.147
6.50	26.186	5.70	26.137	5.20	26.118
6.90	26.282	6.15	26.122	5.65	26.115
7.20	26.302	6.60	26.103	6.15	26.096
7.60	26.301	6.95	26.082	6.65	26.075
7.90	26.276	7.35	26.143	7.20	26.085
8.20	26.310	7.70	26.131	7.65	26.077
8.45	26.838	8.00	26.286	8.00	26.141
8.70	27.036	8.20	26.438	8.50	26.264
8.90	27.107	8.35	26.931	8.60	26.634
9.40	27.197	8.65	27.116	8.80	26.793
9.50	27.302	9.25	27.196	9.10	26.956
10.10	27.538	9.40	27.388	9.25	27.084
10.70 ⊙	27.585	9.90	27.533	9.65	27.248
		10.45⊙	27.555	9.75	27.383
				9.90	27.415
				12.00	27.538
				10.78 ⊙	27.546

TRAVERSE 41		TRAVERSE 42		TRAVERSE 43	
benchmark coordinates: X_L = 159 437.45 m Y_L = 367 948.80 m X_R = 159 446.63 m Y_R = 367 943.00 m		benchmark coordinates: X_L = 159 440.68 m Y_L = 367 953.70 m X_R = 159 449.65 m Y_R = 367 948.08 m		benchmark coordinates: X_L = 159 443.45 m Y_L = 367 958.54 m X_R = 159 452.75 m Y_R = 367 953.50 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.474	0.00	27.476	0.00	27.496
0.75	27.512	1.00	27.547	1.00	27.481
1.15	27.572	1.50	27.512	1.50	27.436
1.50	27.478	1.70	27.448	1.55	27.216
1.85	27.275	1.90	27.094	2.10	27.057
2.00	27.011	2.20	26.680	2.30	26.444
2.20	26.758	2.50	26.333	2.60	26.324
2.50	26.579	2.90	26.221	3.10	26.177
2.75	26.170	3.30	26.184	3.65	26.153
3.00	26.170	3.80	26.159	4.00	26.191
3.40	26.164	4.25	26.152	4.45	26.172
3.80	26.158	4.65	26.131	4.90	26.110
4.25	26.157	5.10	26.157	5.45	26.142
4.60	26.147	5.60	26.147	5.80	26.125
5.00	26.152	6.10	26.139	6.15	26.113
5.55	26.114	6.60	26.106	6.45	26.099
6.00	26.115	7.10	26.079	7.00	26.100
6.50	26.135	7.50	26.091	7.30	26.105
7.00	26.096	7.90	26.096	7.70	26.095
7.55	26.005	8.20	26.031	8.10	26.073
8.00	26.047	8.60	26.042	8.45	26.098
8.40	26.208	8.80	26.092	8.65	26.176
8.70	26.362	8.90	26.817	8.80	27.000
8.90	26.474	9.30	26.994	9.05	27.227
9.00	27.119	10.00	27.093	9.70	27.401
9.50	27.330	10.40⊙	27.167	10.35 ⊙	27.415
10.00	27.435				
10.70⊙	27.464				

TRAVERSE 44		TRAVERSE 45		TRAVERSE 46	
benchmark coordinates: X_L = 159 446.03 m Y_L = 367 963.64 m X_R = 159 455.73 m Y_R = 367 959.82 m		benchmark coordinates: X_L = 159 448.10 m Y_L = 367 969.10 m X_R = 159 457.58 m Y_R = 367 966.27 m		benchmark coordinates: X_L = 159 449.12 m Y_L = 367 975.00 m X_R = 159 459.02 m Y_R = 367 972.87 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.417	0.00	27.502	0.00	27.469
1.00	27.379	1.00	27.390	0.30	27.463
1.30	27.305	1.25	27.336	0.70	27.308
1.50[1]	27.156	1.65	27.081	1.10	27.185
1.70	26.597	1.75	26.430	1.30	27.089
1.90	26.487	2.00	26.361	1.50	26.988
2.40	26.266	2.40	26.316	1.60	26.871
2.90	26.207	2.80	26.205	1.70	26.522
3.40	26.195	3.20	26.193	1.90	26.448
3.90	26.198	3.60	26.230	2.20	26.296
4.40	26.156	4.00	26.189	2.60	26.293
4.70	26.149	4.40	26.181	3.00	26.258
5.40	26.163	4.80	26.150	3.40	26.216
5.80	26.157	5.20	26.187	3.75	26.204
6.30	26.148	5.60	26.184	4.15	26.191
6.75	26.152	6.00	26.157	4.55	26.124
7.10	26.110	6.40	26.101	5.00	26.117
7.60	26.105	6.80	26.069	5.45	26.077
8.00	26.086	7.20	26.021	5.90	26.103
8.50	26.054	7.60	25.950	6.20	26.060
8.85	26.174	7.95	26.003	6.55	26.014
9.05	26.765	8.20	26.131	6.90	25.970
9.50	27.049	8.35	26.297	7.30	25.883
10.00	27.046	8.50	27.125	7.75	26.390
10.45 ⊙	27.517	9.00	27.417	8.10	26.383
		10.00	27.533	8.40	26.586
		10.10 ⊙	27.543	8.65	26.653
				8.95	26.753
				9.10	26.782
				9.30	27.373
				9.50	27.447
				10.25 ⊙	27.505

TRAVERSE 47		TRAVERSE 48		TRAVERSE 49	
benchmark coordinates: X_L = 159 449.80 m Y_L = 367 980.80 m X_R = 159 459.55 m Y_R = 367 980.11 m		benchmark coordinates: X_L = 159 450.00 m Y_L = 367 986.30 m X_R = 159 459.95 m Y_R = 367 986.60 m		benchmark coordinates: X_L = 159 449.75 m Y_L = 367 992.40 m X_R = 159 460.44 m Y_R = 367 990.87 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.466	0.00	27.453	0.00	27.504
0.55	27.363	0.70	27.380	1.00	27.446
0.60	27.116	1.00	27.254	1.60	27.316
1.20	26.866	1.20	27.037	1.90	27.106
1.40	26.582	1.30	26.543	2.10	26.751
1.60	26.492	1.50	26.456	2.25	26.478
1.75	26.398	1.75	26.340	2.50	26.308
1.95	26.276	2.00	26.278	2.75	26.246
2.20	26.243	2.25	26.234	3.10	26.138
2.45	26.233	2.65	26.183	3.45	26.118
2.80	26.170	3.00	26.176	3.85	26.118
3.15	26.180	3.40	26.138	4.20	26.131
3.50	26.192	3.85	26.163	4.60	26.161
3.85	26.160	4.20	26.148	5.00	26.132
4.25	26.153	4.60	26.110	5.35	26.130
4.60	26.174	5.00	26.111	5.75	26.171
4.90	26.154	5.40	26.075	6.10	26.150
5.25	26.141	5.75	26.091	6.45	26.154
5.60	26.141	6.10	26.135	6.85	26.143
5.90	26.098	6.55	26.128	7.20	26.132
6.35	26.004	7.05	26.080	7.60	26.160
6.80	25.916	7.45	26.073	7.90	26.118
7.15	25.858	7.75	26.090	8.20	26.127
7.55	25.925	8.00	26.190	8.45	26.085
7.75	26.157	8.25	26.350	8.75	26.284
7.79	26.799	8.30	26.350	8.90	26.358
8.20	27.135	8.45	26.812	9.10	26.795
8.60	27.241	8.70	26.923	9.50	27.001
9.00	27.390	9.05	27.036	10.00	27.189
9.60	27.402	9.50	27.334	10.30	27.503
9.85 ⊙	27.497	9.65	27.513	10.82 ⊙	27.565
		10.08 ⊙	27.583		

TRAVERSE 50		TRAVERSE 51		TRAVERSE 52	
benchmark coordinates: X_L = 159 451.28 m Y_L = 367 998.15 m X_R = 159 461.18 m Y_R = 367 996.37 m		benchmark coordinates: X_L = 159 451.87 m Y_L = 368 006.50 m X_R = 159 462.00 m Y_R = 368 004.74 m		benchmark coordinates: X_L = 159 452.60 m Y_L = 368 013.82 m X_R = 159 462.33 m Y_R = 368 012.09 m	
date: 80 05 05		date: 80 05 05		date: 80 05 05	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.414	0.00	27.503	0.00	27.477
0.80	27.361	0.90	27.382	0.90	27.430
1.10	27.136	1.30	27.132	1.05	27.328
1.20	26.823	1.50	26.931	1.20	27.232
1.35	26.447	1.65	26.803	1.40	26.532
1.55	26.316	1.80	26.431	1.60	26.450
1.85	26.162	2.10	26.185	1.70	26.354
2.15	26.089	2.40	26.116	1.90	26.178
2.50	26.072	2.70	26.043	2.20	26.119
2.80	26.099	3.05	26.128	2.50	26.102
3.15	26.136	3.40	26.132	2.80	26.162
3.50	26.139	3.80	26.147	3.20	26.138
3.85	26.129	4.20	26.166	3.60	26.149
4.25	26.144	4.60	26.172	4.00	26.116
4.60	26.114	5.10	26.157	4.45	26.148
5.00	26.179	5.60	26.173	4.90	26.110
5.35	26.186	6.10	26.155	5.40	26.111
5.70	26.203	6.55	26.150	5.80	26.079
6.00	26.209	7.00	26.150	6.20	26.073
6.40	26.227	7.40	26.142	6.50	26.076
6.70	26.199	7.80	26.111	6.85	26.078
7.10	26.209	8.20	26.144	7.25	26.032
7.40	26.202	8.50	26.206	7.50	26.015
7.70	26.179	8.75	26.830	7.85	26.133
8.00	26.198	8.95	26.908	7.95	26.186
8.25	26.264	9.05	27.056	8.05	26.947
8.45	26.383	9.25	27.140	8.20	27.061
8.70	26.989	9.40	27.235	8.60	27.215
9.10	27.226	9.50	27.253	9.00	27.373
9.60	27.396	9.65	27.424	9.40	27.447
10.08 ⊙	27.549	10.20 ⊙	27.545	9.88 ⊙	27.475

TRAVERSE 4		TRAVERSE 8		TRAVERSE 16	
benchmark coordinates: X_L = 159 418.57 m Y_L = 367 815.60 m X_R = 159 426.82 m Y_R = 367 809.47 m		benchmark coordinates: X_L = 159 430.83 m Y_L = 367 831.32 m X_R = 159 439.00 m Y_R = 367 825.21 m		benchmark coordinates: X_L = 159 453.73 m Y_L = 367 864.23 m X_R = 159 463.34 m Y_R = 367 859.77 m	
date: 80 05 27		date: 80 05 27		date: 80 05 27	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.711	0.00	27.652	0.00	27.689
0.30	27.681	1.55	27.557	0.70	27.622
1.00	27.617	1.70	27.386	1.10	27.514
1.35	27.501	2.10	27.113	1.50	27.222
1.80	27.430	2.25	27.061	2.45	26.935
2.10	26.821	2.40	26.735	2.80	26.739
2.15	26.637	2.60	26.479	3.00	26.491
2.40	26.578	2.75	26.335	3.30	26.304
2.80	26.419	3.00	26.196	3.60	26.253
3.10	26.288	3.45	26.116	4.00	26.223
3.30	26.179	3.65	26.116	4.65	26.222
3.65	26.134	3.80	26.133	5.45	26.191
4.00	26.156	4.40	26.166	6.30	26.154
4.40	26.182	4.85	26.166	7.20	26.096
4.65	26.202	5.20	26.156	7.90	26.020
5.10	26.299	5.50	26.166	8.20	26.156
5.45	26.235	5.85	26.149	8.50	26.333
5.80	26.209	6.15	26.146	8.75	26.517
6.30	26.209	6.90	26.109	9.10	26.827
6.70	26.231	7.20	26.112	9.50	27.255
7.10	26.189	7.60	26.091	10.00	27.421
7.50	26.204	7.70	26.091	10.40	27.639
7.80	26.209	8.00	26.401	10.62⊙	27.648
8.10	26.229	8.25	26.529		
8.40	26.267	8.50	26.781		
8.75	26.390	8.80	26.786		
8.95	27.235	9.00	26.461		
9.40	27.494	9.50	27.603		
9.80	27.637	9.70	27.710		
10.30⊙	27.757	10.26⊙	27.711		

TRAVERSE 19		TRAVERSE 21		TRAVERSE 23	
benchmark coordinates: X_L = 159 457.59 m Y_L = 367 874.87 m X_R = 159 469.74 m Y_R = 367 874.38 m		benchmark coordinates: X_L = 159 457.12 m Y_L = 367 878.76 m X_R = 159 470.13 m Y_R = 367 883.59 m		benchmark coordinates: X_L = 159 455.35 m Y_L = 367 881.00 m X_R = 159 461.41 m Y_R = 367 891.67 m	
date: 80 05 27		date: 80 05 27		date: 80 05 27	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.618	0.00	27.754	0.00	27.689
0.50	27.625	0.40	27.732	0.70	27.600
1.30	27.345	0.50	27.636	1.20	27.437
1.72	27.075	1.20	27.386	2.20	27.102
2.20	26.968	2.00	27.081	2.60	26.771
2.40	26.554	2.70	26.678	2.90	26.617
2.80	26.350	3.00	26.447	3.40	26.500
3.10	26.243	3.40	26.367	3.90	26.478
3.70	26.237	4.30	26.312	4.60	26.392
4.55	26.199	5.10	26.233	5.20	26.247
5.30	26.164	6.00	26.186	5.90	26.087
6.20	26.126	6.60	26.141	6.60	26.041
7.20	26.070	7.10	26.091	7.10	25.742
7.90	26.027	7.60	25.930	7.45	25.550
8.40	26.049	8.30	25.780	8.00	25.554
8.70	26.223	8.55	25.738	8.10	25.530
8.90	26.507	8.70	25.916	8.25	25.603
8.95	27.012	8.80	26.119	8.40	26.227
9.40	27.213	9.10	26.105	8.60	26.356
10.00	27.264	9.30	26.307	8.75	27.118
10.80	27.317	9.45	26.792	9.15	27.291
11.30	27.408	9.80	27.079	9.55	27.338
12.20 ⊙	27.436	10.20	27.272	10.10	27.441
		10.90	27.390	10.90	27.550
		11.80	27.414	12.04 ⊙	27.697
		12.60	27.420		
		13.75 ⊙	27.559		

TRAVERSE 24		TRAVERSE 25		TRAVERSE 26	
benchmark coordinates:		benchmark coordinates:		benchmark coordinates:	
X_L = 159 453.25 m		X_L = 159 450.54 m		X_L = 159 446.50 m	
Y_L = 367 882.07 m		Y_L = 367 882.74 m		Y_L = 367 883.88 m	
X_R = 159 457.27 m		X_R = 159 453.35 m		X_R = 159 448.64 m	
Y_R = 367 893.41 m		Y_R = 367 894.47 m		Y_R = 367 895.38 m	
date: 80 05 27		date: 80 05 27		date: 80 05 27	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.658	0.00	27.628	0.00	27.643
0.30	27.654	0.65	27.545	0.30	27.566
0.60	27.488	1.45	27.362	0.90	27.535
1.20	27.490	2.55	26.864	1.15	27.450
1.65	27.373	2.90	26.789	1.60	27.326
2.30	26.941	3.30	26.650	1.90	27.109
2.80	26.857	3.80	26.507	2.30	27.001
3.10	26.660	4.30	26.420	3.10	26.712
3.70	26.581	4.70	26.323	3.50	26.561
4.20	26.502	5.35	26.197	3.90	26.392
4.60	26.313	5.95	26.164	4.30	26.270
5.15	26.194	6.35	26.134	4.80	26.249
5.75	26.122	6.85	26.116	5.30	26.212
6.40	26.008	7.50	26.045	5.90	26.180
6.85	26.032	8.00	25.974	6.50	26.106
7.40	25.808	8.50	25.917	7.10	26.063
7.80	25.812	8.90	25.934	7.75	26.017
8.10	25.859	9.15	26.358	8.30	25.943
8.50	26.001	9.45	26.331	8.60	26.029
8.75	26.361	9.80	26.430	8.85	26.297
8.90	27.025	10.15	27.051	9.00	27.192
9.30	27.205	10.70	27.519	9.30	27.324
9.80	27.342	11.00	27.627	9.80	27.506
10.40	27.536	11.30	27.696	10.30	27.643
11.20	27.710	12.00 ⊙	27.656	11.33 ⊙	27.661
11.95 ⊙	27.680				

TRAVERSE 27		TRAVERSE 28		TRAVERSE 29	
benchmark coordinates:		benchmark coordinates:		benchmark coordinates:	
X_L = 159 441.71 m		X_L = 159 436.71 m		X_L = 159 431.88 m	
Y_L = 367 885.09 m		Y_L = 367 886.75 m		Y_L = 367 888.35 m	
X_R = 159 444.44 m		X_R = 159 439.79 m		X_R = 159 435.79 m	
Y_R = 367 896.41 m		Y_R = 367 897.51 m		Y_R = 367 898.93 m	
date: 80 05 28		date: 80 05 28		date: 80 05 28	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.657	0.00	27.637	0.00	27.597
1.00	27.550	1.40	27.382	0.70	27.542
1.70	27.188	1.60	27.097	1.40	27.274
2.55	26.956	2.15	26.907	1.60	27.090
2.90	26.649	2.35	26.540	2.05	26.833
3.30	26.497	2.60	26.509	2.35	26.594
4.00	26.328	2.95	26.308	2.60	26.435
4.50	26.224	3.30	26.187	2.80	26.190
5.30	26.171	4.05	26.128	3.55	26.157
5.95	26.158	4.95	26.130	4.25	26.106
6.80	26.051	5.80	26.110	5.00	26.116
7.30	26.044	6.75	26.093	6.00	26.140
7.85	25.891	7.50	26.130	7.00	26.158
8.30	25.920	8.30	26.181	7.80	26.161
8.75	26.138	8.80	26.307	8.35	26.290
9.00	26.201	9.10	26.941	8.90	26.386
9.10	27.351	9.60	27.153	9.20	27.222
9.80	27.564	9.95	27.663	9.60	27.345
10.70	27.702	10.65	27.692	10.30	27.630
11.55 ⊙	27.651	11.50	27.588	11.10 ⊙	27.568
				11.50	27.524

TRAVERSE 30		TRAVERSE 31		TRAVERSE 32	
benchmark coordinates: X_L = 159 426.33 m Y_L = 367 890.48 m X_R = 159 431.25 m Y_R = 367 900.08 m		benchmark coordinates: X_L = 159 421.19 m Y_L = 367 894.15 m X_R = 159 427.80 m Y_R = 367 902.08 m		benchmark coordinates: X_L = 159 416.48 m Y_L = 367 898.67 m X_R = 159 425.31 m Y_R = 367 904.63 m	
date: 80 05 28		date: 80 05 28		date: 80 05 28	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.618	0.00	27.574	0.00	27.463
0.90	27.523	0.90	27.397	1.10	27.374
2.00	27.054	1.30	27.188	1.60	27.188
2.50	26.348	1.50	26.903	1.85	26.797
2.90	26.117	2.00	26.734	2.20	26.660
3.35	26.109	2.25	26.503	2.35	26.345
3.65	26.322	2.40	26.461	2.50	26.110
4.00	26.287	2.70	26.050	2.80	26.054
4.50	26.014	3.35	25.947	3.00	25.900
4.90	26.008	4.00	25.831	3.25	25.849
5.70	26.019	4.70	26.036	3.55	25.794
6.40	26.030	5.40	26.158	4.10	25.985
7.00	26.170	6.25	26.222	4.65	26.087
7.40	26.411	6.90	26.248	5.45	26.153
7.70	26.394	7.45	26.252	6.30	26.233
7.90	26.247	7.90	26.506	7.00	26.328
8.30	26.274	8.10	26.957	7.55	26.307
8.55	26.902	8.40	27.217	8.20	26.520
9.40	27.524	8.60	27.382	8.45	26.854
10.40	27.637	9.30	27.616	8.70	27.211
10.68 ⊙	27.657	9.45	27.771	9.00	27.397
		9.70	27.767	9.60	27.544
		10.10 ⊙	27.681	10.10	27.810
		10.20	27.596	10.70 ⊙	27.772
				11.30	27.659

TRAVERSE 33		TRAVERSE 34		TRAVERSE 35	
benchmark coordinates: X_L = 159 413.79 m Y_L = 367 903.78 m X_R = 159 424.68 m Y_R = 367 907.38		benchmark coordinates: X_L = 159 413.59 m Y_L = 367 912.26 m X_R = 159 423.77 m Y_R = 367 909.75 m		benchmark coordinates: X_L = 159 416.64 m Y_L = 367 916.77 m X_R = 159 425.00 m Y_R = 367 911.74 m	
date: 80 05 28		date: 80 05 28		date: 80 05 28	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.461	0.00	27.456	0.37	27.185
1.00	27.352	0.30	27.386	0.62	27.012
1.50	27.014	0.40	27.198	1.07	26.790
1.70	26.370	0.90	27.193	1.37	26.524
2.05	26.060	1.15	27.215	1.57	26.147
2.35	25.830	1.40	27.004	1.77	25.534
2.90	25.830	1.65	26.706	2.27	25.490
3.55	25.717	1.85	26.268	2.87	25.630
4.20	25.983	2.05	25.940	3.37	25.879
4.80	26.123	2.30	25.860	3.87	26.084
5.30	26.204	2.80	25.834	4.47	26.204
6.10	26.234	3.25	25.969	5.27	26.210
6.80	26.290	3.80	25.982	5.97	26.297
7.55	26.367	4.45	26.037	6.67	26.370
8.15	26.437	5.10	26.105	6.87	26.498
8.40	26.953	5.65	26.208	7.47	26.593
8.80	27.244	6.30	26.303	7.77	27.024
9.10	27.378	6.90	26.372	8.32	27.336
9.55	27.453	7.60	26.427	8.77	27.346
10.30	27.743	7.90	26.532	9.42	27.622
11.00	27.753	8.30	27.059	9.77 ⊙	27.617
11.43 ⊙	27.755	9.00	27.387		
12.50	27.650	9.95	27.621		
		10.40 ⊙	27.613		
		11.20	27.654		

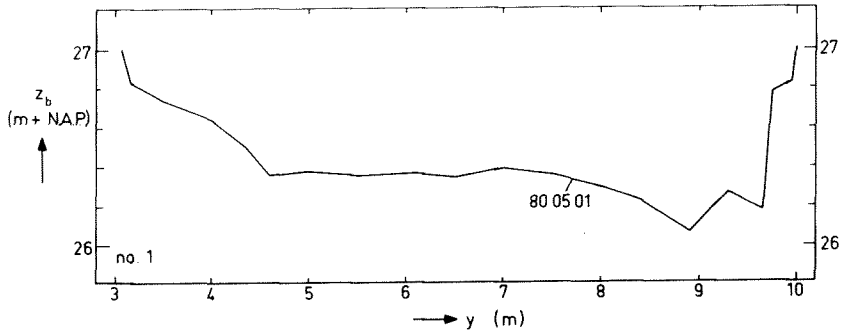
TRAVERSE 36		TRAVERSE 37		TRAVERSE 40	
benchmark coordinates: X_L = 159 420.67 m Y_L = 367 922.80 m X_R = 159 428.20 m Y_R = 367 917.60 m		benchmark coordinates: X_L = 159 424.40 m Y_L = 367 929.34 m X_R = 159 432.30 m Y_R = 367 923.39 m		benchmark coordinates: X_L = 159 434.29 m Y_L = 367 944.11 m X_R = 159 443.09 m Y_R = 367 937.69 m	
date: 80 05 28		date: 80 05 28		date: 80 05 27	
y (m)	z_b (m)	y (m)	z_b (m)	y (m)	z_b (m)
0.00	27.308	0.00	27.496	0.00	27.534
0.55	27.183	0.90	27.405	1.00	27.567
0.95	26.921	1.50	27.155	1.50	27.427
1.15	26.443	1.70	26.011	1.70	27.185
1.40	26.268	2.00	25.995	2.00	27.086
1.80	26.006	2.55	25.993	2.30	26.418
2.20	26.098	3.20	26.037	2.50	26.322
2.65	25.937	3.90	26.063	3.00	26.173
3.15	26.033	4.70	26.054	3.50	26.057
3.70	26.048	5.55	26.154	4.05	26.103
4.40	26.096	6.00	26.191	4.85	26.106
5.20	26.142	6.30	26.339	5.30	26.094
5.70	26.188	6.80	26.345	5.85	26.088
5.90	26.355	7.30	26.447	6.50	26.063
6.15	26.371	7.55	26.554	6.95	25.998
6.40	26.323	7.70	26.878	7.35	26.162
6.75	26.357	8.75	27.202	7.70	26.113
7.15	26.530	8.90	27.517	8.10	26.178
7.40	27.007	9.70 ⊙	27.658	8.50	26.345
7.75	27.189			8.80	26.809
9.20 ⊙	27.573			9.20	27.116
				9.65	27.252
				9.90	27.496
				10.75 ⊙	27.546

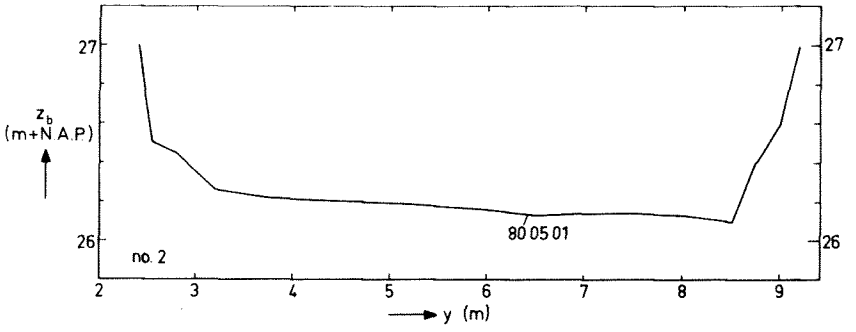
TRAVERSE 44		TRAVERSE 52			
benchmark coordinates: X_L = 159 446.03 m Y_L = 367 963.64 m X_R = 159 455.73 m Y_R = 367 959.82 m		benchmark coordinates: X_L = 159 452.60 m Y_L = 368 013.82 m X_R = 159 462.33 m Y_R = 368 012.09 m			
date: 80 05 27		date: 80 05 27			
y (m)	z_b (m)	y (m)	z_b (m)		
0.00	27.412	0.00	27.468		
0.80	27.407	0.80	27.413		
1.30	27.249	1.10	27.221		
1.55	27.071	1.40	26.493		
1.70	26.519	1.60	26.340		
2.00	26.371	1.90	26.148		
2.40	26.256	2.10	26.121		
3.10	26.142	2.30	26.153		
3.85	26.121	2.85	26.181		
4.70	26.120	3.30	26.086		
5.50	26.117	3.85	26.093		
6.25	26.097	4.30	26.100		
7.20	26.081	4.90	26.102		
8.00	26.024	5.60	26.073		
8.50	26.036	6.25	26.041		
8.80	26.159	6.90	25.992		
9.00	26.811	7.30	26.001		
9.40	27.020	7.70	26.110		
9.90	27.386	7.90	26.186		
10.20	27.472	8.00	26.901		
10.40 ⊙	27.527	8.50	27.193		
		9.10	27.399		
		9.85 ⊙	27.472		

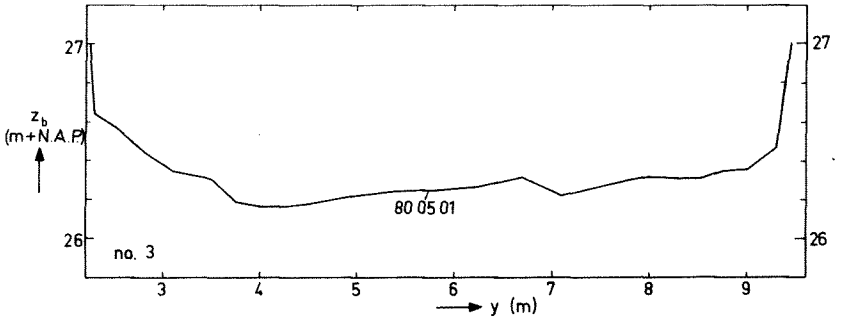
APPENDIX B

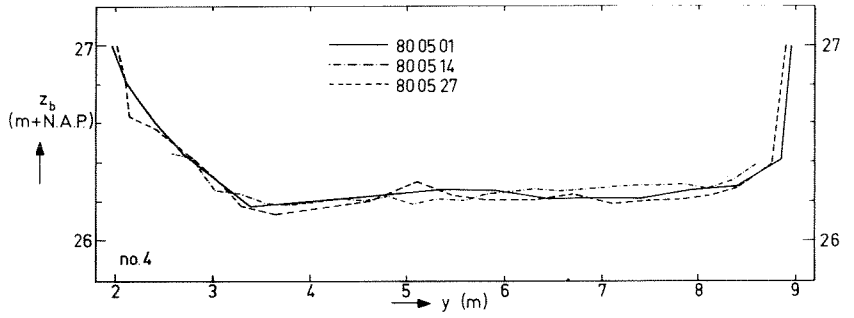
Bed profile diagrams

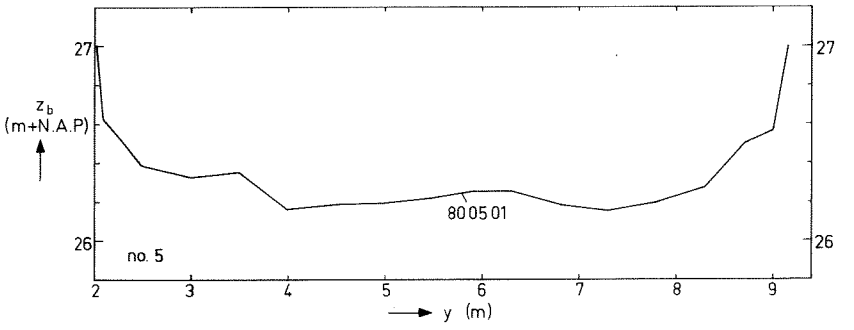
Explanatory note:
In each diagram up to four bed profiles are shown. The profiles indicated by a solid line and by a broken line have been measured by levelling (also see Appendix A). The dash-dotted lines depict bed profiles that have been constructed using the bed level observations by means of the foot of the current meter mounting rod (also see Fig. 2 and Appendix C).

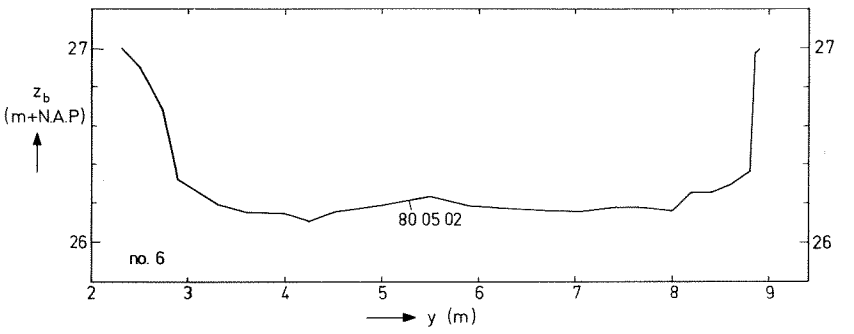

27
26
z_b
(m + N.A.P.)
80 05 01
no. 1
3
4
5
6
7
8
9
10
y (m)

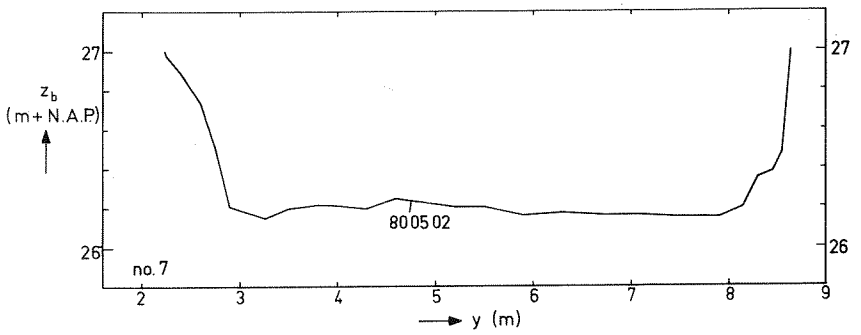

27
26
z_b
(m+N.A.P.)
80 05 01
no. 2
2
3
4
5
6
7
8
9
y (m)

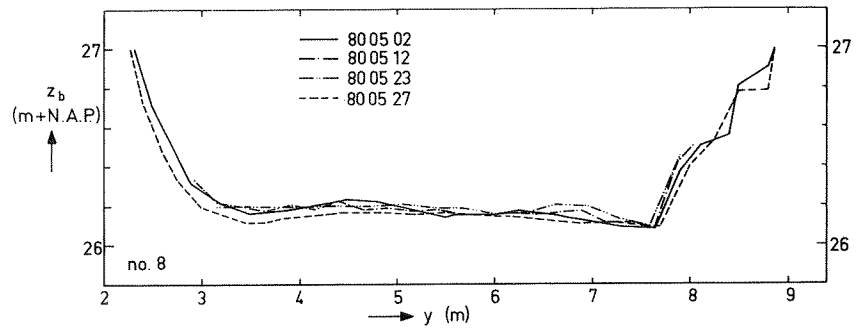

27
26
z_b
(m+N.A.P.)
80 05 01
no. 3
3
4
5
6
7
8
9
y (m)

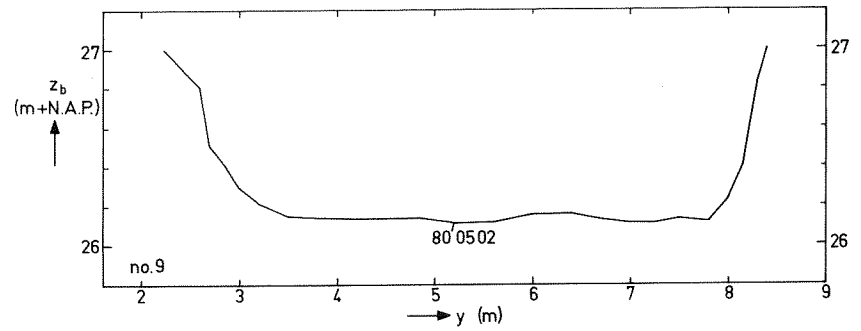

80 05 01
80 05 14
80 05 27
z_b (m+N.A.P)
27
26
no. 4
2
3
4
5
6
7
8
9
y (m)

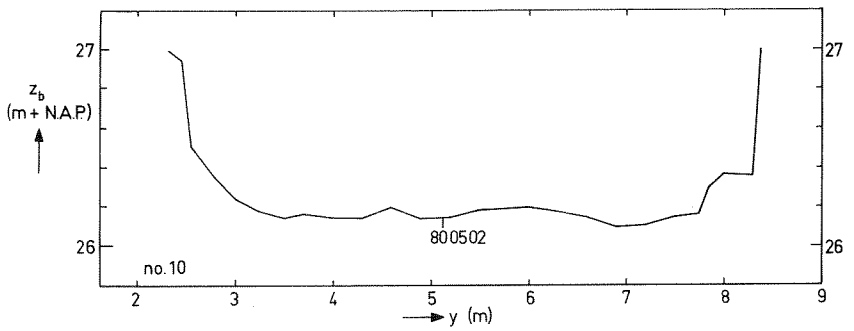

z_b (m+N.A.P)
27
26
80 05 01
no. 5
2
3
4
5
6
7
8
9
y (m)

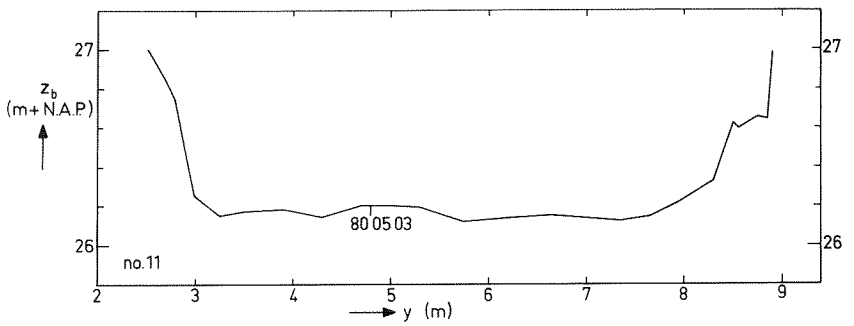

z_b (m+N.A.P)
27
26
80 05 02
no. 6
2
3
4
5
6
7
8
9
y (m)

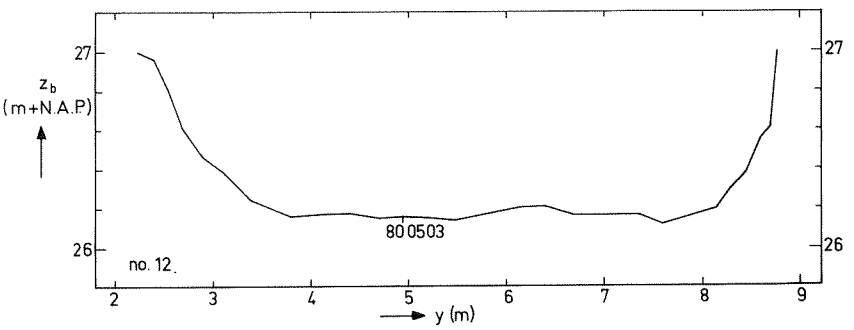

27
26
z_b
(m+N.A.P.)
80 05 02
no. 7
2
3
4
5
6
7
8
9
y (m)

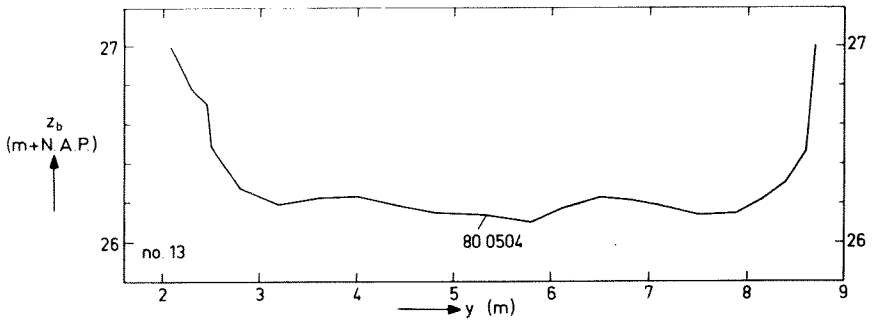

80 05 02
80 05 12
80 05 23
80 05 27
27
26
z_b
(m+N.A.P.)
no. 8
2
3
4
5
6
7
8
9
y (m)

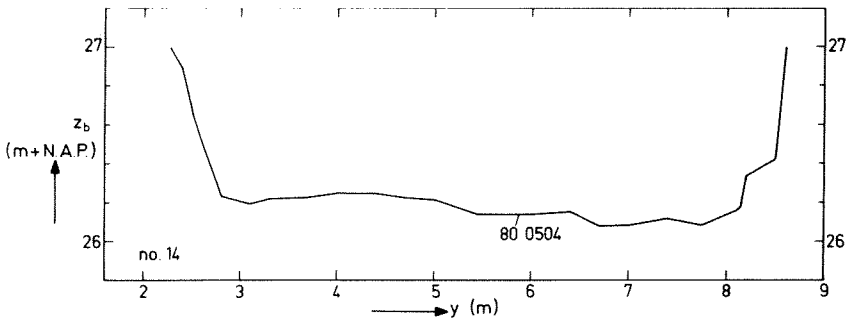

27
26
z_b
(m+N.A.P.)
80 05 02
no. 9
2
3
4
5
6
7
8
9
y (m)

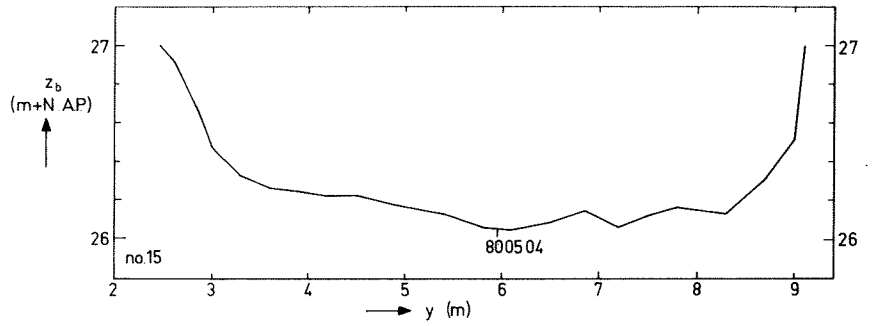

27
26
z_b
(m+N.A.P.)
no.10
800502
2
3
4
5
6
7
8
9
y (m)

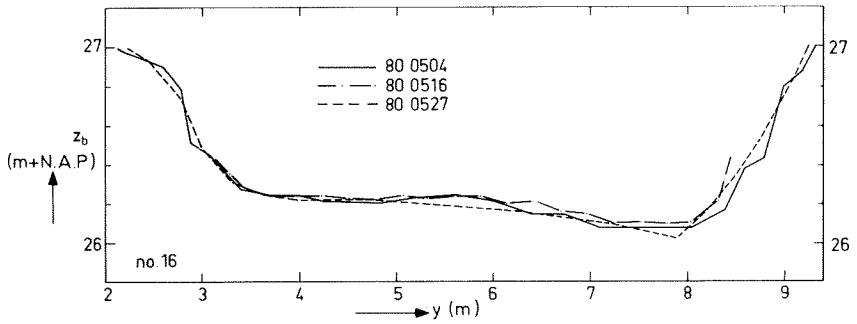

27
26
z_b
(m+N.A.P.)
no.11
800503
2
3
4
5
6
7
8
9
y (m)

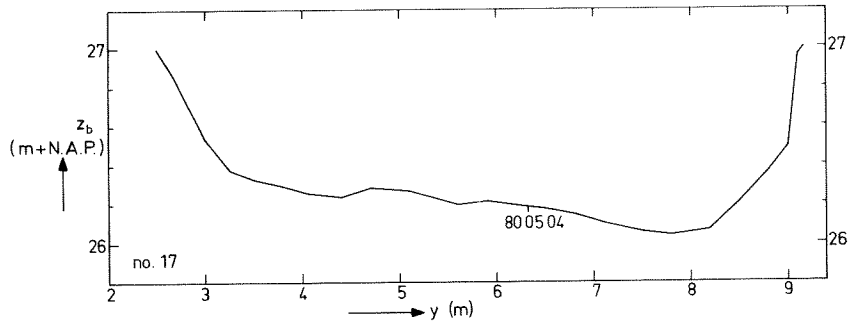

27
26
z_b
(m+N.A.P.)
no. 12
800503
2
3
4
5
6
7
8
9
y (m)

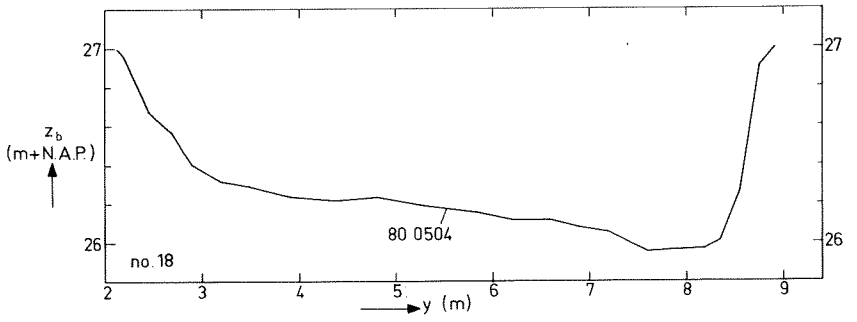

27
26
z_b
(m+N.A.P.)
no. 13
80 0504
2
3
4
5
6
7
8
9
y (m)

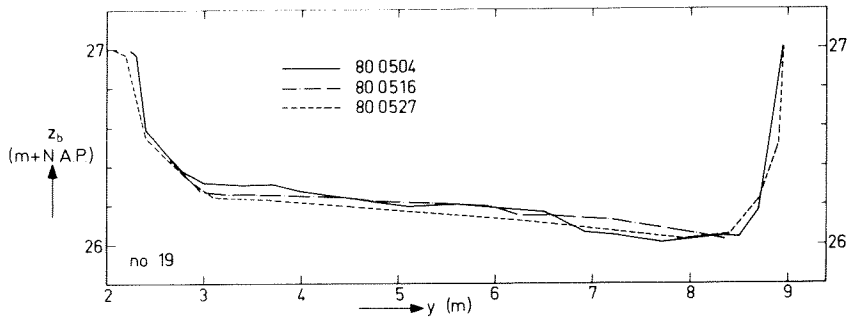

27
26
z_b
(m+N.A.P.)
no. 14
80 0504
2
3
4
5
6
7
8
9
y (m)

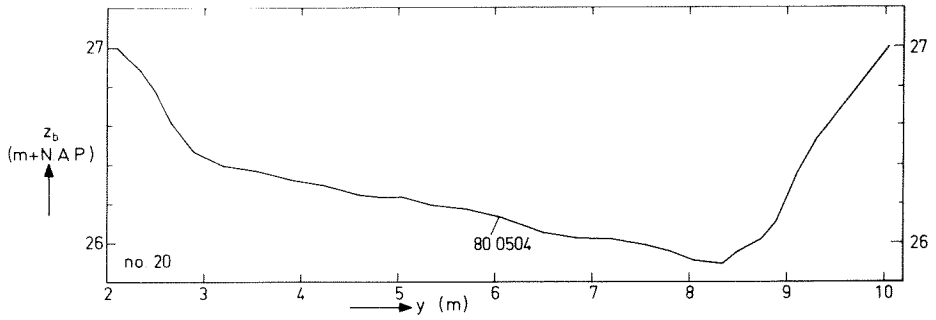

27
26
z_b
(m+N.A.P.)
no.15
80 05 04
2
3
4
5
6
7
8
9
y (m)

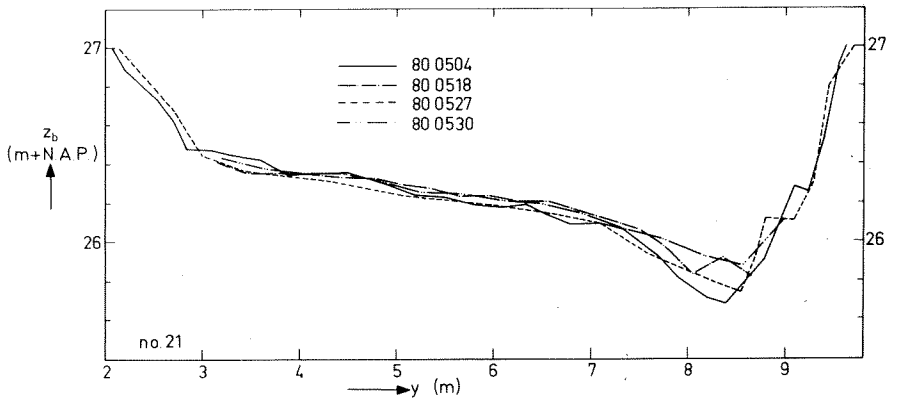

80 0504
80 0516
80 0527
z_b
(m+N.A.P.)
27
26
no. 16
2
3
4
5
6
7
8
9
y (m)

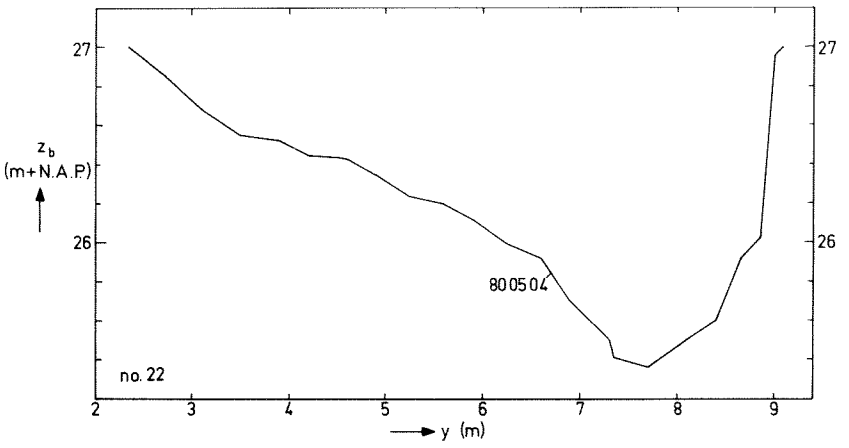

z_b
(m+N.A.P.)
27
26
80 05 04
no. 17
2
3
4
5
6
7
8
9
y (m)

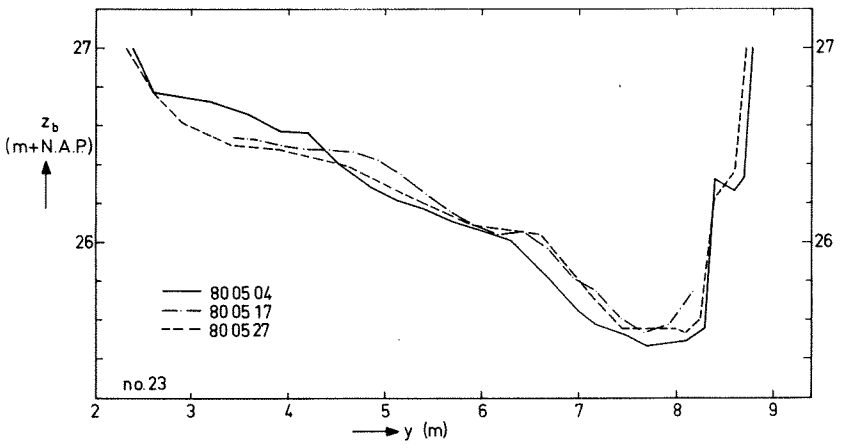

z_b
(m+N.A.P.)
27
26
80 0504
no. 18
2
3
4
5
6
7
8
9
y (m)

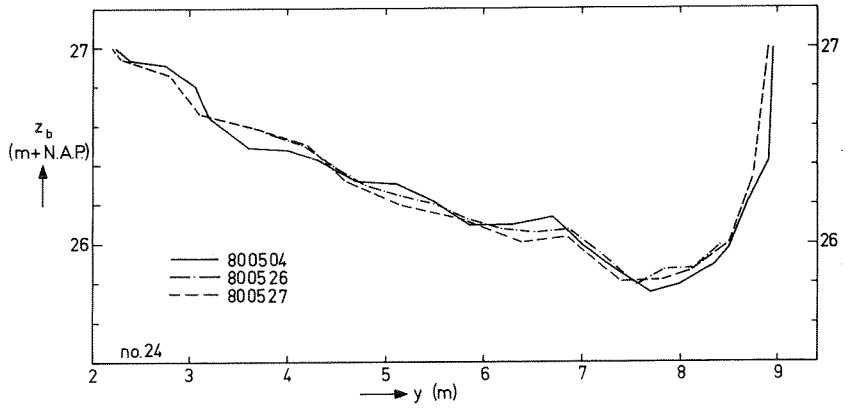

80 0504
80 0516
80 0527
z_b (m+NAP)
27
26
no. 19
2
3
4
5
6
7
8
9
y (m)

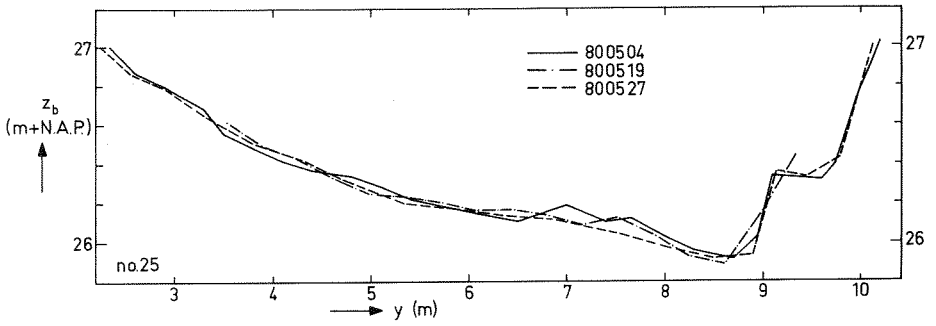

z_b (m+NAP)
27
26
no. 20
80 0504
2
3
4
5
6
7
8
9
10
y (m)

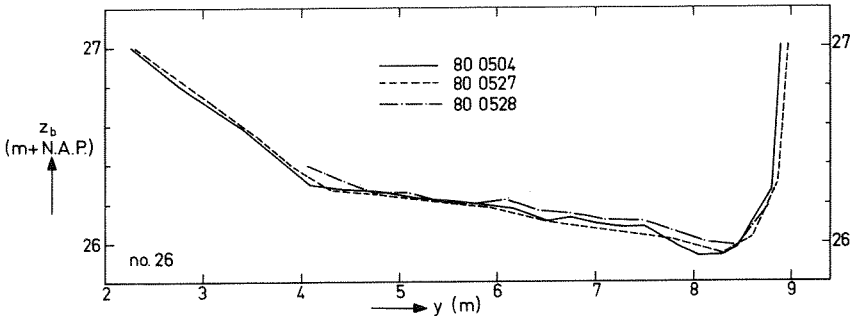

80 0504
80 0518
80 0527
80 0530
z_b (m+NAP)
27
26
no. 21
2
3
4
5
6
7
8
9
y (m)

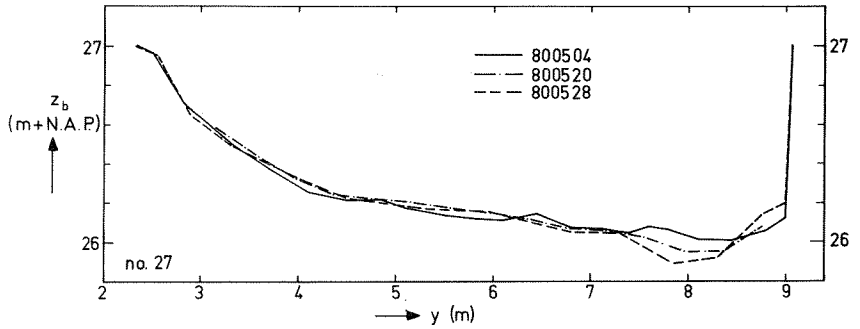

27
26
z_b
(m+N.A.P)
80 05 04
no. 22
2
3
4
5
6
7
8
9
y (m)

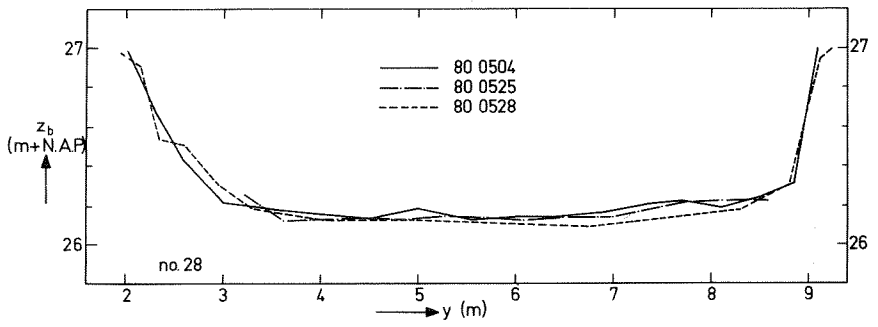

27
26
z_b
(m+N.A.P)
80 05 04
80 05 17
80 05 27
no. 23
2
3
4
5
6
7
8
9
y (m)

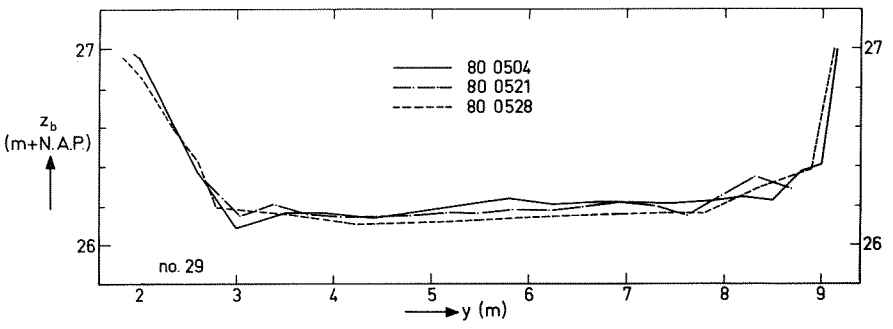

27
26
z_b
(m+N.A.P.)
800504
800526
800527
no.24
2
3
4
5
6
7
8
9
y (m)

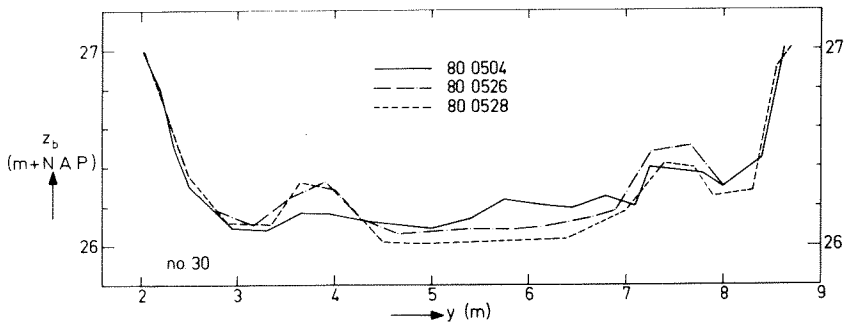

27
26
z_b
(m+N.A.P.)
800504
800519
800527
no.25
3
4
5
6
7
8
9
10
y (m)

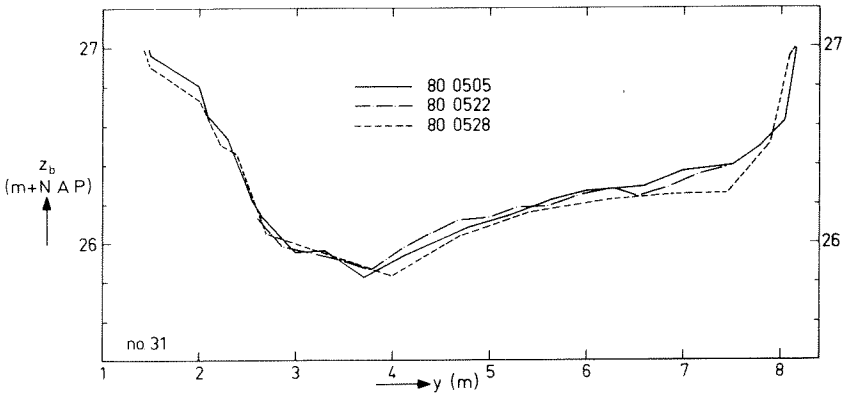

27
26
z_b
(m+N.A.P.)
80 0504
80 0527
80 0528
no. 26
2
3
4
5
6
7
8
9
y (m)

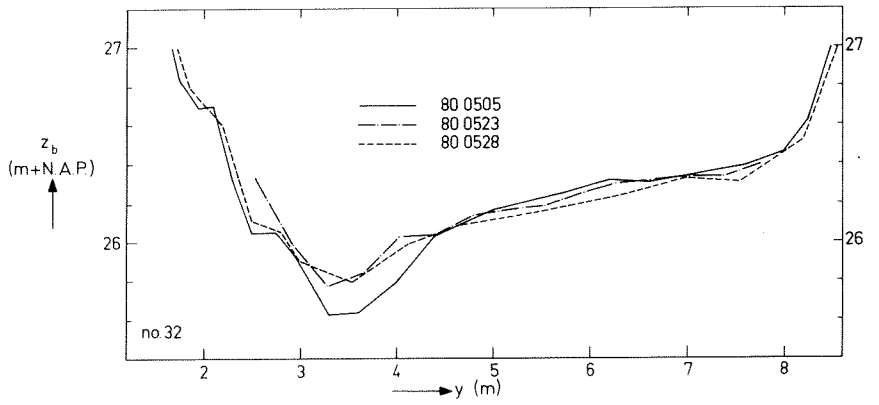

800504
800520
800528
z_b
(m+N.A.P.)
no. 27
y (m)

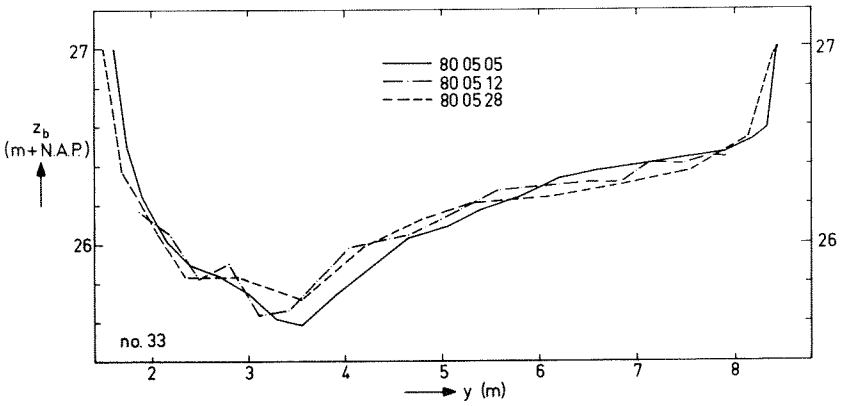

80 0504
80 0525
80 0528
z_b
(m+N.A.P.)
no. 28
y (m)

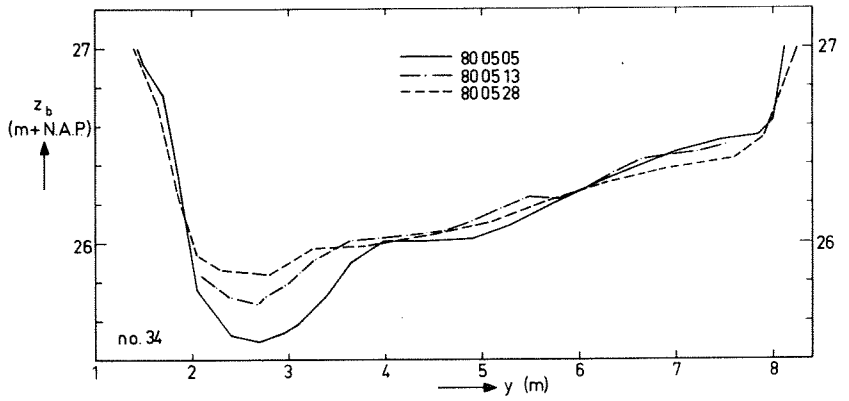

80 0504
80 0521
80 0528
z_b
(m+N.A.P.)
no. 29
y (m)

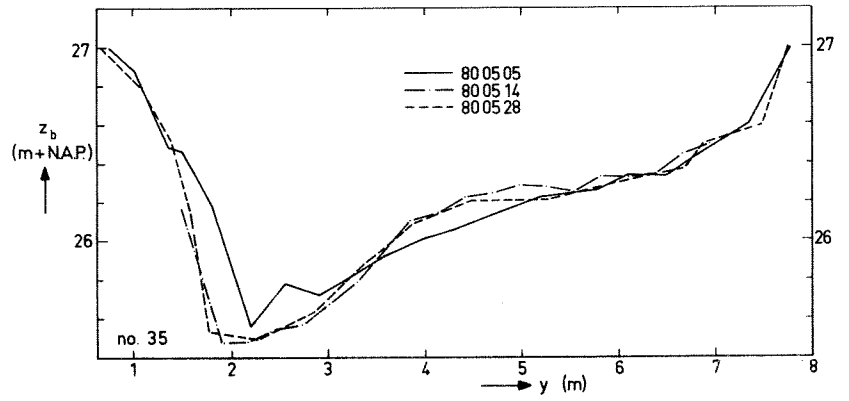

27
26
z_b
(m+N.A.P.)
80 0504
80 0526
80 0528
no. 30
2
3
4
5
6
7
8
9
y (m)

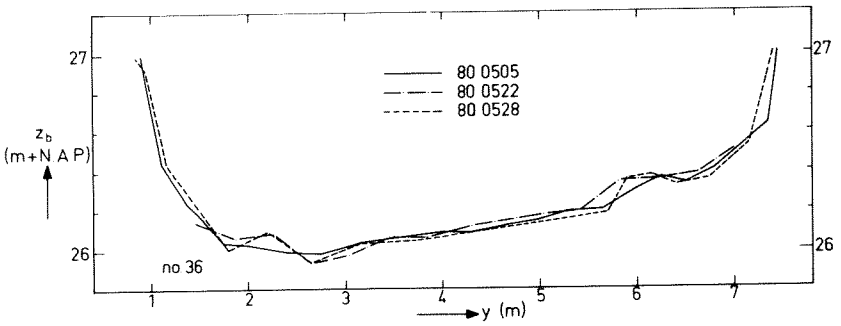

27
26
z_b
(m+N.A.P.)
80 0505
80 0522
80 0528
no. 31
1
2
3
4
5
6
7
8
y (m)

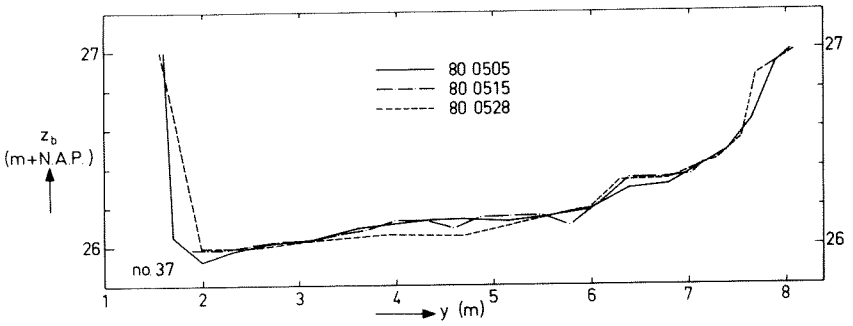

27
26
z_b
(m+N.A.P.)
80 0505
80 0523
80 0528
no. 32
2
3
4
5
6
7
8
y (m)

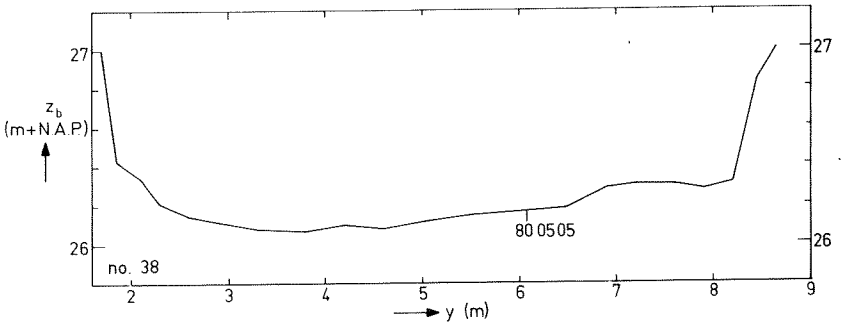

27
26
z_b
(m+N.A.P.)
80 05 05
80 05 12
80 05 28
no. 33
2
3
4
5
6
7
8
y (m)

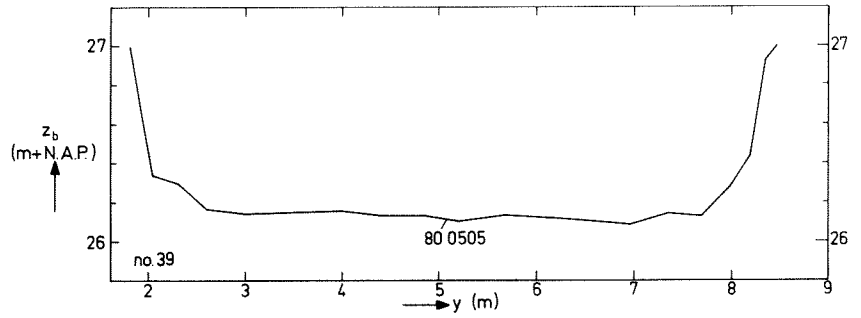

27
26
z_b
(m+N.A.P.)
80 05 05
80 05 13
80 05 28
no. 34
1
2
3
4
5
6
7
8
y (m)

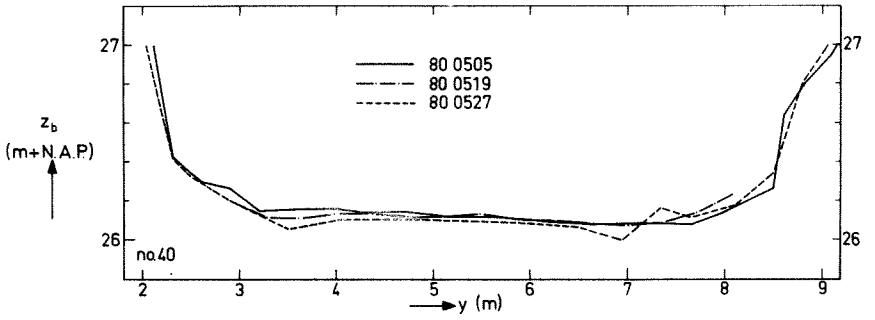

27
26
z_b
(m+N.A.P.)
80 05 05
80 05 14
80 05 28
no. 35
1
2
3
4
5
6
7
8
y (m)

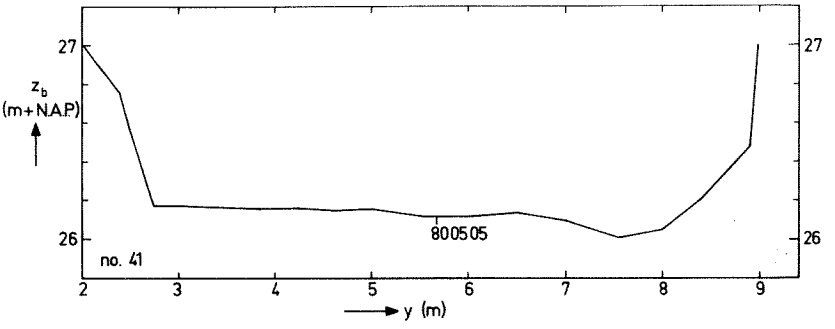

80 0505
80 0522
80 0528
z_b
(m+N.A.P)
27
26
no 36
1
2
3
4
5
6
7
y (m)

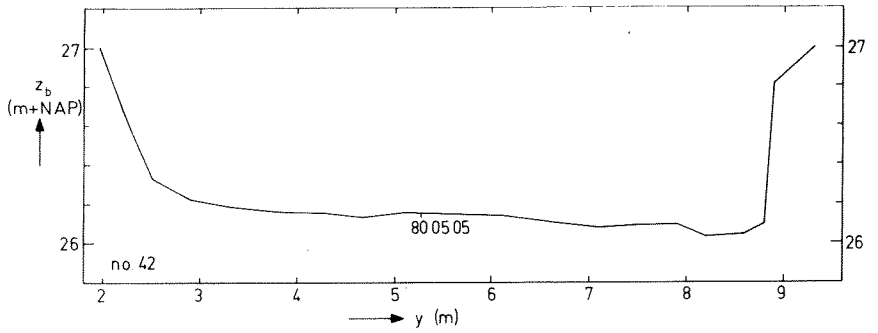

80 0505
80 0515
80 0528
z_b
(m+N.A.P.)
27
26
no 37
1
2
3
4
5
6
7
8
y (m)

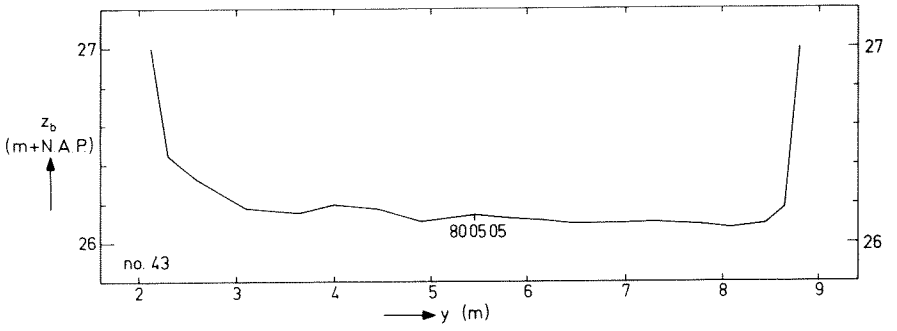

z_b
(m+N.A.P)
27
26
80 0505
no. 38
2
3
4
5
6
7
8
9
y (m)

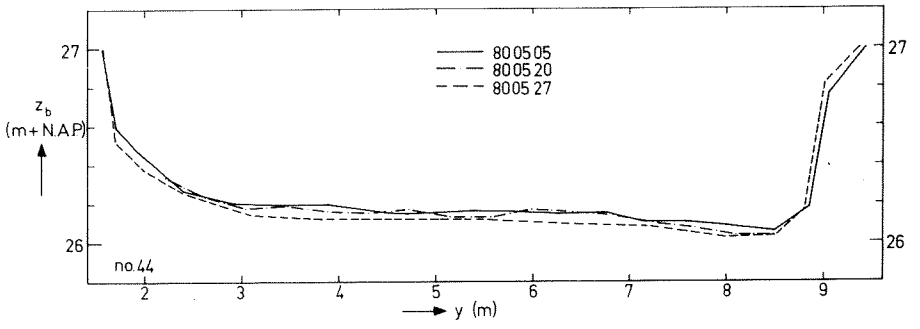

27
26
z_b
(m+N.A.P.)
80 0505
no. 39
2
3
4
5
6
7
8
9
y (m)

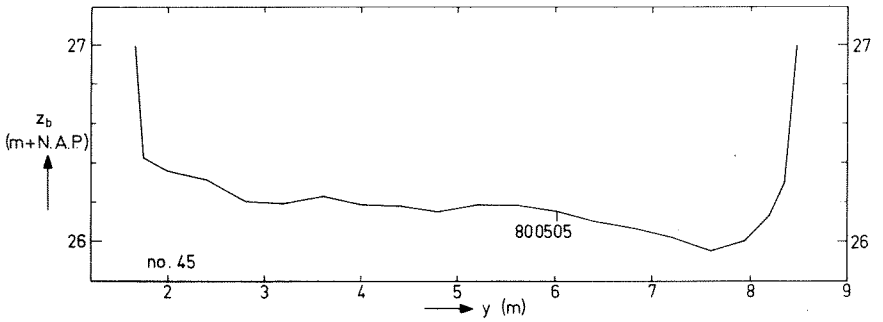

27
26
z_b
(m+N.A.P.)
80 0505
80 0519
80 0527
no. 40
2
3
4
5
6
7
8
9
y (m)

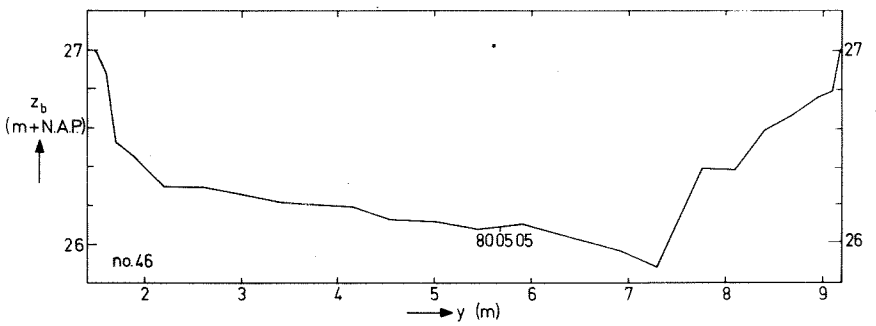

27
26
z_b
(m+N.A.P.)
800505
no. 41
2
3
4
5
6
7
8
9
y (m)

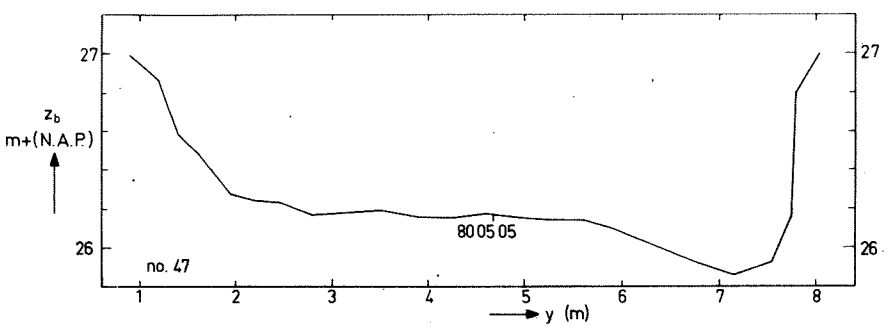

27
26
z_b
(m+NAP)
80 05 05
no. 42
2
3
4
5
6
7
8
9
y (m)

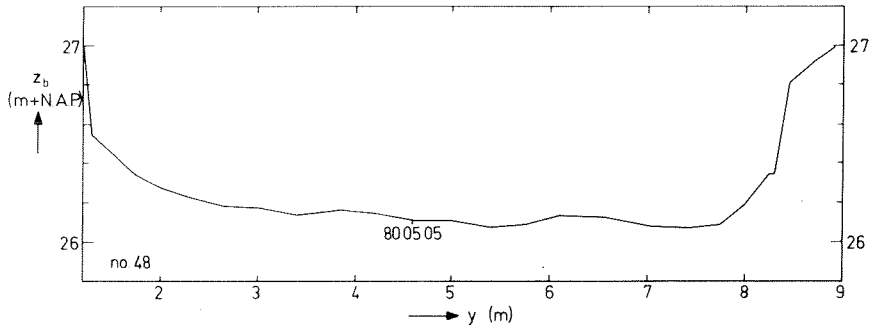

27
26
z_b
(m+N.A.P.)
80 05 05
no. 43
2
3
4
5
6
7
8
9
y (m)

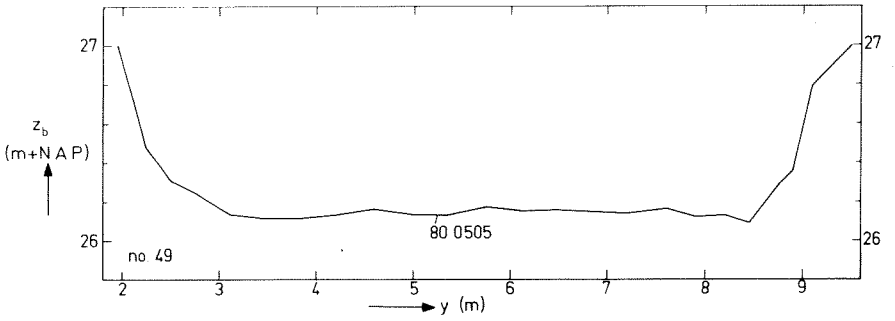

80 05 05
80 05 20
80 05 27
27
26
z_b
(m+N.A.P.)
no. 44
2
3
4
5
6
7
8
9
y (m)

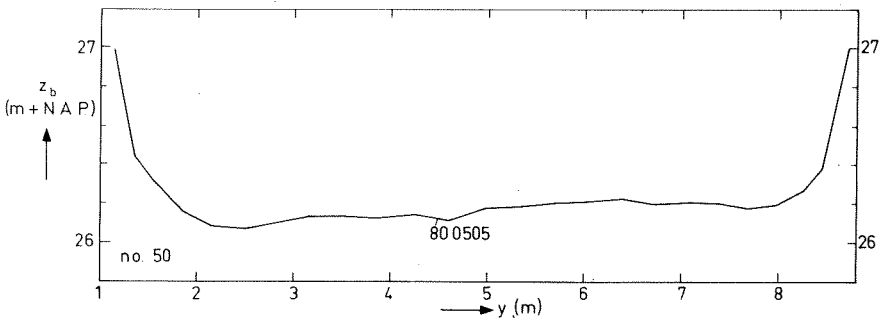

27
26
z_b
(m+N.A.P)
800505
no. 45
2
3
4
5
6
7
8
9
y (m)

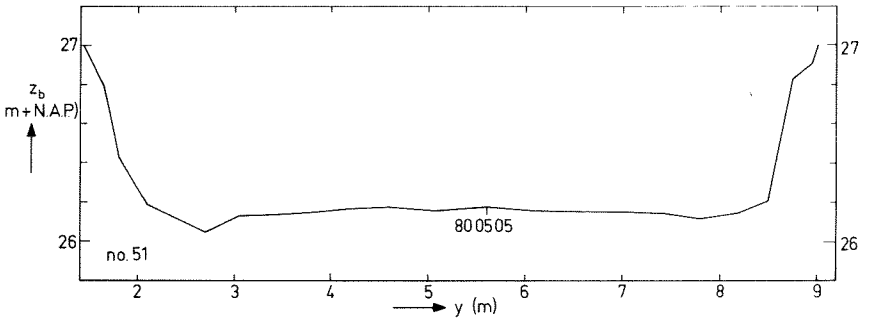

27
26
z_b
(m+N.A.P)
800505
no.46
2
3
4
5
6
7
8
9
y (m)

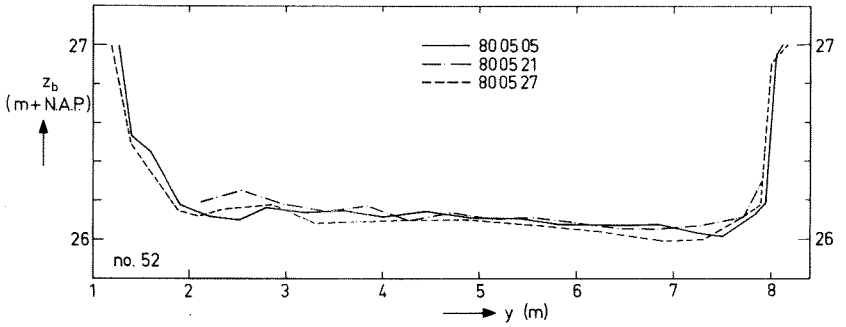

27
26
z_b
m+(N.A.P)
800505
no. 47
1
2
3
4
5
6
7
8
y (m)


27
26
z_b
(m+NAP)
no. 48
80 05 05
2
3
4
5
6
7
8
9
y (m)


27
26
z_b
(m+NAP)
no. 49
80 0505
2
3
4
5
6
7
8
9
y (m)


27
26
z_b
(m+NAP)
no. 50
80 0505
1
2
3
4
5
6
7
8
y (m)


27
26
z_b
m+N.A.P.
no. 51
800505
2
3
4
5
6
7
8
9
y (m)


27
26
z_b
(m+N.A.P.)
no. 52
800505
800521
800527
1
2
3
4
5
6
7
8
y (m)

APPENDIX C

Velocity measurements

Explanatory note:
The velocity measuring points in each vertical have been positioned according to the following rules:

- the interval between successive measuring points equals 0.1 d,
- the measuring points at 0.5 d and 0.7 d above the local bed level are omitted,
- the lowest measuring point is positioned at z_b + 0.10 m,
- the highest measuring point is positioned at z_s - 0.05 m.

TRAVERSE 4 — date: 80 05 14 — time: 10.25 - 17.20

vertical no. 1

y = 2.58 m
z_s = 26.731 m
z_b = 26.444 m
d = 0.287 m

z (m)	u (m/s)
26.558	0.147
26.673	0.217

vertical no. 2

y = 2.78 m
z_s = 26.725 m
z_b = 26.423 m
d = 0.302 m

z (m)	u (m/s)
26.523	0.275
26.604	0.299
26.665	0.274

vertical no. 3

y = 3.03 m
z_s = 26.728 m
z_b = 26.262 m
d = 0.466 m

z (m)	u (m/s)
26.362	0.177
26.449	0.322
26.636	0.353

vertical no. 4

y = 3.29 m
z_s = 26.736 m
z_b = 26.239 m
d = 0.497 m

z (m)	u (m/s)
26.339	0.320
26.388	0.341
26.438	0.360
26.537	0.396
26.637	0.437
26.686	0.428

vertical no. 5

y = 3.54 m
z_s = 26.727 m
z_b = 26.191 m
d = 0.536 m

z (m)	u (m/s)
26.298	0.425
26.620	0.544

vertical no. 6

y = 3.79 m
z_s = 26.732 m
z_b = 26.185 m
d = 0.547 m

z (m)	u (m/s)
26.285	0.447
26.349	0.472
26.403	0.520
26.513	0.584
26.622	0.609
26.681	0.580

vertical no. 7

y = 4.04 m
z_s = 26.731 m
z_b = 26.194 m
d = 0.537 m

z (m)	u (m/s)
26.301	0.448
26.624	0.648

vertical no. 8

y = 4.29 m
z_s = 26.734 m
z_b = 26.215 m
d = 0.519 m

z (m)	u (m/s)
26.315	0.457
26.371	0.512
26.423	0.545
26.526	0.595
26.630	0.626
26.684	0.639

vertical no. 9

y = 4.55 m
z_s = 26.741 m
z_b = 26.201 m
d = 0.540 m

z (m)	u (m/s)
26.309	0.449
26.633	0.640

TRAVERSE 4	date: 80 05 14	time: 10.25 - 17.20
vertical no. 10	vertical no. 11	vertical no. 12
y = 4.80 m z_s = 26.741 m z_b = 26.220 m d_b = 0.521 m	y = 5.06 m z_s = 26.741 m z_b = 26.185 m d_b = 0.556 m	y = 5.31 m z_s = 26.740 m z_b = 26.211 m d_b = 0.520 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.320 0.497 26.376 0.491 26.428 0.507 26.533 0.573 26.637 0.617 26.691 0.666	26.296 0.428 26.407 0.537 26.629 0.642	26.311 0.485 26.370 0.541 26.423 0.545 26.528 0.587 26.634 0.657 26.687 0.678
vertical no. 13	vertical no. 14	vertical no. 15
y = 5.57 m z_s = 26.740 m z_b = 26.201 m d_b = 0.539 m	y = 5.82 m z_s = 26.737 m z_b = 26.234 m d_b = 0.503 m	y = 6.07 m z_s = 26.737 m z_b = 26.246 m d_b = 0.491 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.309 0.447 26.631 0.675	26.334 0.526 26.385 0.550 26.435 0.578 26.536 0.586 26.636 0.635 26.687 0.676	26.344 0.538 26.443 0.601 26.640 0.683
vertical no. 16	vertical no. 17	vertical no. 18
y = 6.32 m z_s = 26.735 m z_b = 26.261 m d_b = 0.474 m	y = 6.58 m z_s = 26.735 m z_b = 26.250 m d_b = 0.485 m	y = 6.83 m z_s = 26.738 m z_b = 26.261 m d_b = 0.477 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.361 0.576 26.404 0.598 26.451 0.598 26.546 0.645 26.641 0.663 26.686 0.658	26.347 0.509 26.444 0.552 26.637 0.672	26.361 0.608 26.404 0.596 26.452 0.610 26.548 0.664 26.643 0.687 26.689 0.693

TRAVERSE 4	date: 80 05 14	time: 10.25 - 17.20
vertical no. 19	vertocal no. 20	vertical no. 21
y = 7.08 m z_s = 26.735 m z_b = 26.270 m d = 0.465 m	y = 7.33 m z_s = 26.739 m z_b = 26.281 m d = 0.458 m	y = 7.58 m z_s = 26.740 m z_b = 26.279 m d = 0.461 m
z (m) u (m/s) 26.363 0.485 26.456 0.553 26.642 0.682	z (m) u (m/s) 26.381 0.561 26.418 0.560 26.464 0.579 26.556 0.616 26.647 0.646 26.689 0.656	z (m) u (m/s) 26.371 0.561 26.647 0.625
vertical no. 22	vertical no. 23	vertical no. 24
y = 7.84 m z_s = 26.740 m z_b = 26.287 m d = 0.453 m	y = 8.09 m z_s = 26.743 m z_b = 26.263 m d = 0.480 m	y = 8.34 m z_s = 26.741 m z_b = 26.301 m d = 0.440 m
z (m) u (m/s) 26.387 0.426 26.423 0.418 26.468 0.445 26.559 0.513 26.649 0.549 26.690 0.560	z (m) u (m/s) 26.359 0.404 26.647 0.508	z (m) u (m/s) 26.401 0.167 26.433 0.182 26.477 0.263 26.565 0.427 26.653 0.437 26.691 0.419
vertical no. 25		
y = 8.59 m z_s = 26.740 m z_b = 26.385 m d = 0.355 m		
z (m) u (m/s) 26.485 0.137 26.527 0.203 26.669 0.239		

TRAVERSE 8	date: 80 05 12	time: 10.30 - 18.20
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.92 m z_s = 26.697 m z_b = 26.339 m d_b = 0.358 m	y = 3.17 m z_s = 26.702 m z_b = 26.214 m d_b = 0.488 m	y = 3.42 m z_s = 26.704 m z_b = 26.199 m d_b = 0.505 m
z (m) u (m/s) 26.483 0.291 26.627 0.271	z (m) u (m/s) 26.314 0.349 26.361 0.386 26.410 0.413 26.508 0.460 26.606 0.442 26.654 0.391	z (m) u (m/s) 26.299 0.368 26.599 0.500
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.67 m z_s = 26.706 m z_b = 26.180 m d_b = 0.526 m	y = 3.92 m z_s = 26.701 m z_b = 26.205 m d_b = 0.496 m	y = 4.16 m z_s = 26.707 m z_b = 26.185 m d_b = 0.522 m
z (m) u (m/s) 26.280 0.361 26.339 0.435 26.390 0.469 26.495 0.508 26.600 0.545 26.655 0.547	z (m) u (m/s) 26.304 0.458 26.602 0.611	z (m) u (m/s) 26.285 0.532 26.342 0.539 26.394 0.567 26.498 0.611 26.603 0.635 26.657 0.610
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.41 m z_s = 26.706 m z_b = 26.222 m d_b = 0.484 m	y = 4.66 m z_s = 26.717 m z_b = 26.186 m d_b = 0.531 m	y = 4.91 m z_s = 26.718 m z_b = 26.189 m d_b = 0.529 m
z (m) u (m/s) 26.319 0.527 26.609 0.639	z (m) u (m/s) 26.286 0.458 26.346 0.543 26.399 0.602 26.505 0.630 26.612 0.688 26.668 0.682	z (m) u (m/s) 26.295 0.519 26.613 0.676

TRAVERSE 8	date: 80 05 12	time: 10.30 - 18.20
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.16 m z_s = 26.715 m z_b = 26.174 m d = 0.541 m	y = 5.40 m z_s = 26.714 m z_b = 26.182 m d = 0.532 m	y = 5.65 m z_s = 26.713 m z_b = 26.158 m d = 0.555 m
z (m) u (m/s) 26.274 0.423 26.336 0.562 26.390 0.611 26.499 0.658 26.607 0.703 26.665 0.693	z (m) u (m/s) 26.289 0.456 26.609 0.685	z (m) u (m/s) 26.258 0.471 26.325 0.523 26.380 0.565 26.491 0.633 26.602 0.675 26.658 0.693
vertical no. 13	vertical no. 14	vertical no. 15
y = 5.90 m z_s = 26.718 m z_b = 26.152 m d = 0.566 m	y = 6.15 m z_s = 26.716 m z_b = 26.169 m d = 0.547 m	y = 6.40 m z_s = 26.711 m z_b = 26.159 m d = 0.552 m
z (m) u (m/s) 26.265 0.447 26.606 0.667	z (m) u (m/s) 26.269 0.519 26.333 0.561 26.388 0.608 26.497 0.639 26.607 0.686 26.666 0.700	z (m) u (m/s) 26.270 0.471 26.602 0.654
vertical no. 16	vertical no. 17	vertical no. 18
y = 6.64 m z_s = 26.712 m z_b = 26.168 m d = 0.544 m	y = 6.89 m z_s = 26.712 m z_b = 26.174 m d = 0.538 m	y = 7.14 m z_s = 26.710 m z_b = 26.112 m d = 0.598 m
z (m) u (m/s) 26.268 0.509 26.322 0.517 26.386 0.559 26.475 0.584 26.604 0.640 26.663 0.650	z (m) u (m/s) 26.282 0.484 26.598 0.661	z (m) u (m/s) 26.212 0.477 26.292 0.506 26.352 0.523 26.471 0.588 26.591 0.650 26.661 0.654

TRAVERSE 8	date: 80 05 12	time: 10.30 - 18.20
vertical no. 19	vertical no. 20	vertical no. 21
y = 7.39 m z_s = 26.710 m z_b = 26.114 m d = 0.596 m z (m) u (m/s) 26.233 0.509 26.590 0.625	y = 7.64 m z_s = 26.708 m z_b = 26.085 m d = 0.623 m z (m) u (m/s) 26.185 0.443 26.272 0.463 26.334 0.498 26.458 0.527 26.583 0.512 26.657 0.490	y = 7.88 m z_s = 26.701 m z_b = 26.425 m d = 0.276 m z (m) u (m/s) 26.535 0.344
vertical no. 22		
y = 8.13 m z_s = 26.700 m z_b = 26.509 m d = 0.191 m z (m) u (m/s) 26.609 0.286		

TRAVERSE 8	date: 80 05 23	time: 10.30 - 15.50
vertical no. 1	vertical no. 2	vertical no. 3
y = 3.16 m z_s = 26.673 m z_b = 26.198 m d = 0.475 m	y = 3.48 m z_s = 26.680 m z_b = 26.200 m d = 0.480 m	y = 3.79 m z_s = 26.685 m z_b = 26.193 m d = 0.492 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.298 0.324 26.342 0.362 26.390 0.395 26.486 0.448 26.582 0.417 26.624 0.386	26.300 0.401 26.344 0.442 26.392 0.469 26.488 0.521 26.584 0.530 26.630 0.499	26.293 0.442 26.341 0.495 26.390 0.542 26.488 0.565 26.587 0.577 26.636 0.569
vertical no. 4	vertical no. 5	vertical no. 6
y = 4.11 m z_s = 26.684 m z_b = 26.198 m d = 0.486 m	y = 4.42 m z_s = 26.686 m z_b = 26.203 m d = 0.483 m	y = 4.74 m z_s = 26.693 m z_b = 26.200 m d = 0.493 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.298 0.506 26.344 0.558 26.394 0.560 26.490 0.606 26.586 0.631 26.634 0.602	26.303 0.538 26.348 0.568 26.397 0.582 26.493 0.617 26.590 0.660 26.637 0.654	26.300 0.443 26.348 0.537 26.398 0.580 26.496 0.629 26.595 0.670 26.644 0.685
vertical no. 7	vertical no. 8	vertical no. 9
y = 5.06 m z_s = 26.694 m z_b = 26.209 m d = 0.485 m	y = 5.37 m z_s = 26.697 m z_b = 26.190 m d = 0.507 m	y = 5.69 m z_s = 26.678 m z_b = 26.189 m d = 0.489 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.309 0.546 26.355 0.564 26.403 0.596 26.500 0.638 26.597 0.690 26.644 0.678	26.290 0.520 26.342 0.549 26.393 0.577 26.494 0.665 26.596 0.699 26.647 0.706	26.289 0.512 26.336 0.500 26.385 0.558 26.482 0.625 26.580 0.651 26.627 0.661

TRAVERSE 8	date: 80 05 23	time: 10.30 - 15.50
vertical no. 10	vertical no. 11	vertical no. 12
y = 6.00 m z_s = 26.699 m z_b = 26.159 m d^b = 0.540 m	y = 6.32 m z_s = 26.700 m z_b = 26.167 m d^b = 0.533 m	y = 6.64 m z_s = 26.675 m z_b = 26.205 m d^b = 0.470 m
z (m) u (m/s) 26.259 0.489 26.322 0.571 26.376 0.581 26.484 0.618 26.593 0.664 26.651 0.657	z (m) u (m/s) 26.267 0.462 26.327 0.534 26.380 0.563 26.486 0.613 26.593 0.638 26.649 0.657	z (m) u (m/s) 26.305 0.550 26.346 0.522 26.393 0.560 26.487 0.571 26.581 0.643 26.627 0.646
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.96 m z_s = 26.694 m z_b = 26.194 m d^b = 0.500 m	y = 7.27 m z_s = 26.689 m z_b = 26.133 m d^b = 0.556 m	y = 7.59 m z_s = 26.682 m z_b = 26.096 m d^b = 0.586 m
z (m) u (m/s) 26.294 0.470 26.344 0.515 26.394 0.565 26.494 0.584 26.594 0.625 26.644 0.626	z (m) u (m/s) 26.233 0.469 26.300 0.501 26.355 0.509 26.467 0.572 26.578 0.593 26.640 0.591	z (m) u (m/s) 26.196 0.383 26.272 0.410 26.331 0.434 26.448 0.441 26.566 0.426 26.633 0.404
vertical no. 16		
y = 7.91 m z_s = 26.682 m z_b = 26.459 m d^b = 0.223 m z (m) u (m/s) 26.632 0.247		

TRAVERSE 16	date: 80 05 15	time: 10.15 - 17.25
vertical no. 1	vertical no. 2	vertical no. 3
y = 3.14 m z_s = 26.678 m z_b = 26.431 m d = 0.247 m	y = 3.41 m z_s = 26.677 m z_b = 26.287 m d = 0.390 m	y = 3.68 m z_s = 26.680 m z_b = 26.244 m d = 0.436 m
z (m) u (m/s) 26.530 0.365 26.629 0.359	z (m) u (m/s) 26.387 0.368 26.443 0.410 26.521 0.412 26.599 0.457 26.638 0.412	z (m) u (m/s) 26.344 0.386 26.418 0.463 26.593 0.524
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.96 m z_s = 26.683 m z_b = 26.239 m d = 0.444 m	y = 4.23 m z_s = 26.683 m z_b = 26.246 m d = 0.437 m	y = 4.50 m z_s = 26.680 m z_b = 26.222 m d = 0.458 m
z (m) u (m/s) 26.339 0.439 26.372 0.479 26.417 0.523 26.505 0.564 26.594 0.573 26.639 0.558	z (m) u (m/s) 26.346 0.469 26.420 0.557 26.596 0.602	z (m) u (m/s) 26.322 0.479 26.360 0.532 26.406 0.558 26.497 0.616 26.589 0.629 26.631 0.610
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.78 m z_s = 26.679 m z_b = 26.221 m d = 0.458 m	y = 5.05 m z_s = 26.682 m z_b = 26.243 m d = 0.439 m	y = 5.32 m z_s = 26.693 m z_b = 26.223 m d = 0.470 m
z (m) u (m/s) 26.321 0.504 26.404 0.602 26.587 0.683	z (m) u (m/s) 26.343 0.517 26.375 0.568 26.419 0.598 26.507 0.624 26.594 0.656 26.632 0.662	z (m) u (m/s) 26.323 0.521 26.411 0.615 26.599 0.672

TRAVERSE 16	date: 80 05 15	time: 10.15 - 17.25
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.60 m z_s = 26.678 m z_b = 26.235 m d = 0.443 m	y = 5.87 m z_s = 26.677 m z_b = 26.240 m d = 0.437 m	y = 6.14 m z_s = 26.677 m z_b = 26.201 m d = 0.476 m
z (m) u (m/s) 26.335 0.545 26.368 0.546 26.412 0.591 26.500 0.629 26.589 0.643 26.627 0.661	z (m) u (m/s) 26.340 0.515 26.414 0.588 26.590 0.683	z (m) u (m/s) 26.301 0.522 26.344 0.480 26.392 0.527 26.487 0.591 26.583 0.642 26.628 0.670
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.42 m z_s = 26.679 m z_b = 26.211 m d = 0.468 m	y = 6.69 m z_s = 26.680 m z_b = 26.157 m d = 0.523 m	y = 6.96 m z_s = 26.681 m z_b = 26.146 m d = 0.535 m
z(m) u (m/s) 26.311 0.456 26.397 0.536 26.585 0.650	z (m) u (m/s) 26.257 0.511 26.262 0.523 26.314 0.599 26.366 0.680 26.471 0.733 26.575 0.662 26.630 0.647	z (m) u (m/s) 26.254 0.528 26.362 0.612 26.579 0.645
vertical no. 16	vertival no. 17	vertical no. 18
y = 7.24 m z_s = 26.680 m z_b = 26.093 m d = 0.587 m	y = 7.51 m z_s = 26.679 m z_b = 26.105 m d = 0.574 m	y = 7.78 m z_s = 26.677 m z_b = 26.096 m d = 0.581 m
z (m) u (m/s) 26.193 0.437 26.210 0.484 26.269 0.463 26.328 0.547 26.445 0.624 26.562 0.650 26.630 0.740	z (m) u (m/s) 26.220 0.520 26.335 0.575 26.564 0.587	z (m) u (m/s) 26.196 0.435 26.212 0.465 26.270 0.516 26.328 0.534 26.445 0.564 26.561 0.523 26.627 0.487

TRAVERSE 16	date: 80 05 15	time: 10.15 - 17.25
vertical no. 19	vertical no. 20	vertical no. 21
y = 8.05 m z_s = 26.671 m z_b = 26.100 m d = 0.571 m	y = 8.33 m z_s = 26.678 m z_b = 26.210 m d = 0.468 m	y = 8.45 m z_s = 26.678 m z_b = 26.431 m d = 0.247 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.215 0.142 26.330 0.376 26.560 0.473	26.310 0.279 26.350 0.342 26.397 0.386 26.490 0.435 26.584 0.415 26.628 0.346	26.531 0.390 26.629 0.300

TRAVERSE 19	date: 80 05 16	time: 11.15 - 16.40
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.65 m z_s = 26.651 m z_b = 26.439 m d = 0.212 m	y = 2.95 m z_s = 26.650 m z_b = 26.285 m d = 0.365 m	y = 3.25 m z_s = 26.653 m z_b = 26.262 m d = 0.391 m
z (m) u (m/s) 26.539 0.050 26.569 0.055 26.599 0.085	z (m) u (m/s) 26.385 0.235 26.435 0.320 26.505 0.355 26.575 0.350 26.600 0.343	z (m) u (m/s) 26.362 0.417 26.422 0.453 26.572 0.447
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.55 m z_s = 26.653 m z_b = 26.266 m d = 0.387 m	y = 3.85 m z_s = 26.653 m z_b = 26.260 m d = 0.393 m	y = 4.15 m z_s = 26.653 m z_b = 26.252 m d = 0.401 m
z (m) u (m/s) 26.366 0.443 26.386 0.452 26.416 0.471 26.496 0.511 26.566 0.509 26.603 0.517	z (m) u (m/s) 26.360 0.502 26.420 0.537 26.570 0.587	z (m) u (m/s) 26.352 0.557 26.372 0.559 26.412 0.575 26.492 0.594 26.572 0.608 26.602 0.611
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.45 m z_s = 26.652 m z_b = 26.246 m d = 0.406 m	y = 4.75 m z_s = 26.652 m z_b = 26.224 m d = 0.428 m	y = 5.05 m z_s = 26.653 m z_b = 26.214 m d = 0.439 m
z (m) u (m/s) 26.346 0.568 26.406 0.581 26.566 0.635	z (m) u (m/s) 26.324 0.551 26.354 0.569 26.394 0.599 26.484 0.631 26.564 0.640 26.593 0.646	z (m) u (m/s) 26.314 0.428 26.384 0.558 26.554 0.625

TRAVERSE 19	date: 80 05 16	time: 11.15 - 16.40
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.35 m z_s = 26.657 m z_b = 26.214 m d_b = 0.443 m	y = 5.65 m z_s = 26.657 m z_b = 26.205 m d_b = 0.452 m	y = 5.95 m z_s = 26.660 m z_b = 26.197 m d_b = 0.463 m
z (m) u (m/s) 26.314 0.490 26.344 0.535 26.394 0.581 26.474 0.635 26.584 0.669 26.608 0.668	z (m) u (m/s) 26.305 0.519 26.345 0.528 26.565 0.661	z (m) u (m/s) 26.297 0.499 26.337 0.553 26.377 0.586 26.477 0.628 26.567 0.653 26.610 0.661
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.25 m z_s = 26.657 m z_b = 26.147 m d_b = 0.510 m	y = 6.55 m z_s = 26.658 m z_b = 26.149 m d_b = 0.509 m	y = 6.85 m z_s = 26.659 m z_b = 26.136 m d_b = 0.523 m
z (m) u (m/s) 26.249 0.369 26.351 0.563 26.557 0.620	z (m) u (m/s) 26.249 0.456 26.299 0.521 26.349 0.537 26.459 0.583 26.559 0.626 26.608 0.646	z (m) u (m/s) 26.236 0.479 26.346 0.539 26.556 0.635
vertical no. 16	vertical no. 17	vertical no. 18
y = 7.15 m z_s = 26.660 m z_b = 26.123 m d_b = 0.537 m	y = 7.45 m z_s = 26.665 m z_b = 26.102 m d_b = 0.563 m	y = 7 75 m z_s = 26.662 m z_b = 26.075 m d_b = 0.587 m
z (m) u (m/s) 26.223 0.452 26.233 0.470 26.283 0.516 26.343 0.539 26.443 0.601 26.543 0.619 26.610 0.619	z (m) u (m/s) 26.212 0.431 26.322 0.515 26.552 0.576	z (m) u (m/s) 26.175 0.272 26.192 0.336 26.251 0.395 26.310 0.449 26.428 0.512 26.545 0.494 26.613 0.479

TRAVERSE 19	date: 80 05 16	time: 11.15 - 16.40
vertical no. 19	vertical no. 20	
y = 8.05 m z_s = 26.646 m z_b = 26.057 m d = 0.589 m	y = 8.35 m z_s = 26.647 m z_b = 26.021 m d = 0.626 m	
z (m) u (m/s)	z (m) u (m/s)	
26.157 0.121	26.121 0.052	
26.175 0.136	26.145 0.070	
26.234 0.192	26.207 0.081	
26.293 0.279	26.269 0.126	
26.410 0.380	26.392 0.123	
26.528 0.390	26.517 0.151	
26.596 0.333	26.591 0.195	

TRAVERSE 21	date: 80 05 18	time: 9.50 - 16.00
vertical no. 1	vertical no. 2	vertical no. 3
y = 3.15 m z_s = 26.635 m z_b = 26.410 m d^b = 0.225 m	y = 3.45 m z_s = 26.636 m z_b = 26.358 m d^b = 0.278 m	y = 3.75 m z_s = 26.637 m z_b = 26.356 m d^b = 0.281 m
z (m) u (m/s) 26.510 0.272 26.586 0.303	z (m) u (m/s) 26.458 0.365 26.469 0.357 26.525 0.373 26.586 0.408	z (m) u (m/s) 26.468 0.449 26.581 0.467
vertical no. 4	vertical no. 5	vertical no. 6
y = 4.05 m z_s = 26.637 m z_b = 26.356 m d^b = 0.281 m	y = 4.35 m z_s = 26.638 m z_b = 26.332 m d^b = 0.306 m	y = 4.75 m z_s = 26.625 m z_b = 26.329 m d^b = 0.296 m
z (m) u (m/s) 26.456 0.453 26.468 0.456 26.525 0.482 26.581 0.508	z (m) u (m/s) 26.454 0.483 26.577 0.541	z (m) u (m/s) 26.429 0.534 26.443 0.529 26.507 0.556 26.558 0.560 26.575 0.563
vertical no. 7	vertical no. 8	vertical no. 9
y = 5.05 m z_s = 26.640 m z_b = 26.292 m d^b = 0.348 m	y = 5.35 m z_s = 26.642 m z_b = 26.275 m d^b = 0.367 m	y = 5.65 m z_s = 26.640 m z_b = 26.236 m d^b = 0.404 m
z (m) u (m/s) 26.432 0.538 26.572 0.544	z (m) u (m/s) 26.375 0.530 26.385 0.531 26.422 0.537 26.495 0.545 26.569 0.573 26.592 0.583	z (m) u (m/s) 26.336 0.513 26.398 0.544 26.560 0.587

TRAVERSE 21	date: 80 05 18	time: 9.50 - 16.00
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.95 m z_s = 26.640 m z_b = 26.240 m d = 0.400 m	y = 6.25 m z_s = 26.635 m z_b = 26.208 m d = 0.427 m	y = 6.55 m z_s = 26.627 m z_b = 26.210 m d = 0.417 m
z (m) u (m/s) 26.340 0.473 26.360 0.485 26.400 0.491 26.480 0.514 26.560 0.586 26.591 0.564	z (m) u (m/s) 26.308 0.440 26.379 0.480 26.550 0.532	z (m) u (m/s) 26.310 0.465 26.335 0.513 26.377 0.536 26.461 0.550 26.544 0.568 26.578 0.577
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.85 m z_s = 26.643 m z_b = 26.161 m d = 0.482 m	y = 7.15 m z_s = 26.644 m z_b = 26.119 m d = 0.525 m	y = 7.45 m z_s = 26.648 m z_b = 26.068 m d = 0.580 m
z (m) u (m/s) 26.261 0.448 26.305 0.472 26.353 0.506 26.450 0.556 26.546 0.573 26.593 0.577	z (m) u (m/s) 26.219 0.501 26.276 0.517 26.329 0.502 26.434 0.541 26.539 0.567 26.594 0.571	z (m) u (m/s) 26.184 0.438 26.300 0.489 26.532 0.544
vertical no. 16	vertical no. 17	vertical no. 18
y = 7.75 m z_s = 26.642 m z_b = 25.981 m d = 0.661 m	y = 8.05 m z_s = 26.640 m z_b = 25.830 m d = 0.810 m	y = 8.35 m z_s = 26.644 m z_b = 25.911 m d = 0.733 m
z (m) u (m/s) 26.081 0.307 26.113 0.351 26.179 0.365 26.247 0.400 26.377 0.461 26.509 0.539 26.572 0.537 26.592 0.534	z (m) u (m/s) 25.930 0.291 25.992 0.383 26.154 0.482 26.478 0.524	z (m) u (m/s) 26.130 0.500 26.204 0.511 26.350 0.506 26.495 0.500 26.568 0.454 26.594 0.473

TRAVERSE 21	date:80 05 18	time: 9.50 - 16.00
vertical no. 19		

y = 8.65 m
z_s = 26.646 m
z_b = 25.818 m
d = 0.828 m

z (m)	u (m/s)
25.984	0.199
26.067	0.299
26.150	0.297
26.316	0.271
26.482	0.315
26.575	0.216
26.596	0.192

TRAVERSE 21	date: 80 05 30	time: 11.10 - 15.45
vertical no. 1	vertical no. 2	vertical no. 3
y = 3.21 m z_s = 26.660 m z_b = 26.430 m d = 0.230 m	y = 3.62 m z_s = 26.667 m z_b = 26.380 m d = 0.287 m	y = 4.03 m z_s = 26.663 m z_b = 26.353 m d = 0.310 m
z (m) u (m/s) 26.530 0.336 26.568 0.348 26.610 0.303	z (m) u (m/s) 26.480 0.432 26.494 0.436 26.551 0.455 26.615 0.453	z (m) u (m/s) 26.453 0.497 26.477 0.502 26.538 0.519 26.600 0.540 26.612 0.547
vertical no. 4	vertical no. 5	vertical no. 6
y = 4.45 m z_s = 26.662 m z_b = 26.352 m d = 0.310 m	y = 4.86 m z_s = 26.665 m z_b = 26.310 m d = 0.355 m	y = 5.27 m z_s = 26.669 m z_b = 26.250 m d = 0.419 m
z (m) u (m/s) 26.452 0.498 26.475 0.502 26.537 0.528 26.610 0.573	z (m) u (m/s) 26.410 0.483 26.452 0.482 26.523 0.566 26.593 0.586 26.614 0.596	z (m) u (m/s) 26.350 0.521 26.375 0.515 26.417 0.548 26.500 0.611 26.584 0.604 26.618 0.604
vertical no. 7	vertical no. 8	vertical no. 9
y = 5.69 m z_s = 26.666 m z_b = 26.248 m d = 0.418 m	y = 6.10 m z_s = 26.668 m z_b = 26.205 m d = 0.463 m	y = 6.51 m z_s = 26.667 m z_b = 26.193 m d = 0.474 m
z (m) u (m/s) 26.348 0.494 26.373 0.547 26.414 0.565 26.497 0.587 26.580 0.616 26.613 0.614	z (m) u (m/s) 26.305 0.484 26.343 0.521 26.390 0.550 26.482 0.576 26.575 0.606 26.618 0.604	z (m) u (m/s) 26.293 0.435 26.335 0.489 26.382 0.519 26.477 0.563 26.571 0.604 26.616 0.602

TRAVERSE 21	date: 80 05 30	time: 11.10 - 15.45
vertical no. 10	vertical no. 11	vertical no. 12
y = 6.92 m z_s = 26.664 m z_b = 26.144 m d = 0.520 m	y = 7.34 m z_s = 26.676 m z_b = 26.066 m d = 0.610 m	y = 7.75 m z_s = 26.678 m z_b = 26.013 m d = 0.665 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.244 0.476 26.300 0.478 26.352 0.468 26.450 0.506 26.560 0.565 26.614 0.596	26.166 0.443 26.188 0.432 26.249 0.453 26.310 0.488 26.432 0.526 26.554 0.564 26.625 0.587	26.113 0.376 26.146 0.423 26.212 0.426 26.279 0.462 26.412 0.506 26.545 0.560 26.611 0.577 26.628 0.563
vertical no. 13	vertical no. 14	vertical no. 15
y = 8.16 m z_s = 26.680 m z_b = 25.926 m d = 0.754 m	y = 8.58 m z_s = 26.664 m z_b = 25.873 m d = 0.791 m	y = 8.99 m z_s = 26.680 m z_b = 26.108 m d = 0.572 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.026 0.290 26.077 0.363 26.152 0.402 26.217 0.458 26.378 0.518 26.528 0.521 26.604 0.520 26.629 0.535	26.031 0.178 26.189 0.247 26.347 0.303 26.505 0.429 26.584 0.329 26.613 0.387	26.451 0.170 26.566 0.165 26.630 0.180

TRAVERSE 23	date: 80 05 17	time: 12.40 - 18.25
vertical no. 3	vertical no. 4	vertical no. 5
y = 3.93 m z_s = 26.627 m z_b = 26.494 m d = 0.133 m	y = 4.18 m z_s = 26.627 m z_b = 26.478 m d = 0.149 m	y = 4.43 m z_s = 26.625 m z_b = 26.466 m d = 0.159 m
z (m) u (m/s) 26.594 0.376	z (m) u (m/s) 26.578 0.404	z (m) u (m/s) 26.566 0.410
vertical no. 6	vertical no. 7	vertical no. 8
y = 4.68 m z_s = 26.627 m z_b = 26.462 m d = 0.165 m	y = 4.93 m z_s = 26.628 m z_b = 26.422 m d = 0.206 m	y = 5.18 m z_s = 26.631 m z_b = 26.347 m d = 0.284 m
z (m) u (m/s) 26.562 0.427 26.576 0.410	z (m) u (m/s) 26.522 0.452 26.542 0.456 26.577 0.449	z (m) u (m/s) 26.447 0.465 26.467 0.439 26.517 0.450 26.581 0.447
vertical no. 9	vertical no. 10	vertical no. 11
y = 5.43 m z_s = 26.631 m z_b = 26.249 m d = 0.382 m	y = 5.68 m z_s = 26.634 m z_b = 26.156 m d = 0.478 m	y = 5.93 m z_s = 26.635 m z_b = 26.082 m d = 0.553 m
z (m) u (m/s) 26.349 0.452 26.369 0.453 26.399 0.475 26.479 0.472 26.549 0.471 26.582 0.463	z (m) u (m/s) 26.256 0.447 26.296 0.493 26.346 0.511 26.436 0.513 26.536 0.464 26.583 0.456	z (m) u (m/s) 26.182 0.480 26.248 0.495 26.303 0.509 26.414 0.498 26.525 0.494 26.585 0.495

TRANSVERSE 23	date 80 05 17	time: 12.40 - 18.25
vertical no.12	vertical no. 13	vertical no. 14
y = 6.18 m z_s = 26.638 m z_b = 26.040 m d = 0.598 m	y = 6.43 m z_s = 26.638 m z_b = 26.050 m d = 0.588 m	y = 6.68 m z_s = 26.640 m z_b = 25.970 m d = 0.670 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.140 0.472 26.159 0.478 26.218 0.504 26.278 0.513 26.396 0.524 26.515 0.479 26.583 0.492	26.150 0.425 26.167 0.447 26.226 0.456 26.285 0.505 26.402 0.502 26.520 0.508 26.588 0.500	26.070 0.449 26.104 0.492 26.171 0.498 26.238 0.515 26.372 0.491 26.506 0.511 26.590 0.509
vertical no. 15	vertical no. 16	vertical no. 17
y = 6.93 m z_s = 26.638 m z_b = 25.820 m d = 0.818 m	y = 7.18 m z_s = 26.640 m z_b = 25.747 m d = 0.893 m	y = 7.43 m z_s = 26.638 m z_b = 25.607 m d = 1.031 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
25.920 0.439 25.983 0.527 26.065 0.577 26.147 0.566 26.310 0.486 26.473 0.462 26.587 0.468	25.847 0.460 25.925 0.517 26.015 0.564 26.104 0.564 26.282 0.530 26.461 0.492 26.550 0.509 26.589 0.494	25.707 0.313 25.813 0.456 25.916 0.525 26.019 0.588 26.226 0.565 26.432 0.514 26.535 0.509 26.589 0.504
vertical no. 18	vertical no. 19	vertical no. 20
y = 7.68 m z_s = 26.642 m z_b = 25.532 m d = 1.110 m	y = 7.93 m z_s = 26.641 m z_b = 25.573 m d = 1.068 m	y = 8.18 m z_s = 26.639 m z_b = 25.744 m d = 0.895 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
25.632 0.000 25.643 0.285 25.754 0.494 25.865 0.545 25.976 0.584 26.199 0.586 26.421 0.538 26.532 0.542 26.593 0.522	25.673 0.000 25.680 0.000 25.786 0.324 25.893 0.618 25.999 0.574 26.213 0.619 26.426 0.598 26.533 0.584 26.589 0.584	25.844 0.000 25.923 0.111 26.012 0.252 26.102 0.260 26.280 0.448 26.459 0.608 26.549 0.588 26.598 0.544

TRAVERSE 24	date: 80 05 26	time: 10.55 - 15.30
vertical no. 3	vertical no. 4	vertical no. 5
y = 4.46 m z_s = 26.626 m z_b = 26.396 m d_b = 0.230 m	y = 4.80 m z_s = 26.634 m z_b = 26.298 m d_b = 0.336 m	y = 5.14 m z_s = 26.632 m z_b = 26.241 m d_b = 0.391 m
z (m) u (m/s) 26.496 0.270 26.534 0.277 26.576 0.297	z (m) u (m/s) 26.398 0.411 26.432 0.417 26.499 0.403 26.566 0.395 26.583 0.394	z (m) u (m/s) 26.341 0.472 26.358 0.500 26.397 0.497 26.475 0.502 26.553 0.465 26.581 0.440
vertical no. 6	vertical no. 7	vertical no. 8
y = 5.49 m z_s = 26.632 m z_b = 26.201 m d_b = 0.431 m	y = 5.83 m z_s = 26.635 m z_b = 26.124 m d_b = 0.511 m	y = 6.17 m z_s = 26.638 m z_b = 26.077 m d_b = 0.561 m
z (m) u (m/s) 26.301 0.504 26.330 0.544 26.373 0.554 26.460 0.543 26.546 0.513 26.582 0.504	z (m) u (m/s) 26.224 0.539 26.277 0.562 26.328 0.576 26.430 0.577 26.532 0.549 26.584 0.525	z (m) u (m/s) 26.177 0.476 26.189 0.505 26.245 0.511 26.301 0.535 26.413 0.578 26.525 0.579 26.588 0.565
vertical no. 9	vertical no. 10	vertical no. 11
y = 6.51 m z_s = 26.636 m z_b = 26.055 m d_b = 0.581 m	y = 6.86 m z_s = 26.638 m z_b = 26.074 m d_b = 0.564 m	y = 7.20 m z_s = 26.627 m z_b = 25.944 m d_b = 0.683 m
z(m) u (m/s) 26.155 0.422 26.171 0.431 26.229 0.502 26.287 0.512 26.403 0.540 26.519 0.579 26.585 0.588	z (m) u (m/s) 26.174 0.499 26.187 0.508 26.244 0.532 26.300 0.540 26.413 0.547 26.526 0.569 26.589 0.565	z (m) u (m/s) 26.044 0.508 26.080 0.545 26.148 0.570 26.217 0.567 26.353 0.560 26.490 0.563 26.576 0.560

TRAVERSE 24	date: 80 05 26	time: 10.55 - 15.30
vertical no. 12	vertical no. 13	vertical no. 14
y = 7.54 m z_s = 26.626 m z_b = 25.792 m d = 0.834 m	y = 7.84 m z_s = 26.634 m z_b = 25.868 m d = 0.766 m	y = 8.13 m z_s = 26.631 m z_b = 25.873 m d = 0.758 m
z (m) u (m/s) 25.892 0.491 25.958 0.556 26.042 0.589 26.125 0.600 26.292 0.588 26.459 0.558 26.542 0.551 26.576 0.558	z (m) u (m/s) 26.021 0.392 26.098 0.530 26.174 0.587 26.328 0.581 26.481 0.577 26.558 0.559 26.586 0.566	z (m) u (m/s) 25.973 0.378 26.024 0.487 26.100 0.567 26.176 0.591 26.327 0.589 26.479 0.587 26.555 0.572 26.581 0.567
vertical no. 15		
y = 8.42 m z_s = 26.632 m z_b = 25.993 m d = 0.639 m		
z (m) u (m/s) 26.185 0.388 26.249 0.465 26.377 0.510 26.505 0.511 26.582 0.481		

TRAVERSE 25	date: 80 05 19	time: 11.30 - 17.05
vertical no. 2	vertical no. 3	vertical no. 4
y = 3.89 m z_s = 26.648 m z_b = 26.494 m d = 0.154 m	y = 4.26 m z_s = 26.643 m z_b = 26.428 m d = 0.215 m	y = 4.62 m z_s = 26.637 m z_b = 26.327 m d = 0.310 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.594 0.135	26.528 0.277 26.557 0.250 26.594 0.239 26.600 0.235	26.427 0.421 26.451 0.414 26.513 0.364 26.575 0.296 26.586 0.293
vertical no. 5	vertical no. 6	vertical no. 7
y = 4.98 m z_s = 26.641 m z_b = 26.247 m d = 0.394 m	y = 5.35 m z_s = 26.644 m z_b = 26.232 m d = 0.412 m	y = 5.71 m z_s = 26.649 m z_b = 26.202 m d = 0.447 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.347 0.447 26.365 0.485 26.404 0.494 26.483 0.473 26.562 0.364 26.590 0.314	26.332 0.503 26.355 0.514 26.396 0.545 26.478 0.547 26.560 0.498 26.593 0.488	26.302 0.562 26.336 0.564 26.380 0.605 26.470 0.582 26.559 0.542 26.600 0.530
vertical no. 8	vertical no. 9	vertical no. 10
y = 6.07 m z_s = 26.643 m z_b = 26.162 m d = 0.481 m	y = 6.44 m z_s = 26.646 m z_b = 26.169 m d = 0.477 m	y = 6.80 m z_s = 26.647 m z_b = 26.140 m d = 0.507 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.262 0.495 26.306 0.586 26.354 0.593 26.450 0.612 26.546 0.602 26.593 0.588	26.269 0.522 26.313 0.551 26.361 0.563 26.457 0.614 26.553 0.599 26.597 0.615	26.240 0.475 26.293 0.533 26.344 0.565 26.446 0.575 26.548 0.611 26.596 0.605

TRAVERSE 25	date: 80 05 19	time: 11.30 - 17.05
vertical no.11	vertical no. 12	vertical no. 13
y = 7.16 m z_s = 26.650 m z_b = 26.085 m d = 0.565 m	y = 7.52 m z_s = 26.651 m z_b = 26.125 m d = 0.526 m	y = 7.89 m z_s = 26.653 m z_b = 26.035 m d = 0.618 m
z (m) u (m/s) 26.185 0.353 26.256 0.519 26.313 0.592 26.427 0.610 26.541 0.613 26.601 0.614	z (m) u (m/s) 26.225 0.526 26.284 0.576 26.337 0.595 26.443 0.600 26.549 0.619 26.602 0.617	z (m) u (m/s) 26.135 0.559 26.159 0.533 26.221 0.545 26.283 0.567 26.407 0.563 26.531 0.590 26.593 0.599 26.604 0.590
vertical no. 14	vertical no. 15	vertical no. 16
y = 8.25 m z_s = 26.650 m z_b = 25.923 m d = 0.727 m	y = 8.61 m z_s = 26.648 m z_b = 25.887 m d = 0.761 m	y = 8.99 m z_s = 26.640 m z_b = 26.157 m d = 0.483 m
z (m) u (m/s) 26.023 0.529 26.069 0.563 26.142 0.603 26.215 0.617 26.361 0.615 26.507 0.602 26.580 0.602 26.601 0.582	z (m) u (m/s) 25.987 0.357 26.029 0.426 26.115 0.520 26.191 0.578 26.343 0.608 26.495 0.577 26.571 0.576 26.597 0.513	z (m) u (m/s) 26.357 0.413 26.457 0.430 26.557 0.415 26.590 0.405
vertical no. 17		
y = 9.34 m z_s = 26.631 m z_b = 26.438 m d = 0.193 m		
z (m) u (m/s) 26.538 0.192 26.558 0.188 26.582 0.199		

TRAVERSE 26	date:80 05 28	time: 10.50 - 17.30
vertical no. 1	vertical no. 2	vertical no. 3
y = 4.07 m z_s = 26.647 m z_b = 26.392 m d^b = 0.255 m	y = 4.41 m z_s = 26.641 m z_b = 26.313 m d^b = 0.328 m	y = 4.74 m z_s = 26.633 m z_b = 26.257 m d^b = 0.376 m
z (m) u (m/s) 26.492 0.318 26.545 0.372 26.597 0.397	z (m) u (m/s) 26.413 0.327 26.444 0.359 26.509 0.449 26.575 0.461 26.591 0.448	z (m) u (m/s) 26.357 0.446 26.369 0.477 26.407 0.506 26.482 0.532 26.557 0.514 26.583 0.507
vertical no. 4	vertical no. 5	vertical no. 6
y = 5.08 m z_s = 26.646 m z_b = 26.255 m d^b = 0.391 m	y = 5.42 m z_s = 26.647 m z_b = 26.205 m d^b = 0.442 m	y = 5.75 m z_s = 26.650 m z_b = 26.194 m d^b = 0.456 m
z (m) u (m/s) 26.355 0.493 26.372 0.520 26.411 0.541 26.490 0.579 26.568 0.557 26.597 0.537	z (m) u (m/s) 26.305 0.504 26.337 0.545 26.381 0.564 26.470 0.601 26.558 0.611 26.597 0.613	z (m) u (m/s) 26.294 0.512 26.331 0.517 26.376 0.576 26.468 0.634 26.559 0.638 26.601 0.641
vertical no. 7	vertical no. 8	vertical no. 9
y = 6.09 m z_s = 26.658 m z_b = 26.217 m d^b = 0.441 m	y = 6.43 m z_s = 26.659 m z_b = 26.160 m d^b = 0.499 m	y = 6.77 m z_s = 26.661 m z_b = 26.145 m d^b = 0.516 m
z (m) u (m/s) 26.317 0.526 26.350 0.531 26.394 0.567 26.482 0.632 26.570 0.658 26.609 0.638	z (m) u (m/s) 26.260 0.480 26.305 0.537 26.359 0.601 26.459 0.616 26.559 0.649 26.609 0.651	z (m) u (m/s) 26.245 0.497 26.299 0.524 26.351 0.568 26.454 0.606 26.557 0.650 26.611 0.648

TRAVERSE 26	date:80 05 28	time: 10.50 - 17.30
vertical no. 10	vertical no. 11	vertical no. 12
y = 7.10 m z_s = 26.649 m z_b = 26.115 m d^b = 0.534 m	y = 7.44 m z_s = 26.649 m z_b = 26.108 m d^b = 0.541 m	y = 7.78 m z_s = 26.651 m z_b = 26.055 m d^b = 0.596 m
z (m) u (m/s) 26.215 0.439 26.275 0.492 26.329 0.523 26.436 0.579 26.543 0.618 26.566 0.632 26.601 0.640	z (m) u (m/s) 26.208 0.437 26.270 0.474 26.324 0.501 26.432 0.571 26.540 0.605 26.598 0.632	z (m) u (m/s) 26.155 0.523 26.174 0.534 26.234 0.550 26.293 0.566 26.413 0.582 26.532 0.618 26.592 0.625 26.602 0.625
vertical no. 13	vertical no. 14	vertical no. 15
y = 8.11 m z_s = 26.650 m z_b = 25.999 m d^b = 0.651 m	y = 8.45 m z_s = 26.644 m z_b = 25.978 m d^b = 0.666 m	y = 8.79 m z_s = 26.639 m z_b = 26.182 m d^b = 0.457 m
z (m) u (m/s) 26.099 0.339 26.129 0.447 26.194 0.568 26.259 0.599 26.390 0.642 26.520 0.655 26.585 0.648 26.601 0.653	z (m) u (m/s) 26.078 0.386 26.112 0.416 26.178 0.509 26.245 0.578 26.378 0.648 26.511 0.669 26.578 0.669 26.594 0.662	z (m) u (m/s) 26.282 0.539 26.319 0.546 26.365 0.558 26.456 0.536 26.548 0.423 26.590 0.396

TRAVERSE 27	date: 80 05 20	time: 10.30 - 17.00
vertical no. 2	vertical no. 3	vertical no. 4
y = 3.55 m z_s = 26.624 m z_b = 26.447 m d = 0.177 m	y = 3.95 m z_s = 26.620 m z_b = 26.330 m d = 0.290 m	y = 4.35 m z_s = 26.623 m z_b = 26.243 m d = 0.380 m
z (m) u (m/s) 26.547 0.222 26.573 0.213	z (m) u (m/s) 26.430 0.304 26.505 0.342 26.569 0.344	z (m) u (m/s) 26.343 0.370 26.385 0.399 26.471 0.472 26.547 0.480 26.574 0.483
vertical no. 5	vertical no. 6	vertical no. 7
y = 4.75 m z_s = 26.626 m z_b = 26.221 m d = 0.405 m	y = 5.15 m z_s = 26.634 m z_b = 26.206 m d = 0.428 m	y = 5.55 m z_s = 26.614 m z_b = 26.176 m d = 0.438 m
z (m) u (m/s) 26.321 0.450 26.342 0.489 26.383 0.540 26.464 0.552 26.545 0.566 26.576 0.552	z (m) u (m/s) 26.306 0.470 26.334 0.506 26.377 0.542 26.462 0.584 26.548 0.616 26.584 0.619	z (m) u (m/s) 26.276 0.498 26.307 0.493 26.350 0.519 26.438 0.566 26.525 0.616 26.563 0.616
vertical no. 8	vertical no. 9	vertical no. 10
y = 5.95 m z_s = 26.620 m z_b = 26.149 m d = 0.471 m	y = 6.35 m z_s = 26.623 m z_b = 26.116 m d = 0.507 m	y = 6.75 m z_s = 26.617 m z_b = 26.071 m d = 0.546 m
z (m) u (m/s) 26.249 0.464 26.290 0.492 26.337 0.545 26.431 0.582 26.525 0.615 26.570 0.618	z (m) u (m/s) 26.216 0.452 26.267 0.536 26.318 0.543 26.419 0.573 26.520 0.625 26.571 0.629	z (m) u (m/s) 26.171 0.379 26.234 0.457 26.289 0.494 26.398 0.572 26.507 0.600 26.566 0.624

TRAVERSE 27	date: 80 05 20	time: 10.30 - 17.00
vertical no. 11	vertical no. 12	vertical no. 13
y = 7.15 m z_s = 26.616 m z_b = 26.059 m d = 0.557 m	y = 7.55 m z_s = 26.618 m z_b = 26.024 m d = 0.594 m	y = 7.95 m z_s = 26.615 m z_b = 25.953 m d = 0.662 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.159 0.455 26.227 0.465 26.283 0.503 26.395 0.550 26.507 0.598 26.565 0.614	26.124 0.480 26.143 0.499 26.192 0.553 26.261 0.587 26.380 0.623 26.499 0.642 26.568 0.643	26.053 0.525 26.085 0.555 26.151 0.646 26.217 0.671 26.349 0.670 26.481 0.633 26.547 0.630 26.564 0.604
vertical no. 14		
y = 8.35 m z_s = 26.601 m z_b = 25.949 m d = 0.652 m		
z (m) u (m/s)		
26.049 0.205 26.079 0.267 26.144 0.330 26.229 0.289 26.340 0.257 26.470 0.452 26.551 0.469		

TRAVERSE 28	date: 80 05 25	time: 11.30 - 16.30
vertical no. 2	verrical no. 3	vertical no. 4
y = 3.22 m z_s = 26.622 m z_b = 26.257 m d = 0.365 m	y = 3.63 m z_s = 26.626 m z_b = 26.120 m d = 0.506 m	y = 4.05 m z_s = 26.626 m z_b = 26.130 m d = 0.496 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.458 0.067 26.549 0.042	26.220 0.382 26.272 0.409 26.322 0.406 26.423 0.418 26.524 0.423 26.574 0.413	26.230 0.353 26.279 0.409 26.328 0.443 26.428 0.526 26.527 0.569 26.576 0.566
vertical no. 5	vertical no. 6	vertical no. 7
y = 4.46 m z_s = 26.637 m z_b = 26.140 m d = 0.497 m	y = 4.86 m z_s = 26.640 m z_b = 26.131 m d = 0.509 m	y = 5.28 m z_s = 26.640 m z_b = 26.148 m d = 0.492 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.240 0.450 26.289 0.508 26.339 0.543 26.439 0.587 26.538 0.612 26.587 0.613	26.231 0.477 26.284 0.535 26.335 0.551 26.436 0.586 26.538 0.645 26.590 0.640	26.248 0.515 26.295 0.531 26.344 0.560 26.444 0.618 26.541 0.648 26.589 0.655
vertical no. 8	vertical no. 9	vertical no. 10
y = 5.69 m z_s = 26.641 m z_b = 26.139 m d = 0.502 m	y = 6.10 m z_s = 26.640 m z_b = 26.122 m d = 0.518 m	y = 6.52 m z_s = 26.641 m z_b = 26.140 m d = 0.501 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.239 0.471 26.289 0.509 26.339 0.551 26.440 0.591 26.540 0.625 26.590 0.651	26.222 0.454 26.277 0.505 26.329 0.508 26.433 0.609 26.536 0.631 26.590 0.643	26.240 0.468 26.290 0.509 26.340 0.542 26.441 0.573 26.541 0.608 26.591 0.623

TRAVERSE 28	date: 80 05 25	time: 11.30 - 16.30 m
vertical no. 11	vertical no. 12	vertical no. 13
y = 6.93 m z_s = 26.639 m z_b = 26.138 m d = 0.501 m	y = 7.34 m z_s = 26.638 m z_b = 26.181 m d = 0.457 m	y = 7.76 m z_s = 26.633 m z_b = 26.218 m d = 0.415 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.238 0.479 26.288 0.536 26.338 0.539 26.439 0.584 26.539 0.612 26.589 0.633	26.281 0.614 26.318 0.618 26.364 0.641 26.456 0.649 26.547 0.646 26.588 0.635	26.318 0.603 26.343 0.612 26.384 0.586 26.468 0.539 26.551 0.482 26.584 0.463
vertical no. 14	vertical no. 15	
y = 8.17 m z_s = 26.627 m z_b = 26.228 m d = 0.399 m	y = 8.58 m z_s = 26.628 m z_b = 26.222 m d = 0.406 m	
z (m) u (m/s)	z (m) u (m/s)	
26.328 0.438 26.348 0.447 26.468 0.458 26.548 0.432 26.578 0.420	26.322 0.147 26.343 0.149 26.384 0.179 26.465 0.225 26.546 0.269 26.577 0.282	

TRAVERSE 29	date: 80 05 21	time: 11.00 - 16.00
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.68 m z_s = 26.619 m z_b = 26.323 m d = 0.296 m	y = 3.03 m z_s = 26.618 m z_b = 26.147 m d = 0.470 m	y = 3.38 m z_s = 26.620 m z_b = 26.205 m d = 0.415 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.423 0.226 26.443 0.232 26.503 0.262 26.563 0.275	26.247 0.264 26.288 0.328 26.335 0.381 26.429 0.430 26.523 0.433 26.568 0.418	26.305 0.420 26.331 0.420 26.373 0.453 26.457 0.513 26.541 0.539 26.571 0.541
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.74 m z_s = 26.619 m z_b = 26.151 m d = 0.468 m	y = 4.09 m z_s = 26.624 m z_b = 26.143 m d = 0.481 m	y = 4.44 m z_s = 26.622 m z_b = 26.142 m d = 0.479 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.251 0.401 26.292 0.473 26.339 0.500 26.433 0.557 26.527 0.583 26.570 0.594	26.243 0.453 26.279 0.484 26.335 0.528 26.431 0.604 26.527 0.628 26.574 0.648	26.242 0.493 26.286 0.524 26.334 0.575 26.430 0.632 26.526 0.651 26.571 0.656
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.80 m z_s = 26.621 m z_b = 26.150 m d = 0.471 m	y = 5.15 m z_s = 26.606 m z_b = 26.164 m d = 0.442 m	y = 5.50 m z_s = 26.621 m z_b = 26.161 m d = 0.460 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.250 0.513 26.291 0.554 26.338 0.589 26.432 0.617 26.526 0.631 26.571 0.641	26.264 0.517 26.296 0.522 26.341 0.561 26.429 0.598 26.518 0.634 26.557 0.650	26.261 0.455 26.299 0.524 26.345 0.572 26.437 0.617 26.529 0.633 26.571 0.651

TRAVERSE 29	date: 80 05 21	time: 11.00 - 16.00
vertical no.10	vertical no. 11	vertical no. 12
y = 5.85 m z_s = 26.595 m z_b = 26.180 m d = 0.415 m	y = 6.21 m z_s = 26.606 m z_b = 26.172 m d = 0.434 m	y = 6.56 m z_s = 26.609 m z_b = 26.191 m d = 0.418 m
z (m) u (m/s) 26.280 0.513 26.304 0.502 26.346 0.528 26.429 0.581 26.512 0.605 26.546 0.612	z (m) u (m/s) 26.272 0.483 26.302 0.528 26.345 0.515 26.432 0.586 26.519 0.599 26.556 0.626	z (m) u (m/s) 26.291 0.523 26.316 0.554 26.358 0.580 26.441 0.621 26.525 0.628 26.559 0.638
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.91 m z_s = 26.595 m z_b = 26.217 m d = 0.378 m	y = 7.27 m z_s = 26.617 m z_b = 26.197 m d = 0.420 m	y = 7.62 m z_s = 26.627 m z_b = 26.149 m d = 0.478 m
z (m) u (m/s) 26.317 0.534 26.330 0.521 26.367 0.598 26.443 0.647 26.518 0.635 26.543 0.641	z (m) u (m/s) 26.297 0.522 26.323 0.528 26.365 0.584 26.449 0.604 26.533 0.609 26.568 0.602	z (m) u (m/s) 26.249 0.405 26.292 0.445 26.340 0.480 26.436 0.534 26.531 0.564 26.578 0.559
vertical no. 16	vertical no. 17	vertical no. 18
y = 7.97 m z_s = 26.624 m z_b = 26.250 m d = 0.374 m	y = 8.32 m z_s = 26.608 m z_b = 26.342 m d = 0.266 m	y = 8.68 m z_s = 26.622 m z_b = 26.285 m d = 0.337 m
z (m) u (m/s) 26.350 0.108 26.362 0.119 26.400 0.190 26.474 0.373 26.549 0.497 26.574 0.512	z (m) u (m/s) 26.559 0.294	z (m) u (m/s) 26.487 0.094 26.555 0.252

TRAVERSE 30	date: 80 05 26	time: 10.45 - 14.55
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.79 m z_s = 26.617 m z_b = 26.178 m d = 0.439 m	y = 3.16 m z_s = 26.619 m z_b = 26.107 m d = 0.512 m	y = 3.53 m z_s = 26.624 m z_b = 26.242 m d = 0.382 m
z (m) u (m/s) 26.278 0.333 26.310 0.363 26.354 0.357 26.442 0.389 26.530 0.409 26.568 0.404	z (m) u (m/s) 26.311 0.331 26.413 0.545 26.515 0.579 26.568 0.568	z (m) u (m/s) 26.342 0.419 26.395 0.573 26.472 0.602 26.548 0.636 26.575 0.650
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.91 m z_s = 26.618 m z_b = 26.322 m d = 0.296 m	y = 4.28 m z_s = 26.618 m z_b = 26.132 m d = 0.486 m	y = 4.65 m z_s = 26.615 m z_b = 26.061 m d = 0.554 m
z (m) u (m/s) 26.422 0.561 26.440 0.580 26.500 0.624 26.569 0.672	z (m) u (m/s) 26.232 0.307 26.278 0.535 26.327 0.567 26.424 0.610 26.521 0.669 26.568 0.685	z (m) u (m/s) 26.161 0.461 26.227 0.529 26.283 0.569 26.394 0.642 26.505 0.664 26.566 0.683
vertical no. 7	vertical no. 8	vertical no. 9
y = 5.02 m z_s = 26.616 m z_b = 26.074 m d = 0.542 m	y = 5.40 m z_s = 26.617 m z_b = 26.089 m d = 0.528 m	y = 5.77 m z_s = 26.625 m z_b = 26.080 m d = 0.545 m
z (m) u (m/s) 26.174 0.446 26.237 0.519 26.291 0.581 26.399 0.624 26.507 0.654 26.565 0.666	z (m) u (m/s) 26.189 0.489 26.247 0.538 26.300 0.594 26.406 0.628 26.511 0.655 26.567 0.663	z (m) u (m/s) 26.180 0.528 26.244 0.567 26.298 0.581 26.407 0.610 26.516 0.631 26.575 0.660

TRAVERSE 30	date:80 05 26	time: 10.45 - 14.55
vertical no. 10	vertical no. 11	vertical no. 12
y = 6.14 m z_s = 26.617 m z_b = 26.093 m d = 0.524 m	y = 6.52 m z_s = 26.621 m z_b = 26.128 m d = 0.493 m	y = 6.89 m z_s = 26.613 m z_b = 26.174 m d = 0.439 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.193 0.551 26.250 0.583 26.302 0.603 26.407 0.627 26.511 0.675 26.566 0.672	26.228 0.549 26.276 0.619 26.325 0.651 26.423 0.671 26.522 0.694 26.570 0.687	26.274 0.576 26.306 0.595 26.350 0.526 26.437 0.434 26.525 0.408 26.563 0.437
vertical no. 13	vertical no. 15	
y = 7.26 m z_s = 26.611 m z_b = 26.475 m d = 0.136 m	y = 8.01 m z_s = 26.612 m z_b = 26.297 m d = 0.315 m	
z (m) u (m/s)	z (m) u (m/s)	
26.587 0.305	26.397 0.400 26.423 0.411 26.486 0.442 26.561 0.478	

TRAVERSE 31	date: 80 05 22	time: 11.15 - 17.45
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.60 m z_s = 26.606 m z_b = 26.133 m d^b = 0.473 m	y = 2.86 m z_s = 26.613 m z_b = 25.987 m d^b = 0.626 m	y = 3.17 m z_s = 26.616 m z_b = 25.952 m d^b = 0.664 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.233 0.356 26.275 0.308 26.322 0.341 26.417 0.371 26.511 0.368 26.556 0.283	26.087 0.233 26.122 0.487 26.175 0.507 26.237 0.494 26.362 0.499 26.487 0.340 26.550 0.464 26.562 0.499	26.052 0.405 26.085 0.427 26.151 0.435 26.218 0.462 26.350 0.509 26.483 0.550 26.550 0.582 26.566 0.590
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.47 m z_s = 26.623 m z_b = 25.915 m d^b = 0.708 m	y = 3.78 m z_s = 26.616 m z_b = 25.868 m d^b = 0.748 m	y = 4.09 m z_s = 26.615 m z_b = 25.973 m d^b = 0.642 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.015 0.317 26.056 0.382 26.127 0.413 26.198 0.455 26.339 0.560 26.481 0.615 26.551 0.631 26.572 0.636	25.968 0.297 26.018 0.345 26.092 0.404 26.167 0.490 26.317 0.568 26.466 0.657 26.541 0.648 26.566 0.654	26.073 0.407 26.101 0.476 26.165 0.516 26.230 0.527 26.358 0.580 26.487 0.633 26.551 0.648 26.566 0.648
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.39 m z_s = 26.617 m z_b = 26.052 m d^b = 0.565 m	y = 4.70 m z_s = 26.618 m z_b = 26.121 m d^b = 0.497 m	y = 5.01 m z_s = 26.620 m z_b = 26.131 m d^b = 0.489 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.152 0.445 26.165 0.450 26.221 0.491 26.277 0.532 26.390 0.589 26.503 0.615 26.566 0.612	26.221 0.477 26.270 0.531 26.319 0.567 26.418 0.616 26.518 0.635 26.567 0.642	26.231 0.495 26.278 0.531 26.327 0.584 26.435 0.617 26.523 0.655 26.570 0.649

TRAVERSE 31	date: 80 05 22	time: 11.15 - 17.45
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.31 m z_s = 26.619 m z_b = 26.184 m d = 0.435 m	y = 5.62 m z_s = 26.618 m z_b = 26.190 m d = 0.428 m	y = 5.93 m z_s = 26.619 m z_b = 26.244 m d = 0.375 m
z (m) u (m/s) 26.284 0.531 26.316 0.542 26.360 0.579 26.448 0.608 26.536 0.638 26.569 0.647	z (m) u (m/s) 26.290 0.449 26.319 0.544 26.362 0.604 26.448 0.631 26.534 0.619 26.567 0.640	z (m) u (m/s) 26.344 0.491 26.386 0.478 26.472 0.543 26.548 0.589 26.566 0.594
vertical no. 13	vertical no. 14	vertical no. 15
y = 6.23 m z_s = 26.621 m z_b = 26.279 m d = 0.342 m	y = 6.54 m z_s = 26.620 m z_b = 26.233 m d = 0.387 m	y = 6.85 m z_s = 26.613 m z_b = 26.285 m d = 0.328 m
z (m) u (m/s) 26.379 0.483 26.415 0.511 26.483 0.529 26.551 0.542 26.570 0.542	z (m) u (m/s) 26.333 0.470 26.350 0.486 26.389 0.525 26.467 0.509 26.545 0.493 26.570 0.477	z (m) u (m/s) 26.385 0.382 26.417 0.375 26.483 0.371 26.549 0.374 26.564 0.385
vertical no. 16	vertical no. 17	
y = 7.15 m z_s = 26.609 m z_b = 26.349 m d = 0.260 m	y = 7.46 m z_s = 26.613 m z_b = 26.391 m d = 0.222 m	
z (m) u (m/s) 26.449 0.395 26.505 0.380 26.558 0.371	z (m) u (m/s) 26.491 0.296 26.523 0.282 26.563 0.298	

TRAVERSE 32	date: 80 05 23	time: 11.00 - 15.05
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.54 m z_s = 26.626 m z_b = 26.335 m d^b = 0.291 m	y = 2.91 m z_s = 26.627 m z_b = 26.000 m d^b = 0.628 m	y = 3.29 m z_s = 26.631 m z_b = 25.773 m d^b = 0.858 m
z (m) u (m/s) 26.509 0.364 26.575 0.370	z (m) u (m/s) 26.100 0.346 26.126 0.396 26.188 0.452 26.251 0.529 26.377 0.581 26.503 0.529 26.579 0.558	z (m) u (m/s) 25.873 0.209 25.934 0.279 26.020 0.394 26.096 0.498 26.267 0.631 26.419 0.648 26.505 0.646 26.580 0.645
vertical no.4	vertical no. 5	vertical no. 6
y = 3.66 m z_s = 26.631 m z_b = 25.840 m d^b = 0.791 m	y = 4.03 m z_s = 26.636 m z_b = 26.032 m d^b = 0.604 m	y = 4.41 m z_s = 26.642 m z_b = 26.040 m d^b = 0.602 m
z (m) u (m/s) 25.940 0.410 25.998 0.476 26.077 0.536 26.156 0.600 26.314 0.615 26.472 0.600 26.580 0.625	z (m) u (m/s) 26.132 0.440 26.153 0.454 26.213 0.519 26.273 0.534 26.394 0.569 26.514 0.591 26.583 0.626	z (m) u (m/s) 26.140 0.426 26.160 0.441 26.220 0.478 26.280 0.521 26.400 0.575 26.520 0.627 26.590 0.659
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.78 m z_s = 26.647 m z_b = 26.133 m d^b = 0.514 m	y = 5.15 m z_s = 26.642 m z_b = 26.163 m d^b = 0.479 m	y = 5.52 m z_s = 26.647 m z_b = 26.182 m d^b = 0.465 m
z (m) u (m/s) 26.233 0.509 26.287 0.539 26.338 0.559 26.441 0.593 26.544 0.655 26.597 0.677	z (m) u (m/s) 26.263 0.503 26.306 0.529 26.354 0.573 26.450 0.616 26.546 0.649 26.592 0.653	z (m) u (m/s) 26.282 0.476 26.322 0.525 26.368 0.540 26.462 0.550 26.555 0.602 26.598 0.634

TRAVERSE 32	date: 80 05 23	time: 11.00 - 15.05
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.90 m z_s = 26.647 m z_b = 26.146 m d = 0.401 m	y = 6.27 m z_s = 26.640 m z_b = 26.299 m d = 0.341 m	y = 6.64 m z_s = 26.636 m z_b = 26.315 m d = 0.321 m
z (m) u (m/s)	z (m) u (m/s	z (m) u (m/s)
26.346 0.514 26.366 0.492 26.406 0.493 26.486 0.480 26.566 0.614 26.596 0.603	26.399 0.545 26.435 0.571 26.504 0.581 26.572 0.592 26.590 0.587	26.415 0.526 26.444 0.541 26.508 0.539 26.572 0.543 26.586 0.547
vertical no. 13	vertical no. 14	vertical no. 15
y = 7.02 m z_s = 26.636 m z_b = 26.334 m d = 0.302 m	y = 7.39 m z_s = 26.630 m z_b = 26.337 m d = 0.293 m	y = 7.76 m z_s = 26.634 m z_b = 26.400 m d = 0.234 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.434 0.432 26.455 0.459 26.515 0.459 26.586 0.483	26.437 0.411 26.511 0.429 26.581 0.458	26.500 0.307 26.540 0.336 26.583 0.355

TRAVERSE 33	date: 80 05 12	time: 11.30 - 18.10
vertical no. 2	vertical no. 3	verrical no. 4
y = 2.18 m z_s = 26.646 m z_b = 26.051 m d = 0.595 m	y = 2.49 m z_s = 26.652 m z_b = 25.821 m d = 0.831 m	y = 2.80 m z_s = 26.660 m z_b = 25.894 m d = 0.766 m
z (m) u (m/s) 26.151 0.117 26.171 0.114 26.231 0.119 26.291 0.104 26.401 0.097 26.521 0.202 26.591 0.333	z (m) u (m/s) 25.921 0.072 25.991 0.155 26.071 0.223 26.151 0.309 26.321 0.493 26.481 0.587 26.561 0.595 26.601 0.594	z (m) u (m/s) 25.994 0.523 26.044 0.579 26.194 0.589 26.504 0.577
vertical no. 5	vertical no. 6	vertical no. 7
y = 3.11 m z_s = 26.658 m z_b = 25.636 m d = 1.022 m	y = 3.42 m z_s = 26.660 m z_b = 25.661 m d = 0.999 m	y = 3.73 m z_s = 26.663 m z_b = 25.819 m d = 0.842 m
z (m) u (m/s) 25.736 0.212 25.836 0.382 25.936 0.514 26.036 0.546 26.236 0.528 26.436 0.525 26.536 0.513 26.606 0.519	z (m) u (m/s) 25.761 0.409 25.861 0.473 26.061 0.438 26.461 0.482	z (m) u (m/s) 25.919 0.394 25.989 0.413 26.069 0.408 26.159 0.395 26.319 0.409 26.489 0.476 26.579 0.531 26.609 0.554
vertical no. 8	vertical no. 9	vertical no. 10
y = 4.04 m z_s = 26.660 m z_b = 25.980 m d = 0.680 m	y = 4.35 m z_s = 26.663 m z_b = 26.010 m d = 0.653 m	y = 4.66 m z_s = 26.656 m z_b = 26.041 m d = 0.615 m
z (m) u (m/s) 26.120 0.358 26.250 0.376 26.520 0.520	z (m) u (m/s) 26.110 0.364 26.140 0.368 26.210 0.395 26.270 0.426 26.400 0.497 26.530 0.584 26.610 0.609	z (m) u (m/s) 26.161 0.405 26.281 0.510 26.531 0.613

TRAVERSE 33	date: 80 05 12	time: 11.30 - 18.10
vertical no.11	vertical no. 12	vertical no.13
y = 4.97 m z_s = 26.655 m z_b = 26.113 m d = 0.542 m	y = 5.28 m z_s = 26.653 m z_b = 26.197 m d = 0.456 m	y = 5.59 m z_s = 26.652 m z_b = 26.270 m d = 0.382 m
z (m) u (m/s) 26.213 0.470 26.273 0.504 26.333 0.549 26.433 0.584 26.553 0.590 26.603 0.600	z (m) u (m/s) 26.297 0.400 26.377 0.475 26.557 0.384	z (m) u (m/s) 26.370 0.507 26.420 0.490 26.500 0.494 26.570 0.535 26.600 0.541
vertical no.14	vertical no. 15	vertical no. 16
y = 5.90 m z_s = 26.654 m z_b = 26.283 m d = 0.371 m	y = 6.21 m z_s = 26.650 m z_b = 26.294 m d = 0.356 m	y = 6.52 m z_s = 26.650 m z_b = 26.311 m d = 0.339 m
z (m) u (m/s) 26.383 0.432 26.433 0.461 26.583 0.533	z (m) u (m/s) 26.394 0.475 26.434 0.499 26.514 0.530 26.574 0.535 26.594 0.542	z (m) u (m/s) 26.411 0.404 26.441 0.435 26.581 0.543
vertical no. 17	vertical no. 18	vertical no. 19
y = 6.83 m z_s = 26.649 m z_b = 26.306 m d = 0.343 m	y = 7.14 m z_s = 26.649 m z_b = 26.410 m d = 0.239 m	y = 7.45 m z_s = 26.645 m z_b = 26.403 m d = 0.242 m
z (m) u (m/s) 26.406 0.484 26.446 0.493 26.506 0.513 26.586 0.569	z (m) u (m/s) 26.510 0.502 26.560 0.536 26.600 0.546	z (m) u (m/s) 26.503 0.449 26.547 0.455 26.593 0.469

TRAVERSE 33	date: 80 05 12	time: 11.30 - 18.10
vertical no.20	vertical no. 21	
y = 7.76 m z_s = 26.641 m z_b = 26.441 m d_b = 0.200 m	y = 7.92 m z_s = 26.644 m z_b = 26.439 m d_b = 0.205 m	
z (m) u (m/s)	z (m) u (m/s)	
26.541 0.416 26.561 0.422 26.591 0.429	26.539 0.285 26.559 0.293 26.589 0.311	

TRAVERSE 34	date: 80 05 13	time: 11.00 - 16.40
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.10 m z_s = 26.651 m z_b = 25.830 m d = 0.821 m	y = 2.39 m z_s = 26.644 m z_b = 25.722 m d = 0.922 m	y = 2.68 m z_s = 26.646 m z_b = 25.689 m d = 0.957 m
z (m) u (m/s) 25.990 0.105 26.080 0.101 26.490 0.549	z (m) u (m/s) 25.822 0.050 25.902 0.284 26.002 0.358 26.092 0.479 26.272 0.440 26.462 0.638 26.552 0.607 26.592 0.601	z (m) u (m/s) 25.789 0.219 25.879 0.326 25.979 0.430 26.459 0.581
vertical no. 20	vertical no. 4	vertical no. 5
y = 2.75 m z_s = 26.661 m z_b = 25.721 m d = 0.940 m	y = 2.97 m z_s = 26.650 m z_b = 25.785 m d = 0.865 m	y = 3.26 m z_s = 26.671 m z_b = 25.910 m d = 0.761 m
z (m) u (m/s) 25.821 0.244 25.911 0.302 26.001 0.389 26.091 0.482 26.281 0.499 26.471 0.574 26.561 0.571 26.611 0.575	z (m) u (m/s) 25.885 0.270 25.955 0.317 26.045 0.456 26.125 0.488 26.305 0.577 26.485 0.556 26.565 0.570 26.605 0.553	z (m) u (m/s) 26.010 0.441 26.060 0.411 26.520 0.570
vertical no. 6	vertical no. 7	vertical no. 8
y = 3.65 m z_s = 26.667 m z_b = 26.012 m d = 0.655 m	y = 3.94 m z_s = 26.660 m z_b = 26.020 m d = 0.640 m	y = 4.23 m z_s = 26.652 m z_b = 26.038 m d = 0.614 m
z (m) u (m/s) 26.112 0.460 26.142 0.478 26.212 0.533 26.272 0.539 26.412 0.557 26.542 0.582 26.622 0.600	z (m) u (m/s) 26.121 0.470 26.151 0.478 26.281 0.533 26.531 0.596	z (m) u (m/s) 26.138 0.510 26.158 0.504 26.218 0.535 26.278 0.562 26.408 0.598 26.528 0.621 26.598 0.636

TRAVERSE 34	date: 80 05 13	time: 11.00 - 16.40
vertical no. 9	vertical no. 10	vertical no. 11
y = 4.62 m z_s = 26.663 m z_b = 26.061 m d = 0.602 m	y = 4.91 m z_s = 26.649 m z_b = 26.111 m d = 0.538 m	y = 5.20 m z_s = 26.654 m z_b = 26.175 m d = 0.479 m
z (m) u (m/s) 26.161 0.526 26.181 0.522 26.301 0.567 26.541 0.586	z (m) u (m/s) 26.211 0.527 26.271 0.575 26.331 0.585 26.431 0.597 26.541 0.584 26.601 0.538	z (m) u (m/s) 26.275 0.530 26.365 0.553 26.555 0.560
vertical no. 12	vertical no. 13	vertical no. 14
y = 5.49 m z_s = 26.660 m z_b = 26.232 m d = 0.428 m	y = 5.78 m z_s = 26.654 m z_b = 26.222 m d = 0.432 m	y = 6.07 m z_s = 26.656 m z_b = 26.275 m d = 0.381 m
z (m) u (m/s) 26.332 0.493 26.352 0.494 26.402 0.525 26.442 0.564 26.572 0.587 26.602 0.598	z (m) u (m/s) 26.322 0.474 26.392 0.545 26.582 0.569	z (m) u (m/s) 26.375 0.458 26.395 0.478 26.425 0.503 26.505 0.533 26.575 0.585 26.605 0.565
vertical no. 15	vertical no. 16	vertical no. 17
y = 6.36 m z_s = 26.659 m z_b = 26.359 m d = 0.300 m	y = 6.65 m z_s = 26.657 m z_b = 26.421 m d = 0.236 m	y = 6.94 m z_s = 26.659 m z_b = 26.447 m d = 0.212 m
z (m) u (m/s) 26.459 0.450 26.479 0.457 26.599 0.554	z (m) u (m/s) 26.522 0.520 26.562 0.525 26.602 0.582	z (m) u (m/s) 26.548 0.502 26.568 0.494 26.608 0.534

TRAVERSE 34	date: 80 05 13	time: 11.00 - 16.40
vertical no. 18	vertical no. 19	
y = 7.23 m z_s = 26.658 m z_b = 26.461 m d = 0.197 m	y = 7.52 m z_s = 26.645 m z_b = 26.497 m d = 0.148 m	
z (m) u (m/s) 26.561 0.495 26.531 0.512 26.611 0.519	z (m) u (m/s) 26.597 0.366	

TRAVERSE 35	date: 80 05 14	time: 10.15 - 16.20
vertical no. 1	vertical no. 2	vertical no. 3
y = 1.48 m z_s = 26.690 m z_b = 26.170 m d^b = 0.520 m	y = 1.90 m z_s = 26.656 m z_b = 25.474 m d^b = 1.182 m	y = 2.18 m z_s = 26.662 m z_b = 25.482 m d^b = 1.180 m
z (m) u (m/s 26.270 0.274 26.380 0.265 26.590 0.218	z (m) u (m/s) 25.574 0.125 25.594 0.139 25.714 0.187 25.824 0.217 25.944 0.302 26.414 0.477 26.534 0.459 26.604 0.468	z (m) u (m/s) 25.582 0.118 25.602 0.113 25.722 0.087 25.832 0.255 25.952 0.454 26.192 0.482 26.422 0.522 26.542 0.534 26.612 0.557
vertical no. 4	vertical no. 5	vertical no. 6
y = 2.46 m z_s = 26.645 m z_b = 25.548 m d^b = 1.097 m	y = 2.74 m z_s = 26.676 m z_b = 25.569 m d^b = 1.107 m	y = 3.02 m z_s = 26.643 m z_b = 25.673 m d^b = 0.970 m
z (m) u (m/s 25.648 0.120 25.768 0.275 25.988 0.450 26.428 0.524	z (m) u (m/s) 25.669 0.208 25.789 0.280 25.899 0.356 26.099 0.391 26.239 0.459 26.459 0.560 26.569 0.579 26.629 0.578	z (m) u (m/s) 25.773 0.267 25.863 0.262 26.053 0.342 26.453 0.554
vertical no. 7	vertical no. 8	vertical no. 9
y = 3.30 m z_s = 26.663 m z_b = 25.782 m d^b = 0.881 m	y = 3.58 m z_s = 26.663 m z_b = 25.961 m d^b = 0.702 m	y = 3.86 m z_s = 26.662 m z_b = 26.104 m d^b = 0.558 m
z (m) u (m/s) 25.882 0.261 25.952 0.239 26.042 0.290 26.132 0.376 26.312 0.491 26.482 0.578 26.572 0.597 26.612 0.602	z (m) u (m/s) 26.101 0.302 26.241 0.453 26.521 0.595	z (m) u (m/s) 26.204 0.426 26.264 0.492 26.324 0.562 26.424 0.597 26.544 0.611 26.604 0.618

TRAVERSE 35	date:80 05 14	time: 10.15 - 16.20
vertical no.10	vertical no. 11	vertical no. 12
y = 4.14 m z_s = 26.660 m z_b = 26.140 m d^b = 0.520 m	y = 4.42 m z_s = 26.659 m z_b = 26.226 m d^b = 0.433 m	y = 4.70 m z_s = 26.662 m z_b = 26.246 m d^b = 0.416 m
z (m) u (m/s) 26.240 0.455 26.350 0.578 26.560 0.633	z (m) u (m/s) 26.326 0.537 26.356 0.564 26.396 0.593 26.486 0.624 26.566 0.640 26.606 0.632	z (m) u (m/s) 26.346 0.560 26.406 0.603 26.576 0.633
vertical no. 13	vertical no. 14	vertical no. 15
y = 4.98 m z_s = 26.657 m z_b = 26.287 m d^b = 0.370 m	y = 5.26 m z_s = 26.657 m z_b = 26.279 m d^b = 0.378 m	y = 5.54 m z_s = 26.657 m z_b = 26.252 m d^b = 0.405 m
z (m) u (m/s) 26.387 0.541 26.437 0.592 26.507 0.614 26.587 0.618 26.607 0.609	z (m) u (m/s) 26.379 0.473 26.429 0.541 26.579 0.571	z (m) u (m/s) 26.352 0.379 26.372 0.426 26.412 0.461 26.492 0.537 26.572 0.563 26.602 0.560
vertical no.16	vertical no. 17	vertical no. 18
y = 5.82 m z_s = 26.655 m z_b = 26.331 m d^b = 0.324 m	y = 6.10 m z_s = 26.654 m z_b = 26.325 m d^b = 0.329 m	y = 6.38 m z_s = 26.651 m z_b = 26.345 m d^b = 0.306 m
z (m) u (m/s) 26.431 0.507 26.461 0.529 26.591 0.529	z (m) u (m/s) 26.425 0.402 26.455 0.409 26.515 0.491 26.585 0.512 26.605 0.512	z (m) u (m/s) 26.445 0.443 26.485 0.468 26.590 0.418

TRAVERSE 35	date: 80 05 14	time: 10.15 - 16.20
vertical no. 19	vertical no. 20	
y = 6.66 m z_s = 26.649 m z_b = 26.447 m d = 0.203 m	y = 6.94 m z_s = 26.653 m z_b = 26.494 m d = 0.159 m	
z (m/s) u (m/s)	z (m) u (m/s)	
26.547 0.299 26.567 0.313 26.597 0.365	26.594 0.355	

TRAVERSE 36	date: 80 05 22	time: 11.00 - 15.20
vertical no. 1	vertical no. 2	vertical no. 3
y = 1.45 m z_s = 26.588 m z_b = 26.142 m d_b = 0.446 m	y = 1.85 m z_s = 26.591 m z_b = 26.063 m d_b = 0.528 m	y = 2.24 m z_s = 26.589 m z_b = 26.088 m d_b = 0.501 m
z (m) u (m/s) 26.243 0.372 26.276 0.418 26.321 0.429 26.410 0.414 26.499 0.362 26.538 0.337	z (m) u (m/s) 26.221 0.614 26.274 0.626 26.380 0.582 26.485 0.482 26.541 0.411	z (m) u (m/s) 26.188 0.613 26.238 0.656 26.288 0.654 26.389 0.625 26.489 0.613 26.540 0.575
vertical no. 4	vertical no. 5	vertical no. 6
y = 2.64 m z_s = 26.594 m z_b = 25.936 m d_b = 0.658 m	y = 3.04 m z_s = 26.593 m z_b = 25.978 m d_b = 0.615 m	y = 3.44 m z_s = 26.589 m z_b = 26.063 m d_b = 0.526 m
z (m) u (m/s) 26.036 0.429 26.068 0.482 26.133 0.535 26.199 0.578 26.331 0.580 26.462 0.581 26.544 0.587	z (m) u (m/s) 26.079 0.439 26.101 0.441 26.163 0.503 26.224 0.533 26.347 0.539 26.470 0.537 26.543 0.555	z (m) u (m/s) 26.163 0.408 26.221 0.439 26.273 0.480 26.378 0.509 26.483 0.533 26.548 0.549
vertical no. 7	vertical no. 8	vertical no. 9
y = 3.83 m z_s = 26.593 m z_b = 26.063 m d_b = 0.530 m	y = 4.23 m z_s = 26.593 m z_b = 26.112 m d_b = 0.481 m	y = 4.63 m z_s = 26.593 m z_b = 26.144 m d_b = 0.449 m
z (m) u (m/s) 26.163 0.422 26.222 0.475 26.275 0.502 26.381 0.535 26.487 0.567 26.543 0.575	z (m) u (m/s) 26.212 0.534 26.256 0.551 26.304 0.556 26.400 0.601 26.497 0.622 26.553 0.625	z (m) u (m/s) 26.244 0.474 26.279 0.470 26.324 0.533 26.414 0.552 26.502 0.603 26.543 0.615

TRAVERSE 36	date: 80 05 22	time: 11.00 - 15.20
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.02 m z_s = 26.595 m z_b = 26.173 m d_b = 0.422 m	y = 5.42 m z_s = 26.591 m z_b = 26.196 m d_b = 0.395 m	y = 5.82 m z_s = 26.593 m z_b = 26.346 m d_b = 0.247 m
z (m) u (m/s) 26.273 0.484 26.300 0.528 26.342 0.547 26.426 0.579 26.511 0.608 26.545 0.604	z (m) u (m/s) 26.296 0.468 26.354 0.475 26.433 0.525 26.512 0.578 26.541 0.575	z (m) u (m/s) 26.447 0.504 26.494 0.519 26.543 0.510
vertical no. 13	vertical no. 14	
y = 6.21 m z_s = 26.598 m z_b = 26.354 m d_b = 0.244 m	y = 6.61 m z_s = 26.595 m z_b = 26.380 m d_b = 0.215 m	
z (m) u (m/s) 26.455 0.370 26.501 0.405 26.549 0.431	z (m) u (m/s) 26.480 0.310 26.509 0.313 26.545 0.299	

TRAVERSE 37	date: 80 05 15	time: 10.05 - 16.10
vertical no. 1	vertical no. 2	vertical no. 3
y = 1.60 m z_s = 26.605 m z_b = 25.981 m d = 0.624 m	y = 1.90 m z_s = 26.650 m z_b = 25.984 m d = 0.666 m	y = 2.20 m z_s = 26.619 m z_b = 25.984 m d = 0.635 m
z (m) u (m/s) 26.081 0.334 26.106 0.319 26.231 0.335 26.481 0.213	z (m) u (m/s) 26.084 0.435 26.114 0.441 26.174 0.440 26.244 0.443 26.374 0.366 26.514 0.245 26.574 0.217 26.594 0.216	z (m) u (m/s) 26.084 0.519 26.114 0.562 26.234 0.571 26.494 0.402
vertical no. 4	vertical no. 5	vertical no. 6
y = 2.50 m z_s = 26.622 m z_b = 26.005 m d = 0.617 m	y = 2.80 m z_s = 26.636 m z_b = 26.028 m d = 0.608 m	y = 3.10 m z_s = 26.630 m z_b = 26.032 m d = 0.598 m
z (m) u (m/s) 26.105 0.565 26.125 0.569 26.185 0.573 26.245 0.592 26.375 0.577 26.505 0.563 26.565 0.528	z (m) u (m/s) 26.128 0.478 26.148 0.523 26.268 0.586 26.518 0.608	z (m) u (m/s) 26.132 0.460 26.152 0.480 26.212 0.530 26.272 0.512 26.392 0.580 26.512 0.615 26.582 0.592
vertical no. 7	vertical no. 8	vertical no. 9
y = 3.40 m z_s = 26.626 m z_b = 26.065 m d = 0.561 m	y = 3.70 m z_s = 26.622 m z_b = 26.088 m d = 0.534 m	y = 4.00 m z_s = 26.616 m z_b = 26.133 m d = 0.483 m
z (m) u (m/s) 26.165 0.488 26.285 0.585 26.515 0.611	z (m) u (m/s) 26.188 0.290 26.248 0.518 26.298 0.570 26.408 0.591 26.508 0.602 26.568 0.613	z (m) u (m/s) 26.233 0.497 26.273 0.537 26.513 0.623

TRAVERSE 37	date: 80 05 15	time: 10.05 - 16.10
vertical no. 10	vertical no. 11	vertical no. 12
y = 4.30 m z_s = 26.610 m z_b = 26.136 m d = 0.474 m	y = 4.60 m z_s = 26.605 m z_b = 26.095 m d = 0.510 m	y = 4.90 m z_s = 26.616 m z_b = 26.151 m d = 0.465 m
z (m) u (m/s) 26.236 0.519 26.276 0.577 26.326 0.597 26.416 0.616 26.516 0.634 26.556 0.633	z (m) u (m/s) 26.195 0.521 26.295 0.626 26.505 0.674	z (m) u (m/s) 26.251 0.587 26.291 0.626 26.331 0.617 26.431 0.652 26.521 0.677 26.561 0.673
vertical no. 13	vertical no. 14	vertical no. 15
y = 5.20 m z_s = 26.621 m z_b = 26.158 m d = 0.463 m	y = 5.50 m z_s = 26.617 m z_b = 26.159 m d = 0.458 m	y = 5.80 m z_s = 26.617 m z_b = 26.105 m d = 0.512 m
z (m) u (m/s) 26.258 0.503 26.338 0.604 26.528 0.658	z (m) u (m/s) 26.260 0.461 26.300 0.506 26.340 0.551 26.440 0.588 26.530 0.617 26.570 0.616	z (m) u (m/s) 26.205 0.450 26.305 0.505 26.515 0.585
vertical no. 16	vertical no. 17	vertical no. 18
y = 6.10 m z_s = 26.599 m z_b = 26.226 m d = 0.373 m	y = 6.40 m z_s = 26.615 m z_b = 26.355 m d = 0.260 m	y = 6.70 m z_s = 26.616 m z_b = 26.348 m d = 0.268 m
z (m) u (m/s) 26.326 0.334 26.376 0.363 26.446 0.439 26.526 0.533 26.546 0.539	z (m) u (m/s) 26.455 0.312 26.565 0.458	z (m) u (m/s) 26.449 0.232 26.499 0.324 26.559 0.391

TRAVERSE 37	date: 80 05 15	time: 10.05 - 16.10
vertical no. 19	vertical no. 20	
y = 7.00 m z_s = 26.612 m z_b = 26.365 m d = 0.247 m	y = 7.15 m z_s = 26.605 m z_b = 26.421 m d = 0.184 m	
z (m) u (m/s) 26.465 0.333 26.555 0.353	z (m) u (m/s) 26.521 0.279 26.551 0.292	

TRAVERSE 40	date: 80 05 19	time: 11.35 - 16.50
vertical no. 2	vertical no. 3	vertical no. 4
y = 2.90 m z_s = 26.587 m z_b = 26.201 m d^b = 0.386 m	y = 3.27 m z_s = 26.589 m z_b = 26.114 m d^b = 0.475 m	y = 3.64 m z_s = 26.590 m z_b = 26.114 m d^b = 0.476 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.301 0.279 26.317 0.265 26.345 0.278 26.432 0.356 26.489 0.369 26.536 0.340	26.214 0.420 26.256 0.466 26.288 0.472 26.398 0.496 26.473 0.507 26.538 0.490	26.214 0.488 26.258 0.513 26.304 0.531 26.402 0.577 26.495 0.579 26.540 0.571
vertical no. 5	vertical no. 6	vertical no. 7
y = 4.01 m z_s = 26.588 m z_b = 26.136 m d^b = 0.452 m	y = 4.38 m z_s = 26.587 m z_b = 26.137 m d^b = 0.450 m	y = 4.75 m z_s = 26.587 m z_b = 26.121 m d^b = 0.466 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.236 0.500 26.271 0.517 26.317 0.537 26.407 0.612 26.497 0.615 26.538 0.635	26.237 0.502 26.272 0.536 26.317 0.576 26.407 0.632 26.497 0.646 26.537 0.652	26.221 0.508 26.261 0.536 26.308 0.564 26.401 0.618 26.494 0.616 26.538 0.643
vertical no. 8	vertical no. 9	vertical no. 10
y = 5.12 m z_s = 26.589 m z_b = 26.120 m d^b = 0.469 m	y = 5.49 m z_s = 26.591 m z_b = 26.139 m d^b = 0.452 m	y = 5.86 m z_s = 26.594 m z_b = 26.107 m d^b = 0.487 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.220 0.550 26.261 0.570 26.308 0.585 26.401 0.640 26.495 0.657 26.539 0.661	26.239 0.520 26.275 0.559 26.320 0.569 26.410 0.618 26.501 0.650 26.541 0.654	26.207 0.565 26.253 0.561 26.302 0.542 26.400 0.617 26.497 0.648 26.543 0.667

TRAVERSE 40	date: 80 05 19	time: 11.35 - 16.50
vertical no. 11	vertical no. 12	vertical no. 13
y = 6.23 m z_s = 26.597 m z_b = 26.104 m d_b = 0.493 m	y = 6.60 m z_s = 26.601 m z_b = 26.090 m d_b = 0.511 m	y = 6.97 m z_s = 26.595 m z_b = 26.077 m d_b = 0.518 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.204 0.499 26.252 0.551 26.301 0.574 26.399 0.612 26.497 0.659 26.546 0.678	26.190 0.439 26.243 0.471 26.294 0.515 26.396 0.582 26.498 0.624 26.550 0.658	26.177 0.439 26.232 0.518 26.281 0.545 26.387 0.572 26.491 0.598 26.544 0.614
vertical no. 14	vertical no. 15	vertical no. 16
y = 7.34 m z_s = 26.593 m z_b = 26.095 m d_b = 0.498 m	y = 7.71 m z_s = 26.585 m z_b = 26.140 m d_b = 0.445 m	y = 8.08 m z_s = 26.576 m z_b = 26.231 m d_b = 0.345 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.195 0.414 26.244 0.434 26.294 0.462 26.376 0.502 26.493 0.531 26.543 0.545	26.240 0.390 26.273 0.408 26.318 0.421 26.407 0.439 26.496 0.388 26.535 0.392	26.331 0.275 26.369 0.254 26.438 0.262 26.507 0.223 26.526 0.240

TRAVERSE 44	date: 80 05 20	time: 10.30 - 16.50
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.21 m z_s = 26.543 m z_b = 26.337 m d = 0.206 m	y = 2.63 m z_s = 26.552 m z_b = 26.233 m d = 0.319 m	y = 3.05 m z_s = 26.557 m z_b = 26.177 m d = 0.380 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.437 0.120 26.460 0.139 26.492 0.167	26.333 0.127 26.361 0.128 26.424 0.161 26.502 0.213	26.277 0.418 26.291 0.436 26.329 0.474 26.406 0.461 26.482 0.450 26.528 0.410
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.47 m z_s = 26.562 m z_b = 26.188 m d = 0.374 m	y = 3.89 m z_s = 26.566 m z_b = 26.160 m d = 0.406 m	y = 4.31 m z_s = 26.577 m z_b = 26.152 m d = 0.425 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.289 0.574 26.301 0.567 26.339 0.579 26.413 0.597 26.488 0.562 26.513 0.548	26.260 0.465 26.282 0.477 26.322 0.484 26.404 0.530 26.485 0.555 26.516 0.550	26.252 0.480 26.280 0.476 26.322 0.562 26.408 0.602 26.493 0.606 26.528 0.600
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.73 m z_s = 26.577 m z_b = 26.170 m d = 0.407 m	y = 5.15 m z_s = 26.573 m z_b = 26.130 m d = 0.443 m	y = 5.57 m z_s = 26.562 m z_b = 26.128 m d = 0.434 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.270 0.490 26.292 0.514 26.333 0.537 26.414 0.594 26.496 0.608 26.527 0.618	26.230 0.517 26.263 0.547 26.307 0.567 26.395 0.569 26.484 0.626 26.522 0.625	26.228 0.491 26.258 0.529 26.302 0.549 26.388 0.585 26.475 0.623 26.512 0.627

TRAVERSE 44	date: 80 05 20	time: 10.30 - 16.50
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.99 m z_s = 26.562 m z_b = 26.171 m d^b = 0.391 m	y = 6.41 m z_s = 26.562 m z_b = 26.155 m d^b = 0.407 m	y = 6.83 m z_s = 26.560 m z_b = 26.137 m d^b = 0.413 m
z (m) u (m/s) 26.271 0.529 26.327 0.558 26.405 0.577 26.483 0.615 26.511 0.630	z (m) u (m/s) 26.255 0.506 26.277 0.519 26.317 0.529 26.398 0.559 26.479 0.589 26.510 0.589	z (m) u (m/s) 26.237 0.448 26.261 0.465 26.302 0.481 26.385 0.529 26.467 0.556 26.500 0.563
vertical no. 13	vertical no. 14	vertical no. 15
y = 7.25 m z_s = 26.561 m z_b = 26.098 m d^b = 0.463 m	y = 7.67 m z_s = 26.560 m z_b = 26.073 m d^b = 0.487 m	y = 8.09 m z_s = 26.553 m z_b = 26.035 m d^b = 0.518 m
z (m) u (m/s) 26.198 0.380 26.237 0.432 26.283 0.466 26.376 0.510 26.469 0.519 26.511 0.530	z (m) u (m/s) 26.173 0.337 26.209 0.379 26.267 0.414 26.364 0.445 26.461 0.465 26.508 0.477	z (m) u (m/s) 26.135 0.279 26.190 0.284 26.242 0.303 26.345 0.333 26.449 0.350 26.502 0.381
vertical no. 16		
y = 8.50 m z_s = 26.551 m z_b = 26.031 m d^b = 0.520 m		
z (m) u (m/s) 26.132 0.222 26.187 0.242 26.239 0.227 26.343 0.203 26.447 0.150 26.501 0.148		

TRANSVERSE 52	date: 80 05 21	time: 10.30 - 15.50
vertical no. 1	vertical no. 2	vertical no. 3
y = 2.12 m z_s = 26.540 m z_b = 26.196 m d^b = 0.344 m	y = 2.55 m z_s = 26.541 m z_b = 26.252 m d^b = 0.289 m	y = 2.98 m z_s = 26.542 m z_b = 26.181 m d^b = 0.361 m
z (m) u (m/s 26.296 0.092 26.333 0.263 26.402 0.430 26.470 0.401 26.489 0.405	z (m) u (m/s) 26.352 0.359 26.368 0.391 26.425 0.415 26.491 0.448	z (m) u (m/s) 26.281 0.440 26.325 0.489 26.398 0.559 26.470 0.564 26.492 0.566
vertical no. 4	vertical no. 5	vertical no. 6
y = 3.41 m z_s = 26.547 m z_b = 26.146 m d^b = 0.401 m	y = 3.84 m z_s = 26.547 m z_b = 26.176 m d^b = 0.371 m	y = 4.27 m z_s = 26.549 m z_b = 26.097 m d^b = 0.452 m
z (m) u (m/s) 26.246 0.513 26.266 0.537 26.306 0.554 26.387 0.589 26.467 0.617 26.497 0.632	z (m) u (m/s) 26.276 0.525 26.287 0.536 26.324 0.561 26.399 0.595 26.473 0.632 26.497 0.631	z (m) u (m/s) 26.197 0.495 26.233 0.528 26.278 0.547 26.368 0.607 26.459 0.654 26.499 0.659
vertical no. 7	vertical no. 8	vertical no. 9
y = 4.70 m z_s = 26.546 m z_b = 26.140 m d^b = 0.406 m	y = 5.13 m z_s = 26.547 m z_b = 26.105 m d^b = 0.442 m	y = 5.56 m z_s = 26.542 m z_b = 26.115 m d^b = 0.427 m
z (m) u (m/s) 26.240 0.597 26.262 0.575 26.302 0.599 26.384 0.641 26.465 0.670 26.496 0.666	z (m) u (m/s) 26.205 0.498 26.238 0.548 26.282 0.574 26.370 0.606 26.459 0.630 26.497 0.631	z (m) u (m/s) 26.215 0.496 26.243 0.562 26.286 0.599 26.371 0.640 26.467 0.646 26.492 0.655

TRAVERSE 52	date: 80 05 21	time: 10.30 - 15.50
vertical no. 10	vertical no. 11	vertical no. 12
y = 5.99 m z_s = 26.544 m z_b = 26.088 m d = 0.456 m	y = 6.42 m z_s = 26.546 m z_b = 26.058 m d = 0.488 m	y = 6.85 m z_s = 26.544 m z_b = 26.055 m d = 0.489 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.188 0.493 26.225 0.521 26.270 0.557 26.362 0.592 26.453 0.623 26.494 0.633	26.158 0.522 26.204 0.540 26.253 0.551 26.350 0.588 26.448 0.633 26.494 0.644	26.155 0.477 26.201 0.527 26.250 0.532 26.348 0.579 26.445 0.607 26.493 0.627
vertical no. 13	vertical no. 14	vertical no. 15
y = 7.28 m z_s = 26.546 m z_b = 26.072 m d = 0.474 m	y = 7.71 m z_s = 26.548 m z_b = 26.116 m d = 0.432 m	y = 7.90 m z_s = 26.546 m z_b = 26.295 m d = 0.251 m
z (m) u (m/s)	z (m) u (m/s)	z (m) u (m/s)
26.172 0.483 26.214 0.528 26.262 0.562 26.356 0.564 26.451 0.558 26.496 0.541	26.216 0.304 26.245 0.344 26.288 0.377 26.375 0.362 26.461 0.314 26.497 0.315	26.395 0.079 26.446 0.066 26.496 0.104

APPENDIX D

Measurements of water surface level at point gauge stations

Coordinates of point gauge stations

date	time	z_s - 26000 (mm), at point gauge station			
may 1980	h min	1	2	3	4
12	9 00	727.9	689.2	610.2	577.6
12	19 00	732.3	695.6	626.1	586.5
13	9 00	731.8	699.2	626.8	583.5
13	18 00	755.5	708.4	639.0	606.1
14	9 15	741.2	702.6	622.0	592.3
14	17 00	752.9	710.8	644.4	604.4
15	9 15	724.3	684.3	608.0	576.6
15	16 45	713.4	672.0	599.8	562.8
16	10 00	695.3	653.8	581.8	547.7
17	9 00	668.5	640.4	573.8	538.0
18	9 00	685.6	641.8	573.0	538.6
19	17 30	680.2	646.4	569.0	537.0
20	9 00	682.7	651.3	576.9	542.2
21	9 15	696.4	651.5	575.6	542.8
21	16 30	694.9	659.9	585.3	552.7
22	10 00	686.5	650.2	573.4	541.3
22	18 00	695.5	658.1	580.3	548.8
23	15 30	709.1	673.4	600.3	564.1
25	9 30	690.4	653.2	571.1	545.2
26	17 00	689.8	655.2	582.7	546.6
28	9 00	710.6	672.8	596.8	566.0
30	16 20	712.7	675.3	603.4	568.2

Measurements of water surface level at point gauge stations.

station no.	X (m)	Y (m)
1	159 406.05	367 794.00
2	159 449.63	367 851.77
3	159 423.56	367 925.03
4	159 453.43	368 009.75

Coordinates of point gauge stations.

APPENDIX E

Transverse slope of water surface

Explanatory note:
The discharge has been determined by means of the velocity-area method. The product of depth-averaged velocity and schematized water depth is integrated in the transverse direction over a distance of b_o = 6.1 m, using the mid-section method (Anon., 1979).

station no.	date May 1980	time	S_t	Q	$\frac{g\, b_o^3\, d_o^2}{Q^2} S_t$
-	-	h min	10^{-3}	$m^3\ s^{-1}$	-
4	14	10 00	- 0.19	1.452	- 0.050
4	14	17 30	- 1.04	1.452	- 0.264
8	12	9 30	- 0.33	1.417	- 0.091
8	12	18 00	- 0.55	1.417	- 0.152
16	15	10 00	+ 1.11	1.371	+ 0.329
16	15	17 30	+ 1.07	1.371	+ 0.317
19	16	10 30	+ 0.72	1.354	+ 0.219
19	16	16 45	+ 0.84	1.354	+ 0.255
21	18	10 30	+ 1.46	1.387	+ 0.422
21	18	16 05	+ 1.51	1.387	+ 0.437
21	30	10 45	+ 1.17	1.352	+ 0.356
21	30	15 50	+ 1.21	1.352	+ 0.368
23	17	18 30	+ 1.65	1.365	+ 0.493
24	26	10 30	+ 0.43	1.386	+ 0.125
24	26	16 15	+ 0.38	1.386	+ 0.110
25	19	11 00	- 0.04	1.333	- 0.013
25	19	17 10	+ 0.11	1.333	+ 0.034
26	28	10 20	- 0.10	1.366	- 0.030
26	28	17 45	+ 0.12	1.366	+ 0.036
27	26	9 00	- 1.31	1.267	- 0.454
27	26	9 00	- 1.60	1.267	- 0.555
27	26	17 10	- 0.81	1.267	- 0.281
28	25	11 00	- 0.03	1.210	- 0.011
28	25	16 45	+ 0.45	1.210	+ 0.171
28	25	16 45	+ 0.25	1.210	+ 0.095
29	21	10 00	- 0.44	1.246	- 0.158
29	21	16 00	- 0.36	1.246	- 0.129
30	26	10 20	- 1.41	1.409	- 0.395
30	26	15 00	- 1.31	1.409	- 0.367
31	22	10 50	- 1.41	1.301	- 0.464
31	22	17 50	- 1.11	1.301	- 0.365
32	23	10 30	- 0.63	1.382	- 0.184
32	23	15 10	- 0.87	1.382	- 0.254
33	12	10 30	- 2.20	1.374	- 0.649
33	12	18 20	- 1.82	1.374	- 0.537
34	13	9 50	- 0.96	1.525	- 0.230
34	13	17 20	- 1.26	1.525	- 0.302
35	14	9 50	- 2.18	1.435	- 0.589
35	14	16 25	- 1.85	1.435	- 0.500
36	22	10 30	+ 0.04	1.383	+ 0.012
36	22	16 15	+ 0.36	1.383	+ 0.105

station no.	date May 1980	time	S_t	Q	$\frac{g\, b_o^3\, d_o^2}{Q^2} S_t$
-	-	h min	10^{-3}	$m^3\ s^{-1}$	-
37	15	16 15	+ 0.22	1.301	+ 0.072
37	15	16 15	- 0.19	1.301	- 0.062
40	19	11 00	+ 0.30	1.343	+ 0.093
40	19	17 00	+ 0.17	1.343	+ 0.052
44	20	10 00	+ 0.55	1.213	+ 0.208
44	20	17 00	+ 0.48	1.213	+ 0.182
52	21	10 00	+ 0.58	1.386	+ 0.168
52	21	16 00	+ 0.85	1.386	+ 0.246

g = 9.81 m s^{-2}; b_o = 6.10 m; d_o = 0.50 m.